Changing New Zealanders' Attitudes to Milk?

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Abstract

The long-term decline in milk consumption is a serious threat for the milk industry and for public health. This study investigated the relationship between consumer attitudes and milk consumption and the effects of TV advertising of milk.

Two random telephone surveys were conducted one year apart. Respondents reported their usual milk intake and beliefs about milk. In the second survey perceptions to milk advertising were also examined. GPs' views on milk were sought by mail questionnaire.

People's perceptions to milk broadly related to what was important in their lives; what threatens them physically and emotionally. Women were more positive about milk but were concerned about its fat content. Men were less aware of milk's nutritional benefits but were more conscious of men's health issues as evidenced by their greater concern about milk and cholesterol. Younger people were the least likely to view milk as good value for money and were more swayed by soft drinks.

Young European women consumed the least milk. Their low consumption was related to perceptions about body weight yet they liked the taste of milk. The TV advertising campaign that gained the most attention featured a Samoan rugby player. The campaign failed to appeal to the female target audience. Rather it appealed mostly to young Maori and Pacific Islands men who were already high milk consumers. There were some positive changes in beliefs as a result of the advertising but concerns about allergies, fat and cholesterol and the cost of milk were amplified. There was no evidence of any consequent change in milk consumption.

GPs' perceptions about milk were broadly similar to those of the general population. Their limited knowledge about the nutritional importance of milk suggests they are unlikely to promote increased consumption.

The findings indicate that to halt or reverse the decline, the milk industry must develop advertising strategies that have more relevance to consumers. Product innovations for specific usage occasions may help to grow consumption. There is an opportunity to maximise use of resources and form industry-health alliances. Further research is needed to understand the relevance of milk in consumer lifestyles.

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I give consent to this copy of my thesis being made available for loan and photocopying.

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"Real knowledge is to know the extent of one's ignorance."
-Confucius

Chapter 1

The Problem of Declining Milk Consumption

Declining milk consumption is a global problem, which has serious implications for nutritional health. In New Zealand milk consumption has been in decline since the early 1980s whilst the consumption of soft drinks and "new age" beverages such as Red Bull, is growing rapidly. International trends suggest that consumption of soft drinks will continue to increase at the expense of more nutritious beverages such as milk.

Soft drinks have negligible nutritional value but are increasingly popular amongst children and adolescents in the United States. They have been shown to displace the nutrients associated with milk consumption and have become the largest source of refined sugar in the American diet.

Milk contains nutrients that are vital for health. In particular milk is a rich and accessible source of dietary calcium. An adequate calcium intake is essential for optimal bone density and has an important role in the prevention of osteoporosis. There is recent evidence that consumption of low fat milk may be important in reducing the risks of hypertension and colon cancer.

Consumers have little understanding about the role of calcium in bone health and of the nutritional properties of milk. There is a lack of awareness of the adverse nutritional effects that may result from the substitution of soft drinks for milk. Various factors based on widespread misconceptions have become barriers to milk consumption. The belief that milk allergy is a common problem, is one example.

This chapter will provide background evidence to show that the decline in milk consumption is a problem for the milk industry and has nutritional implications for consumers. In particular, the role of calcium in the diet and the health consequences of inadequate dietary calcium intakes will be reviewed.

PART 1: STATEMENT OF THE PROBLEM

1.1 Background

Milk is an important component of people's diet in many countries, particularly in New Zealand where milk and dairy products are abundant and are a major export earner. Milk is a staple food for the majority of the population. It accounts for 0.7% of household expenditure on food (Statistics New Zealand, Household Economic Survey, 1998).

Milk provides a number of important nutrients that are difficult to obtain from other foods. Along with fruit and vegetables, breads and cereals, and meat, milk and dairy products form one of the four major food groups. Nutritionally, milk is an important source of energy, protein and vitamins and minerals. Milk is a good source of calcium that is well absorbed relative to other foods.

The 1997 National Nutrition Survey (Ministry of Health, 1999) showed that New Zealanders over the age of 15 years obtain 37% of their calcium intake from milk. The predominance of milk as a source of calcium increased with age amongst women. For men, the percentage of calcium from milk decreased with age until 25 to 44 years and increased in older age groups (Table 1.1). Other sources of calcium were cheese (11%), bread (6%), vegetables, non-alcoholic beverages and dairy products (all 5%). The calcium in foods derived from plant sources is less available to the body than the calcium in milk and dairy products. Plants contain substances, such as fibre, phytate, and oxalate, which reduce the absorbability of calcium from the digestive tract (Graves, 1998).

Table 1.1 Proportion of calcium intake derived from milk, New Zealand 1997

Age 15+ years	Men	Women
All	36%	39%
15-18	38%	31%
19-24	37%	36%
25-44	34%	38%
45-64	36%	40%
65-74	42%	42%
75+	38%	45%

(Ministry of Health, 1999).

Overall, the findings from the National Nutrition Survey revealed that 20% of the population had an inadequate intake of calcium. Calcium requirements formulated by the United Kingdom Panel on Dietary Reference Values (UK Department of Health, 1991) were used in the probability analysis. Inadequate intakes were higher among women (25%) than men (14%), especially in those aged 15 to 18 years, women (37%) and men (33%) (Ministry of Health, 1999).

Inadequate calcium intakes may contribute to low bone mass and density, especially during growth. Low bone density is a risk factor for osteoporosis, which can lead to fractures. The commonest sites of fracture are the hip, spine and wrist. Osteoporosis

is a very debilitating and costly disease. It is estimated that 40% of women and 13% of men will have a fracture because of osteoporosis during their life and that the cost of osteoporosis in terms of health care is almost $200 million per year (Osteoporosis New Zealand, 1999).

While the national incidence of osteoporosis in New Zealand is not known it has been shown that the incidence of fractures of the hip tripled in the Christchurch region between 1970 and 1993 (Elliot, 1996). This appears to be the result of a rapidly ageing population. The total cost for the health system of each fracture is estimated to be in excess of $20,000. Furthermore, it is estimated that 19% of hip fracture patients enter long term care at a cost of about $30,000 per year (Elliot, 1996).

Adolescence is the most important period of life for the development of bone mass (Angus & Eisman, 1988). The second National Health and Nutrition Examination Survey (NHANES II) in the United States suggests that teenage girls reach adulthood with less than their peak bone mass because they fail to increase their calcium intake when their calcium needs are greatest (Eck & Hackett-Renner, 1992). The preoccupation of female adolescents with slimness coupled with the perception that high calcium foods are fattening might be a reason for the low intake of these foods (Moses, Banilivy & Lifshitz, 1989). Lack of calcium in the crucial bone development years may lead to an earlier onset of osteoporosis than in past generations.

Childhood and adolescent milk intake has been shown to correlate with calcium intake and can have a substantial impact on the attainment of peak bone mass (Teegarden, Lyle & Proulx, 1999). Goulding et al (1998) found that one fifth of girls aged 11 to 15 years with forearm fractures consumed less total calcium than recommended. Conversely, Wyshak and Frisch (1994) showed that high calcium intakes appear to exert a protective effect against fractures in teenage boys and girls. They also reported a positive relationship between cola beverage intake and bone fracture. Eating disorders, the drive for thinness, skipping breakfast, eating more fast food, smoking and excessive exercise appear to compound the problem.

Increases in the calcium intakes of people of all ages are necessary for reductions in the prevalence of osteoporosis. A key objective of the New Zealand Ministry of Health's National Plan of Action for Nutrition (1995) is to ensure that 75% of the adult population have intakes greater than 600mg of calcium a day by the year 2000. This goal, however, may be too modest. In 1997, the Food and Nutrition Board of the National Academy of Sciences recommended calcium intakes of 1300mg for 9 to 18 year olds, 1000mg for adults 19 to 50 years and 1200mg for adults over 50 years.

There is therefore quite compelling evidence which suggests that New Zealanders would benefit from consumption of greater quantities of milk and dairy products. Unfortunately, milk consumption in New Zealand, as in other countries, is in decline. Milk is not freely available in schools and it is not known to what extent other drinks in the diets of children, teenagers or adults are replacing it. Consumers' motivations and perceptions, which may inhibit milk consumption, have not been clearly identified.

PART 2: HOW MILK IS DECLINING

1.2 Milk Consumption in New Zealand

Although the overall volumes of milk production have remained stable in New Zealand the domestic per capita consumption of milk has declined since 1976 (Figure 1.1). Fresh milk consumption has decreased by almost 20% from 116 litres per capita in 1982 to 94.6 litres per capita in 1997 (Statistics New Zealand, 1998). There has been a worldwide increase in cheese and yoghurt use but the per capita consumption in New Zealand is low relative to other countries. For example, the per capita consumption of cheese in 1997 was 9.2 kg compared to 23.3kg in France (International Dairy Federation, 1997).

Figure 1.1 Per capita consumption of milk in New Zealand, 1945-1997
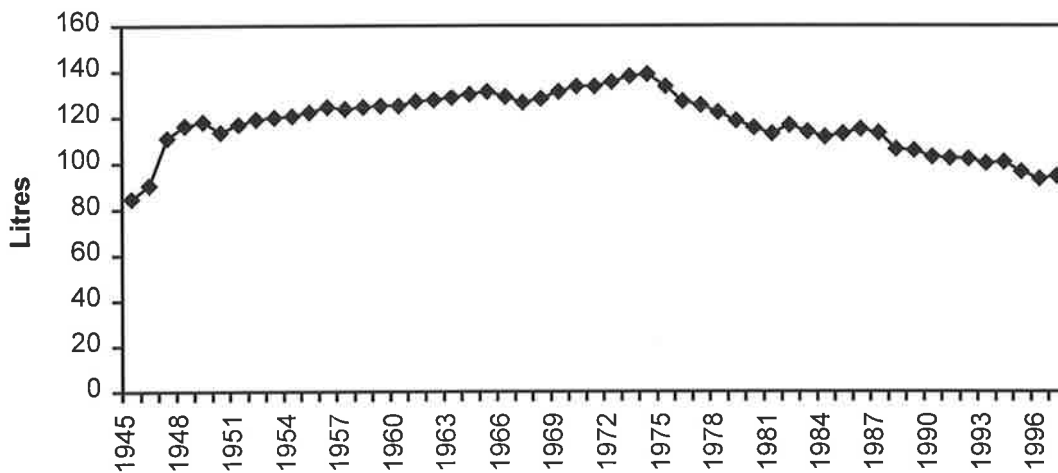
(New Zealand Milk Board Reports 1945-1981, Statistics New Zealand, 1982-1997).

Most of the reasons for the decline are unknown but governmental policies have been implicated. The price of milk has escalated by about 800% over the last twenty years. A government subsidy on the retail price of milk was put in place in 1942. The subsidy increased annually reaching a peak in 1973. From 1976 consumer price increases reflected progressive reduction in the subsidy, which was, eliminated altogether in 1985 (Brown, 1994). The removal of the subsidy resulted in a further rapid rise in the retail price, which had an adverse effect on sales.

The withdrawal of the national provision of free milk for school children in 1967 may also have had an adverse impact. It may have caused a decline in the consumption of milk as a beverage. In the United Kingdom subsidised milk is provided in schools and children are responsible for a large proportion of the milk consumed as a primary beverage (Roberts, 1988).

There have also been changes in eating and drinking habits. The traditional family three-course meal and home made puddings have declined in popularity for many

years (Roberts, 1988). This has resulted in less milk being used in cooking. Households rely more on ready-prepared foods and meals, convenience foods and snacks.

Milk is a commonly used breakfast food, but breakfast eating habits are changing. In 1980 the New Zealand Department of Health surveyed 1500 mothers of school children aged between 5 and 15 years of age about their children's breakfast habits (Nutrition Section, Ministry of Health, 1980). Most (97%) of the children ate breakfast cereals and porridge, toast and bread. Tea, coffee and cocoa were the most commonly used beverages (52% of all children) followed by milk (32%) and fruit drinks or juices (11%). Milk consumption was higher in summer (38%) compared with winter (26%).

In 1998, research on breakfast eating habits showed that 72% of New Zealanders ate breakfast each day (Consumer Link, 1998). The research was conducted among 500 people aged 12 or over throughout New Zealand's 15 main urban centres. Breakfast cereal was the most popular breakfast food eaten by 67% of weekday breakfast eaters. Cereals were a more popular choice among men (72%) than women (62%). Other foods included fruit juice (23%) and yoghurt (19%). Milk was a more popular choice among the men (43%) than the women (39%). Choice of fruit juice was similar in both genders, and more women (24%) than men (14%) included yoghurt (Consumer Link, 1998).

The choice of milk was highest among single persons under 40 years (48%) and lowest among single people over 40 years (30%) and married persons over 40 years (28%). Across age groups milk was the most popular choice among 12 to 14-year-olds (67%). Consumption of milk declined across age groups with only 29% of those over 50 years including milk (Consumer Link, 1998).

In New Zealand, the breakfast cereal market is growing by volume (Woodfield, 1998). A move to target specific segments of the market with particular products has led to a large increase in consumer choice. Although there may be a range of cereals in each household to meet different requirements, anecdotal evidence suggests that cereals may be eaten at all times of the day, with or without milk and often with yoghurt.

In the United States there was a decline in breakfast food consumption between 1965 and 1991, particularly among children (1 to 10 years) and adolescents (15 to 18 years) (Siega-Riz, Popkin & Carson, 1998). The findings showed that the likelihood of breakfast consumption was significantly less for adolescents (aged 15 to 18) than for any other age group, and it was less for girls than boys (Siega-Riz et al, 1998). Decline in breakfast consumption was higher among those living in low-income households, or headed by a single parent, less well educated women or women employed outside the home. The estimated consumption of ready to eat cereals increased during the study but milk as a breakfast food declined by 10 percentage points. Consumption of whole milk declined from more than 180g to less than 80g per breakfast consumer, whereas skim milk increased from less than 10g to nearly 100g. For breakfast consumers, the meal's contribution to total energy remained relatively stable.

In the United Kingdom milk has traditionally had a good image with most consumers, but consumption has declined (Roberts, 1988). Milk is no longer considered an essential part of the diet and there is concern and misunderstanding about its fat content. This may be partly due to increased consumer interest in the link between diet and health, which has resulted in greater consumer demand for a wider choice of milks. There has been an increase in the availability of semi-skimmed and skimmed milks. This may have allayed the fears of some people concerned about fat intake. In many countries including the United Kingdom, reduced and low fat milks fortified with skim milk powder are rarely available. Consequently skim milk is perceived as watery and has a low taste preference (Roberts, 1988).

In response to consumer demand there is now greater availability of milk in New Zealand supermarkets. Sales of milk in supermarkets for the leading Anchor brand account for 37% of household milk purchases (AC Nielsen & NZ Statistics, 1997). Changes in household and shopping patterns have encouraged this trend and it has provided a stimulus to increase consumer choice. Flavoured milk and high fat breakfast milk together with specialist products such as cultured and calcium fortified milks have also gained in market share.

In New Zealand it is the view of the milk industry that home delivered milk is an important factor in growing the level of milk consumption and every effort is made to preserve its availability (New Zealand Dairy Foods, 1998). Purchase of home delivered milk throughout New Zealand is very regional. In the South Island it accounts for approximately 30% of milk sales compared to 32% of sales in supermarkets. In contrast, in the upper North Island it accounts for only 8% of sales, compared to 41% sales in supermarkets (New Zealand Dairy Foods, 1998). The remaining milk sales are in "corner grocery shops", service stations and other convenience outlets. The challenge to the milk industry is to make milk as widely available as soft drinks, particularly in the rapidly growing convenience market.

1.3 Global milk consumption

Consumption of milk varies widely throughout the world. In 1996 the consumption per head varied from 151 kg per year in Ireland to below 0.05 kg per year in China (International Dairy Federation, 1997). The per capita consumption of milk in New Zealand in 1996 was 39% less than in Ireland and less than in many countries in Europe, the United Kingdom, the USA and Australia (Figure 1.2).

In countries with developed markets, milk consumption is generally static except where a growth in population is driving the market, or where markets have responded to an increase in advertising. For example, in the United States consumption grew by over 1% in 1996, supported by $100 million of generic advertising (International Dairy Federation, 1997).

Figure 1.2 Global per capita consumption of milk in 1996 (kg per year)

New Zealand
Denmark
Russia
USA
Spain
Australia
Sweden
UK
Luxembourg
Ukraine
Norway
Iceland
Finland
Ireland

0   20   40   60   80   100   120   140   160
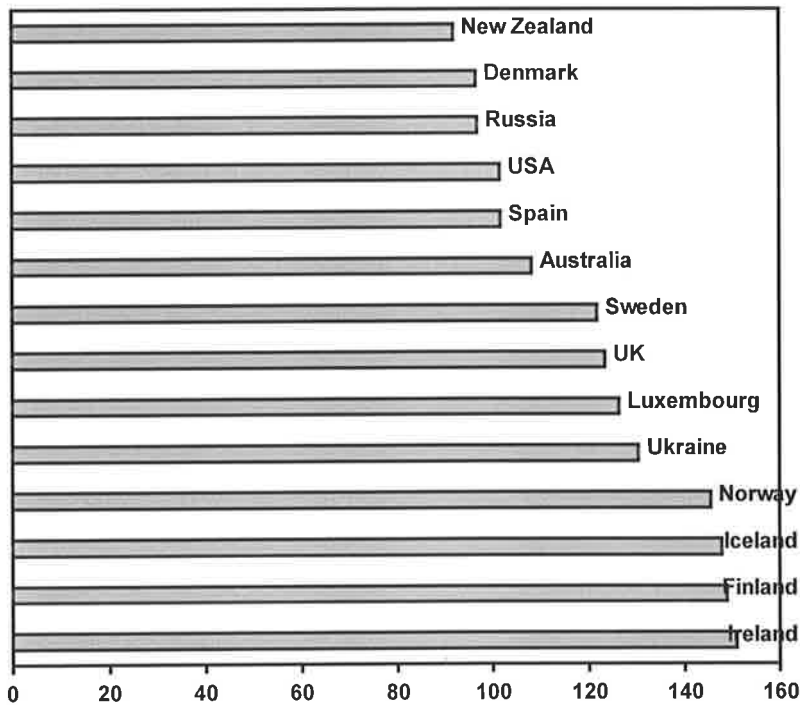
(International Dairy Federation, 1997)

There has been a trend away from consumption of whole milk (4% fat) in most 'developed' markets. Milks of between 0.5 and 2.5% fat have gained volume. In the United Kingdom, semi-skimmed milk with a fat content of about 1.6 % represented 43% of liquid milk consumption in 1995, compared to 38% in 1993 (Mintel International, 1996). According to a survey commissioned by the United Kingdom National Dairy Council in 1993, almost nine out of ten consumers consider milk to be an important part of a healthy diet and 55% mentioned semi-skimmed milk in this regard, compared with 47% in 1991. While the share of semi-skimmed milk has increased dramatically from 27% in volume in 1991 to 42% in 1995, it is noteworthy that the share of skimmed milk declined from 9% to 7% during the same period. It is conceivable that the appeal of semi-skimmed milk to United Kingdom consumers is based on both its health aspects and its taste (Mintel International, 1996).

In Australia and New Zealand, the growth of reduced and low fat milks has not been so rapid. In Australia, the per capita consumption of regular whole milk has declined by 25% in volume over the past 15 years (Australian Dairy Federation, 1998). Regular whole milk had a 96% volume share in 1982 declining to a 71% share in 1997; reduced fat milk had a 21% share and low fat milk, an 8% share.

In 1997, milk consumption by type was similar in New Zealand to Australia for regular whole milk (63.3%), but slightly less for reduced fat milk (13.2%) and higher for low fat milk, 22% (New Zealand Dairy Foods, 1998).

International consumption statistics for value added milk drinks, fermented drinks and yoghurt show growth of about 4% a year, driven by a high rate of new product development and the presence of brands that are increasingly sold world-wide (International Dairy Federation, 1997).

1.4 Soft drink consumption

Milk as a drink, both in and out of the home, has endured ruthless competition from soft drinks. Their range of products, packaging and availability has increased and the low material costs enable them to be extensively promoted.

The consumption of soft drinks in New Zealand has increased by 44% in the last five years; New Zealanders consuming 81.6 litres of soft drink per capita in 1996/97 per year (Figure 1.3). Over the same period of time Australian soft drink consumption has increased by 25%; Australians consuming 119.7 litres per capita per year (ASDA, 1998).

Figure 1.3 Per capita consumption of soft drinks in New Zealand (Litres per year, 1989-1996)
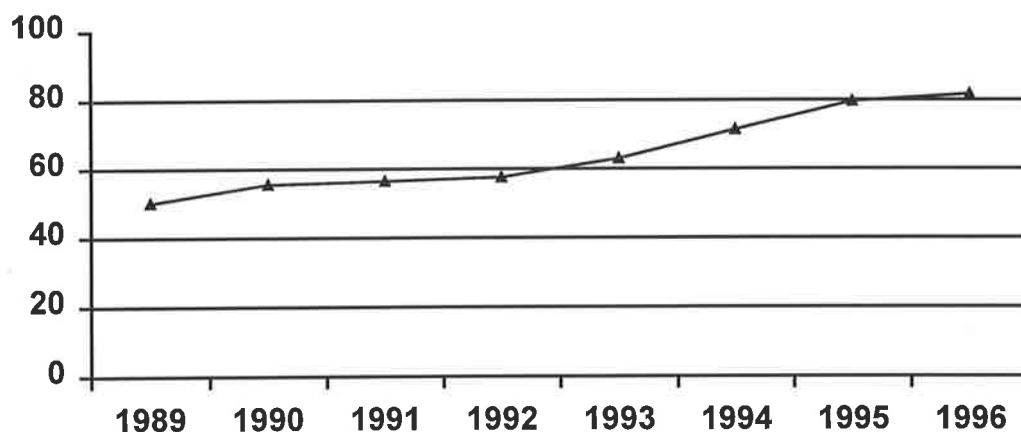
(Australasian Soft Drink Association, 1998)

In 1997, soft drinks were reported to be the beverage of choice in Australia and New Zealand (ASDA, 1996). According to Jesse Meyers, former Editor of Beverage Digest " beverage consumers of the 1990s are searching for products that are cold, swift, sweet and image enhancing" (ASDA, 1996). The first real generation of soft drink consumers was the teenagers of post world war two. These 'baby boomers' are now taking soft drinks with them into middle age and beyond. Accordingly, the global soft drink industry experienced 63% growth in the 1960s, 52% growth in the 1970s and 34% growth in the 1980s (ASDA, 1996).

A further factor driving soft drink sales is the cost to the consumer. Over the past 10 years, the price per litre of soft drinks in New Zealand supermarkets has declined by

nearly 50% from $1.88 in 1988 to $0.96 in 1998 (AC Nielsen, 1998). Over the same period, the price per litre of milk has almost doubled (Figure 1.4).

Figure 1.4 Price of milk versus soft drinks (Litres per year, 1988-1998)
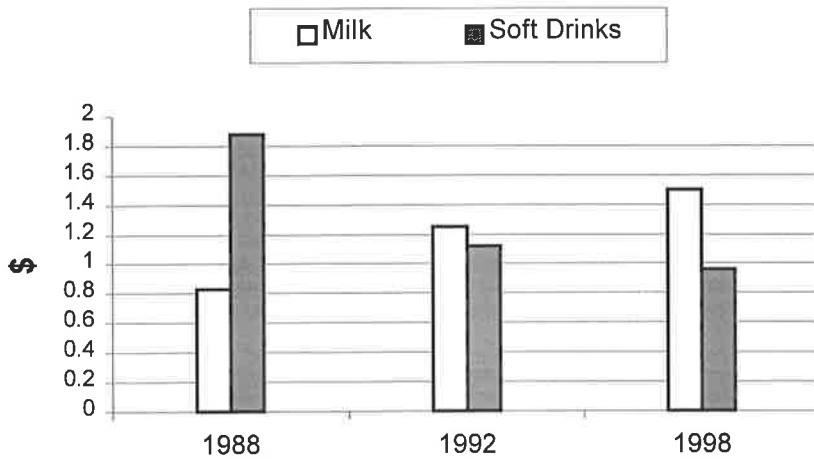
(AC Nielsen, 1998)

In the United States the per capita consumption of soft drinks per year in 1998 was 193.3 litres, almost double that of milk at 101 litres per capita. Whilst per capita consumption of soft drinks in Australia (119.7 litres per year) has surpassed that of milk, in New Zealand it remains slightly below milk consumption (Figure 1.5).

Figure 1.5   Per capita consumption of milk versus soft drinks in New Zealand, Australia and the United States (Litres per year)
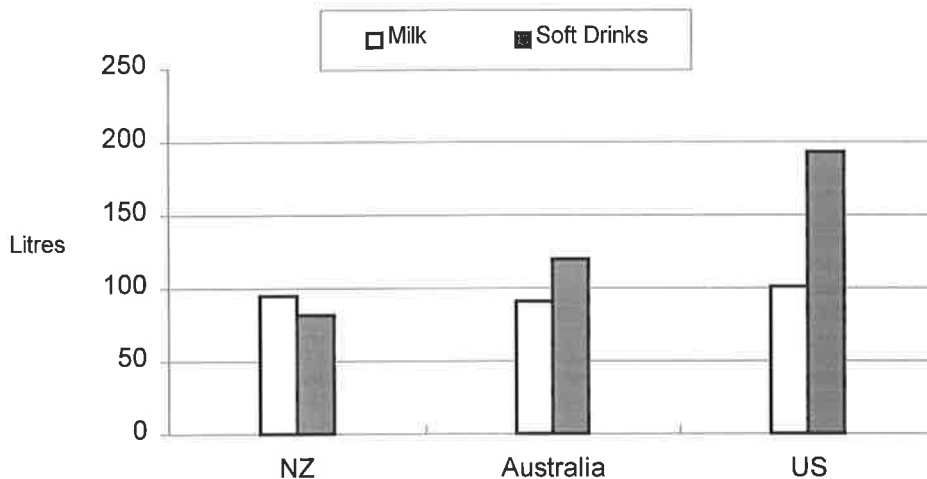
(Statistics New Zealand, 1998; IDF, 1997; ASDA, 1998; NSDA, 1998)

1.5 Nutritional consequences of increasing soft drink consumption

In the United States, data from the 1977-1979 and 1994 US Department of Agriculture (USDA) Continuing Surveys of Food Intakes by Individuals (CSFII) showed that consumption of soft drinks markedly increased amongst children and adolescents (Borrud, Wilkinson & Mickle, 1997). In particular, the proportion of adolescent boys and girls consuming soft drinks on any given day, increased by 74% and 65% respectively between the two survey periods. The government survey found that boys and girls (aged 13 to 18 years) drink on average 868 cans of soft drink a year. In extreme cases some people get as much as 40% of their total calorie intake from soft drinks.

Soft drinks account for more than 27% of Americans' beverage consumption (NSDA, 1998) and they are the largest source of refined sugars in the American diet (Gibney, Sibman-Grant & Stanton, 1995). The US Department of Agriculture Nation-wide Food Consumption Survey revealed that soft drinks are also the fifth largest source of energy for adults providing 5.6% of all the calories that Americans consume (USDA, 1996). In 12 to 19 year olds, soft drinks provide 9% of energy for boys and 8% of energy for girls and these percentages are triple (boys) or double (girls) what they were in 1977-78 (Centre for Science in the Public Interest, 1998).

Obesity rates have risen in tandem with soft drink consumption, and heavy consumers of soft drinks have higher energy intakes (Environ, 1998). In the United States the prevalence of overweight among young people aged 6 to 17 years has more than doubled in the last 30 years (Troiano, Flegal & Kuczmarski, 1995). It is estimated that about 11% of US youths aged 6 to 17 years are seriously overweight (Troiano et al, 1995). The US National Institutes of Health recommend that people who are trying to lose or control their weight should drink water instead of soft drinks (NIH, 1997).

The proportion of adolescent girls drinking milk on any given day decreased from 72% in 1977 to 57% in 1994 (Borrud et al, 1997). Twenty years ago, boys consumed more than twice as much milk as soft drinks, and girls consumed 50% more milk than soft drinks. By 1994, both boys and girls consumed twice as much soft drink as milk and 20 to 29 year olds consumed three times as much (USDA, 1996). The Nation-wide Food Consumption Survey found that only 29% of boys and 10% of girls aged 12 to 19 years consumed the recommended amount of dairy foods and only 36% of boys and 14% of girls consumed 100% of the Recommended Dietary Allowance (RDA) for calcium (USDA, 1996). The optimal daily intake of calcium for this age group is 1200-1500mg per day (National Institute of Health, 1996).

The nutrition community in the US has long been concerned about soft drink consumption in children and teenagers. In the 1960s, the American Medical Association issued a statement expressing its opposition to the sale of soft drinks in school lunchrooms (Council on Foods and Nutrition, 1962). The Council warned against the nutritional consequences of choosing a carbonated beverage rather than milk. From 1980 to 1983, in US schools receiving federal funds through the

National School Lunch and School Breakfast Programmes, soft drinks were not sold from the beginning of the school day until after the lunch period had ended (Eisenman and Longen, 1980). Since November 1983, soft drinks have been prohibited only in foodservice facilities or during the actual serving of food (Food and Nutrition Service, USDA, 1984). The USDA has restricted the sale of foods of minimal nutritional value because they are considered inappropriate in nutrition education settings. In a review of adolescent food habits, however, Truswell and Darnton-Hill (1981) expressed an opposite point of view. They suggested that growing teenagers need the energy soft drinks provide and are of no nutritional concern.

Findings from the Nation-wide Food Consumption Survey, 1977-78 (Guenther, 1986) tend to contradict Truswell and Darnton-Hill's view. The nutritional impact of soft drink consumption was assessed by determining the partial correlation of soft drink intake with intakes of energy and 14 nutrients, while controlling for 19 variables related to time, location and personal and household characteristics. The negative part correlation of soft drink intake with intakes of calcium (-0.11), magnesium (-0.06), riboflavin (-0.09), vitamin A (-0.08) and ascorbic acid (-0.06) indicate that soft drinks may contribute to low intakes of those nutrients by some teenagers. Soft drink and milk intakes were negatively correlated ($r = -0.22$, $p < 0.0005$).

Soft drinks had the greatest impact on the adequacy of calcium intake (Guenther, 1986). Boys who did not consume soft drinks had diets that provided more than the RDA for calcium (108%). Boys who were low users had diets that provided 94% of the RDA while high users' diets provided 89% of the RDA. Girls who did not consume soft drinks had diets that provided 75% of the RDA for calcium. Low users' diets provided 66% of the RDA, and high users' diets provided only 59% of the RDA (Guenther, 1986).

The findings also showed that soft drinks were just as likely to be drunk at lunch or supper, suggesting that teenagers may have substituted soft drinks for milk at meals (Guenther, 1986). Boys were more likely than girls to drink milk at any occasion, especially at breakfast. Milk was consumed less frequently and in smaller amounts in the summer than in each of the other three seasons, whereas soft drinks were consumed more frequently and in greater amounts in the summer. In terms of household income, the findings showed that mean intake of milk generally increased with income whereas mean soft drink intakes did not show an income-related pattern.

More recently, Harnack, Stang & Story (1999) analysed data from the 1994 Continuing Survey of Food Intakes by Individuals to determine whether children and adolescents who consume more soft drinks consume lower quantities of milk and fruit juice. Soft drink consumption patterns varied significantly between age groups (Table 1.1).

Table 1.2 Proportion of children consuming soft drinks by age category

	%
Pre-school, 2-5 years (n=810)	
Non-consumers	49.5
5-270 ml/d	38.9
>270 ml/d	11.7
School age, 6 to 12 years (n=557)	
Non-consumers	35.9
5-270 ml/d	31.8
>270 ml/d	32.3
Adolescents, 13 to 18 years (n=423)	
Non-consumers	17.5
5-390 ml/d	32.2
390-780 ml/d	28.1
>780 ml/d	22.2

(Harnack, Stang & Story, 1999)

Of the pre-school children, 12% drank an average of 270 ml of soft drink or more per day. Among school-aged children, more than a third consumed 270 ml or more and 22% of adolescents consumed more than 780 ml of soft drink a day. That is, children consume greater volumes of soft drinks as they gain more independence. Energy intake was found to be positively associated with soft drink consumption. In particular, energy intake was higher for those in the highest soft drink consumption category. For example, mean adjusted energy intake was 1,830 kcal/day for school-aged children who were non-consumers of soft drinks compared with 2,018 kcal/day for children in the age group who consumed an average of 270 ml or more per day (Harnack et al, 1999).

The data showed that soft drinks displace milk and fruit juice in both the diets of children and adolescents. Soft drink consumption was inversely associated with consumption of milk, fruit juice and the nutrients concentrated in these beverages. Logistic regression analysis (predicting the odds of low milk and fruit juice consumption adjusted for age, sex, race and energy), indicated that for all age groups, those in the high soft drink consumption category were more likely to consume less than 240 ml milk per day, compared to nonconsumers of soft drinks. For example, adolescents consuming 780 ml soft drink or more per day were about four times more likely to consume less than 240 ml of milk per day compared to nonconsumers of soft drinks.

Again, for those nutrients that may be considered markers for milk consumption (calcium, riboflavin, vitamin A, phosphorus, and the ratio of calcium to phosphorus), notable differences in intake by soft drink consumption were evident. In general, for all age categories, these micronutrients were inversely associated with soft drink consumption (Harnack et al, 1999).

It has been hypothesised that a low ratio of calcium to phosphorus in the diet may adversely affect calcium balance and increases the risk of osteoporosis (Wyshak, Frisch & Albright, 1989; Riggs & Melton, 1986 and Wyshak & Frisch, 1994). In the

above study it was shown that the calcium to phosphorus ratio declined with increasing soft drink consumption (Harnack et al, 1999).

It has been suggested that people of all ages who drink soft drinks instead of milk or other dairy products will most likely have a lower calcium intakes (CSPI, 1998). The concern is that a low calcium intake contributes to osteoporosis and the risk depends in part on how much bone mass is built early in life. Girls build 92% of their bone mass by age 18 (Institute of Medicine, 1997). If they fail to consume enough calcium in their teenage years they cannot "catch up" later. For this reason, higher calcium intakes are recommended for young people aged 9 to 18 years than for adults 19 to 50 years. Of particular concern is the knowledge that US teenage girls consume only 60% of the recommended calcium intake, with high soft drink consumers consuming almost one fifth less than non-consumers (Environ, 1998).

In the US it has been recommended that nutrition education messages targeted to children should encourage limited consumption of soft drinks (Harnack et al, 1999). In addition, it is suggested that policies that limit children's access to soft drinks at day care centres and schools be promoted.

Recent research in the UK suggests that children's drinking behaviour evolves as they grow; choice and control shifting gradually from mother to child (Tetra Pak Ltd, 1998). The research focused on drinking occasions within the child's day – breakfast, the lunchtime drink at school, routine drink consumption at home, and drinks when out. These occasions can be divided into private and public, with brands and child choice of most importance in the public sphere, while mothers' values of product integrity and economy persist longest for drinking in family situations at home.

The research showed that breakfast drinking is private, and shows the least change as the child grows. This is the occasion over which the mother's control is at its maximum, and perceived product benefits are crucial. Once children start school, outside influences come into play. Sophistication grows as children progress through primary school, so that by the age of eight their brand experience is extensive. Their repertoire across the day is wide: bottled water, fruit juice, tea and coffee, soft drinks plus natural and flavoured milk. They also appreciate occasional specific products for example, Lucozade for football training. Generally, by age 11, children have gained greater freedom of choice and discretion over spending. Then, drinking habits become more leisure related and less adult control allows greater scope for diversity. From experiencing brands chosen by their parents, children move to being consumers within their peer group. The findings showed that nearly two-thirds of this age group will sometimes buy a soft drink on the way home from school, and they will make a detour to get the brand they want at the right temperature (Tetra Pak Ltd, 1998).

This research suggests that the nutrition and health properties of milk are important when it is taken as a perceived breakfast drink. However, because drinks that are consumed in public by teenagers are chosen as much for their image as for their content, it is important for the milk industry to promote the image-related properties of milk. Children represent a major area for market expansion but have demanding standards for product, pack and promotion.

PART 3: NUTRITION, HEALTH AND MILK

1.6 Nutritional implications of declining milk consumption

The nutritive value of milk has long been recognised. Milk is considered to be a primary dietary source of calcium because of its high calcium content, calcium bioavailability and presence of other key nutrients such as protein, riboflavin, vitamin B_{12} and magnesium (National Institute of Health, 1996). In addition, the vitamin D, lactose and favourable calcium: phosphorus ratio in milk facilitates calcium absorption. Milk also provides an important source of energy.

Calcium intake, intestinal absorption and endogenous faecal loss influence calcium balance (National Institute of Health, 1994). Intake and absorption account for only 25% of the variation in calcium balance, whereas urinary losses account for approximately 50%. The contemporary diet consists of high amounts of sodium and animal protein, both of which can significantly increase urinary calcium excretion.

1.6.1 Calcium in the Paleolithic diet

There is persuasive evidence that human beings are naturally adapted to high calcium intakes. During the Late Palaeolithic Period of 35,000 to 10,000 years ago, the diet of human adults is estimated to have contained from 2000-3000mg of calcium per day, three to five times the median intake of present-day New Zealand adults (Eaton and Nelson, 1991). This high calcium intake was primarily obtained from uncultivated plant foods and, to a small extent, from wild game.

The Late-Palaeolithic diet provided an abundance of protein, micronutrients and fibre but relatively little fat and sodium, hence the high calcium intake interacted with quite a different mix of other nutrients compared with a modern diet (Eaton, Konner & Shostak, 1988). Furthermore, the lifestyle of Stone Agers demanded levels of physical activity that exceeded those among contemporary humans. The dental and skeletal remains of Late-Palaeolithic-Era humans indicate that the end results of their nutritional experience were equal or superior to those achieved today (Eaton, Konner & Shostak, 1988).

It is believed that our genetic makeup remains adapted for the circumstances of the Late Stone Age (Eaton and Nelson, 1991). As a physiological consequence of the naturally high intakes of that era, there is an absorptive barrier to calcium in the gastrointestinal tract.

The sodium content of the stone-age diet is estimated to have supplied a mere 690mg of sodium at basal energy intakes (Eaton and Konner, 1985). This level is considerably less than the current recommended dietary intake for adult men (920-2300mg). Sodium is absorbed with 100% efficiency, and when dietary sodium is severely restricted urine and sweat sodium can be reduced to almost zero. Physiological systems have evolved to conserve sodium via the kidneys,

gastrointestinal tract, and sweat glands, and land mammals also have both a taste and appetite for salt.

A decline in food variety, resulting in decreased intake of calcium occurred as a result of the agricultural revolution about 10,000 years ago. Barger-Lux and Heaney (1994) suggest that time since then, has not been sufficient to allow our genetic programme to adapt to lower calcium intakes.

1.6.2 Calcium in the present day diet

Adaptive mechanisms driven by parathyroid hormone and the vitamin D system once assisted stone age humans to overcome seasonal breaks in the supply of calcium rich foods. However, the calcium restricted diets common today are considered to force those same mechanisms into continuous high gear over most of adult life, quite possibly with untoward consequences (Barger-Lux and Heaney, 1994). Other nutritional inadequacies often accompany and complicate low calcium intake. Low calcium diets have been shown to be markers for diets with multiple nutrient inadequacies (Barger-Lux, Heaney & Packard, 1992).

Today, New Zealand adults typically consume only about one-fifth to one-third as much calcium as did Stone Age humans. The 1997 National Nutrition Survey (Ministry of Health, 1999) reported a mean calcium intake of 908mg/d for men and 735 mg/d for women. At a calcium intake of 800mg, the current recommended dietary intake (RDI) for adults, calcium is absorbed at an average efficiency of only 25% (95% confidence interval, 0.15 to 0.41). As calcium is contained in the digestive juices, net absorption is lower still. At very low calcium intakes, the average value for absorption fraction is still less than 0.50 (Heaney, Recker & Stegman, 1989). Dermal loss of calcium via sweat glands is unregulated. Urinary calcium at net absorption of zero ranges close to 100 mg/d, and the estimated minimum obligatory loss via the kidneys, gastrointestinal tract, and sweat glands totals about 216 mg/d (Charles, Eriksen & Hasling, 1991).

Diets with excess sodium, protein, or both, carry a cost that, in effect, increases the requirement for calcium. Sodium was scarce in the diets of primitive humans. Accordingly, sodium is absorbed with 100% efficiency and conserved avidly in the body. Studies have shown that sodium is a significant determinant of urinary calcium (Nordin, 1996). Urine calcium rises by 1-2 mmol for every 100 mmol increment of ingested sodium (Nordin, Need & Morris, 1991). It has been clearly established that protein produces a similar effect (Heaney and Recker, 1982). For example, as protein intake is doubled, urinary calcium increases by about 50%.

1.6.3 Calcium and bone mass

There are several factors which can modify calcium balance and influence bone mass (NIH, 1994). These include dietary constituents, hormones, drugs and the level of physical activity. In addition the individual's age, body weight, ethnicity and genetic background may modify the effects of dietary calcium on bone health.

The metabolites of vitamin D enhance calcium absorption. In particular, the major metabolite 1,25-dihydroxyvitamin D stimulates active transport of calcium in the small intestine. In the absence of 1,25-dihydroxyvitamin D (which may occur from

inadequate exposure to sunlight), less than 10% of dietary calcium may be absorbed. Vitamin D deficiency is associated with an increased risk of fractures (Heaney, 1993).

Sex hormone deficiency is associated with excessive bone resorption in both women and men. Until menopause, most women are oestrogen replete. When women reach menopause, however oestrogen depletion will cause rapid bone loss. Women can eventually lose 20% to 30% of total bone mass (Dalsky, 1989).

Exercise has been shown to maintain or increase bone density (Dalsky, Stocke & Ehsani, 1988) but the effect does not appear to be large enough to offset the rapid bone loss that occurs after the menopause (Smith and Gilligan, 1991). Many studies investigating the link between exercise and bone loss have focused on aerobic exercise, such as running and brisk walking. Other researchers have focused on the effect of strength training on bone loss or the effects of exercise combined with oestrogen. Comparison of studies is difficult because of differences in the frequency, type, duration and intensity of exercise as well as skeletal measurement sites and measurement techniques. It appears that purely mechanical loading of bone can increase bone mineral content but it has to exceed the current loading history of that bone. That is, exercise has to exceed the activities of daily living to produce a response.

Higher body weight appears to be protective against both low bone mass and hip fractures (Sowers, Khirsagar & Crutchfield, 1991; Cummings, Kelsey & Nevitt, 1985; Paganini-Hill, Chaos & Ross, 1991), although positive effects are seen within the healthy weight range. Possible mechanisms include enhanced conversion of androgens to oestrogens in the adipose tissue, response to mechanical stress on the bone which may cause it to become more dense, and adipose tissue acting as a padding for the hip during a fall.

Research has not yet identified the best combination of oestrogen replacement, calcium and exercise for fighting osteoporosis. However, clinical experience shows that all three are needed to prevent the rapid bone loss that can occur in postmenopausal women (Munnings, 1992).

Despite physiological mechanisms by which humans adjust to temporary environmental shortages, chronic low intakes of calcium have a number of health consequences, most notably bone fragility, high blood pressure and colon cancer. Evidence indicates that improvement in calcium intake prevents some portion of these multi-factorial problems (Barger-Lux & Heaney, 1994).

Studies undertaken in the 1920s and 1930s in the UK showed that supplements of milk in the diet had a positive effect on growth especially in ill-nourished children (Orr, 1928; Leighton and Clarke, 1929; Milk Nutrition Committee, 1938). The effects of a school milk scheme on children's growth was evaluated in a randomised, controlled, intervention trial (Milk Nutrition Committee, 1938). In this intervention, two levels of a milk supplement were evaluated against a control diet (usual diet plus a supplement of biscuits) with changes in the height and weight of children as the main outcome measures.

The results showed that the provision of 380ml of milk per day, contributed to small but positive gains in height and weight in children aged five to fourteen years. The findings highlighted that the effects of milk supplementation were greater in poorly nourished children because the skeleton in such children tended to be deficient in calcium. However, given the only method of evaluating skeletal development was through the measurement of height, the interpretation of the findings was somewhat speculative. Nevertheless, milk was perceived to be an important staple food for children's bone growth during this era. The perceived benefits of milk supplementation provided the impetus for the New Zealand government subsidised school milk scheme between 1937 to 1967.

Contemporary research on the effects of diet on growth has the advantage of being able to focus quite specifically on the mineral mass and density of the skeleton. The advent and widespread use of techniques such as dual energy X-ray absorptiometry (DEXA) allows very precise measurements of bone mineral mass and density to be made, at both a whole body and site specific level.

The role of nutrition in supporting bone growth is critically important because maximisation of skeletal development in childhood and adolescence is a recognised preventative strategy against the bone thinning disease, osteoporosis (Matkovic & Illich, 1993). The quantity of bone at skeletal maturity, known as peak bone mass, has been shown to be inversely related to the risk of osteoporotic fracture later in life (Anderson, Tylavsky & Halioua, 1993).

From infancy, the activity of bone formation predominates until young adulthood, resulting in accumulation of bone mass. Thereafter, bone tissue is continuously formed and resorbed with minimal change in bone volume through the remodelling process. Bone modelling and skeletal bone mass probably result from a complex sequence of hormonal changes in interaction with nutritional factors. The concerted actions of growth hormone, insulin-like growth factor-1, sex and adrenal steroids and their receptors, are responsible for the growth spurt, stabilisation of the bone modelling process, and attainment of skeletal bone mass (Matkovic, 1996).

Chronic deficiency of calcium intake starting early in life is responsible for the development of osteoporosis (Murphy et al, 1994 and Matkovic, 1991). A recent New Zealand study found that girls 3 to 15 years old with arm fractures had lower bone density, which can result from low calcium intake (Goulding, Cannan & Williams, 1998). A maximal bone mass at skeletal maturity is considered to be the best protection against age-related bone loss (Cadogan, Eatall & Jones, 1997 and Bonjour, Carrie & Ferrari, 1997). Prospective studies have shown that low bone density is an important predictor of future fracture risk (Cummings, Black & Nevitt, 1990).

Epidemiological studies suggest that variations in calcium intake early in life may account for a 5% to 10% difference in peak bone mass (Matkovic, Kostial & Simonovic, 1979 and Sandler, Slemenda & LaPorte, 1995). This difference may account for a 50% greater risk of hip fracture later in life (Matkovic et al, 1979).

Studies of calcium supplementation via increased milk consumption have shown that increased milk consumption early in life is associated with higher peak bone

mass (Cadogen et al, 1997; Chan, Hoffman & McMurray, 1995; Gilchrist, 1997; Renner, 1994). A significant positive association between milk consumption up to age 25 and subsequent hip and spine bone mineral density in middle aged women living in Cambridge, England has also been demonstrated (Murphy, Khaw & May, 1994). A similar study showed a positive association between milk intake in childhood and adolescence and bone mineral density at the radius in postmenopausal women in the United States (Sandler, Slemenda & LaPorte, 1985).

A recent study examined the effect of milk on the development of bone mass and density in adolescent girls (Cadogen et al, 1997). The study design was a randomised, controlled, intervention trial with total body bone mineral density (TBBMD) and total body bone mineral content (TBBMC) as the main outcome measures. The subject group was 80 healthy adolescent girls aged 11-12 years, with a baseline calcium intake of 746 mg/day. Half of the group was randomised to receive a daily milk supplement of 568 ml of milk per day. Subjects could choose from whole (3.9% fat), semi-skimmed (1.6% fat) or skimmed (0.1% fat) milk and were asked to consume as much of the daily supplement as possible. The intervention continued for an 18-month period. At baseline, 6,12 and 18 months TBBMC and TBBMD were measured using DEXA. The DEXA measurements also provide estimates of body composition (lean mass, fat mass and percentage body fat). Height and weight were also recorded at each time point. Dietary intake was assessed at baseline and at the end of the trial by the seven-day weighed intake method.

The findings showed that bone mineral accretion could be modified during childhood and adolescence through milk supplementation. Milk intake in the intervention group increased from about 150ml/day at baseline to approximately 450ml/day; the majority of subjects chose semi-skimmed milk. Subjects receiving the milk had greater intakes of protein, calcium, zinc, magnesium, riboflavin and thiamin. At the end of the 18 months the mean increase in TBBMC in the milk group was 27% and in the control group 24.1%, p=0.009. The corresponding figures for TBBMD were 9.6% and 8.5%. There were no differences between the milk and control groups in terms of increments in height, weight, lean and fat mass and percentage body fat.

A further study in adult women confirms the amount of milk consumed during adolescence is associated with current bone mineral measures and that current milk consumption is most influential on spine bone mineral content (Teegarden, Lyle & Proulx, 1999). In this study 224 healthy women, ages 18 to 31, completed a food frequency interview and recall of previous milk intake from early childhood to 12 years of age and during adolescence. Subjects were to indicate consumption as "infrequent" or "never", "sometimes", or "at every or almost every meal". Through the use of DEXA, investigators looked at subject's total body (TB), femoral neck (N), radius (R), and spine (S) bone mineral density (BMD) and bone mineral content (BMC).

It was found that childhood and adolescent milk intake correlated with the subject's current calcium intake. The amount of milk drunk during adolescence was positively related to radius bone mineral density. When the data were controlled for weight, adolescent milk intake was also correlated to TB BMD, TB BMC, S BMC,

R BMD, and R BMC but not to N BMD. Current milk intake was strongly related to S BMC. This result was not surprising because the spine is predominantly trabecular bone and has a higher metabolic turnover compared with cortical bone. In addition, the spine attains peak bone mass during the mid 20s (Recker, Davies & Hinders, 1992). Therefore current intakes in this age range will influence the amount of bone at this site.

The findings suggest that:
- Milk consumption habits developed in childhood remain through adulthood.
- High milk consumption during the peak bone development period of childhood and adolescence can lead to stronger bones.

1.6.4 Calcium and osteoporosis

Osteoporosis is a major public health problem, especially in contemporary Western society with its ageing population (Jones, Nguyen & Sambrook, 1994). It is the single most important cause of fractures in middle aged and elderly people. Most studies have concentrated almost exclusively on osteoporotic fractures in women. With increasing longevity in males, osteoporosis will become of increasing importance in men.

Total fracture risk during later life is substantial. A recent Australian study documented the incidence of fractures in men and women over 60 years of age living in the geographically isolated area of Dubbo in New South Wales (Jones et al, 1994). The study showed that the residual lifetime fracture risk in a person over 60 years with average life expectancy was 29% for males and 56% for females. In the 60 to 80 age group only 10% of fractures involved the hip, while in the over 80 age group this incidence rose to 41%. Incidence of distal forearm, hip and total fractures increased exponentially in both sexes with increasing age.

In New Zealand, the average age of women having hip fractures is 78-80 years (Elliot, 1997). The risk of hip fractures rises sharply with age, doubling every 5 to 7 years past the age of 65. Hip fractures are associated with a high mortality. It is estimated that 6% of women die in hospital after a fracture and 27% die within the following year. As fractures are more common with advancing age, the consequences of osteoporosis will become increasingly important.

Hereditary and environmental factors contribute to the development of osteoporosis. Recent studies have indicated that up to 80% of the variability in bone mass is genetically determined (Pollitzer and Anderson, 1989). In particular, it has been shown that genetic factors have greater impact than environmental factors on the development of pre-menopausal bone mass (Armamento-Villareal, Villareal & Avioli, 1992). However, dietary factors can help reduce risk in girls predisposed to the disease.

A study of the calcium kinetics in the maternal grandmother, mother and granddaughter in 10 multigenerational families showed that girls and adult women with a family history of osteoporosis showed a significantly altered bone turnover response to acute changes in calcium intake (O'Brien, Abrams & Liang, 1998). As they increased their calcium intake from calcium-rich foods, there was increased

calcium retention, suggesting that optimal calcium intakes for those with a family history of low bone mass may help to achieve peak bone mass and protect against future osteoporosis.

1.6.5 Osteoporosis in Asia

Recent epidemiological studies have suggested that the incidence of postmenopausal osteoporosis is lower in Asia than in the Western world. One of the possible explanations for this difference hinges on the large intake of phytoestrogen-rich soybean products by Asian women. From animal studies, it appears that soy isoflavones may have a bone-conserving effect in the ovarian hormone deficient state. It has been shown for example, that genistein, an isoflavone found predominantly in soy, prevents bone loss in ovariectomised rats (Arjmandi, Alekel & Hollis, 1998).

In a US study of 66 postmenopausal women, the effects of soy protein containing moderate and higher concentrations of isoflavones on bone mineral density was recently investigated (Potter, Baum & Stillman, 1998). The bone mineral content and density of the lumbar spine, the proximal femur and the total body was assessed over a six month period in a double blind trial. Significant increases were found in both bone mineral content and density in the lumbar spine but not elsewhere in subjects taking a diet containing 40g protein/d from soy (containing 2.25 mg isoflavones/g protein).

The findings are of particular interest given that of all the skeletal sites measured, the spine is the area that is thought to be the most sensitive to osestrogen because of its higher content of trabecular bone. The spine is remodeled more rapidly than is the hip, which contains a higher proportion of cortical bone. However, this is a short study with respect to bone and such findings need to be confirmed by studies of greater duration.

1.6.6 Calcium and hypertension

Hypertension, or high blood pressure, is a major risk factor for stroke, cardiovascular disease and kidney failure. The prevalence of hypertension is high throughout the world. Genetic and environmental factors influence blood pressure. Lifestyle modification is the favoured approach to the prevention and treatment of high blood pressure because of the high cost and associated side effects of pharmaceutical intervention.

More than 30 studies supporting the postulated inverse relationship between blood pressure status and dietary calcium have been reported (McCarron, Morris & Cole, 1982; McCarron, 1992). It has been shown that the association of calcium intake and blood pressure is clearest among people with usual calcium intakes below a threshold of about 500mg a day (Sowers, Zemel & Zemel, 1991). In four-year prospective data from the Nurses Health Study, involving 58,218 women participants, dietary calcium and magnesium were independently associated with risk of hypertension. It was less likely to develop in those with usual calcium intakes above 800mg/d than in those with intakes below 400mg/d (relative risk 0.77, p<0.001 (Witternan, Willett & Stampfer, 1989).

In a major US clinical trial, Dietary Approaches to Stop Hypertension (DASH), it was found that a diet rich in fruits, vegetables, and low fat dairy foods and with reduced saturated fat and total fat can substantially lower blood pressure (Appel, Moore & Obarzanek, 1997). DASH was a multicentre, randomised feeding study that tested the effects of dietary patterns on blood pressure over a 11 week period. It was designed to test the hypothesis that a change of blood pressure would differ between subjects on a control diet, a supplemented fruit and vegetable diet and a combination diet. The nutrient composition of the control diet was typical of the diets of a substantial number of Americans and calcium levels were close to the 25th centile of US consumption. The supplemented fruit and vegetable diet was similar to the control diet but provided more fruits and vegetables and fewer snacks and sweets. The combination diet was rich in fruits, vegetables and low fat dairy foods and had reduced amounts of saturated fat, total fat and cholesterol. This diet provided 2.7 servings per day of dairy products (predominantly low fat) which was almost twice the average consumption of 1.5 servings per day and calcium at levels close to the 75th centile of US consumption. The sodium content of each diet was similar –approximately 3g per day.

The findings of the DASH study showed that adoption of the combination diet could potentially shift the population distribution of blood pressure downward, reducing the occurrence of blood-pressure-related cardiovascular disease. It is noteworthy that significant inverse associations of blood pressure with intake of nutrients such as calcium, magnesium, potassium, fibre and protein have previously been observed. However, these nutrients have often been tested as dietary supplements. These have been associated only with minor or inconsistent changes in blood pressure. Nutrients in dietary supplements may not reduce blood pressure to the same extent as nutrients in food. This may be due to interactions with other dietary components or because of altered bioavailability.

People with hypertension habitually avoid dairy products and under-consume many essential nutrients including calcium, potassium, magnesium, phosphorus and several vitamins (McCarron, 1992). It has been suggested that adoption of the DASH combination diet, including low fat dairy foods, might be an effective alternative to drug therapy in people with hypertension (Appel, Moore & Obarzanek, 1997).

1.6.7 Calcium and colon cancer

High intakes of dairy products or dairy product nutrients such as calcium appear to be associated with reduced risk of colon cancer (Garland, Shekell & Barrett-Connor, 1985; Kato, Akhmedkhanov & Koenig, 1997; Hyman, Baron & Dain, 1998). In a 19-year observational study of 1954 men, aged 40 to 55 years at entry, 49 cases of colon cancer were found (Garland, Shekell & Barrett-Connor, 1985). The dietary density of calcium was identified from 28-day food intake histories obtained by nutritionists. Analysis by quartiles showed the incidence of colon cancer increased three-fold as estimated calcium intake decreased from the highest quartile (>384mg/MJ) to the lowest (<60mg/MJ). Of seven published in vivo human studies of the calcium effect on colonic mucosa, five were able to demonstrate favourable changes in cell proliferation or differentiation after calcium supplementation (Scalmati, Lipkin & Newmark, 1992).

Hyman et al (1998) found that adults who consumed more than two servings of dairy products a day had a slightly lower incidence of recurrent colon cancer than adults who consumed less than one-half serving of dairy products. Researchers have also found that when adults shift from a diet high in dairy products to one free of dairy products, the cytotoxicity of human faecal water, an accepted risk factor for colon cancer, increases (Glinghammer, Venturi & Rowland, 1997).

In a recent trial, intake of low fat dairy products (milk, yoghurt, cheese) altered biomarkers associated with colon cancer toward a more stable state (Holt, Atillasoy & Gilman, 1998). Seventy adults who previously had colon polyps (benign tumours that may turn cancerous) surgically removed, were randomly assigned to either increase their calcium with low fat dairy products to 1500mg a day or consume their normal diet containing 600 to 700 mg of calcium for one year (control). At six and 12 months, adults who consumed additional dairy products had significantly reduced cell proliferation of the colonic mucosa.

Baron, Beach & Mandel (1999) found that among 832 subjects who previously had colon polyps removed, increasing calcium intake by 1200mg a day modestly reduced the recurrence of colorectal adenomas. After four years, about 7% fewer subjects in the calcium group (31%) developed at least one new polyp than in the control group (38%) p=0.43.

In addition to calcium, other milk components may be protective. Findings from laboratory animal and in vitro studies demonstrate that milk fat components such as conjugated linoleic acid (CLA), sphingolipids and butyric acid are anti-carcinogenic (Parodi, 1997). However, the anti-carcinogenic effects have not yet been established in humans.

1.7 Factors related to milk avoidance

Lactose intolerance is a common condition that is often thought to require total avoidance of milk. It affects about 70% of the world's population and is particularly common in people of Asian descent. Virtually all infants are capable of digesting lactose in breast and other mammalians milks but after weaning the majority of the world's population lose the principal enzyme that digests lactose. Australian and New Zealand Caucasian populations are among the minority in that they have a high level of lactase persistence (Cobiac, 1994).

It has been estimated that the prevalence of lactose maldigestion in New Zealand Caucasians is 9%, Maori 64%, Samoans 54% (Abbott and Tasman-Jones, 1985) and 56-90% for those of Chinese or Asian origin living in Australia (Davis and Bolin, 1969, 1970; Bryant, Chu & Lovitt, 1970). However, this prevalence was estimated in only small numbers of adults and the true prevalence in a larger sample may differ.

If the intake of lactose exceeds the capacity of the available enzyme, some of the lactose remains undigested. Large amounts of the lactose enter the colon where it can be fermented by colonic bacteria producing intestinal gas, abdominal distention and watery diarrhoea. The production of gastrointestinal symptoms in certain

individuals by consumption of lactose-containing food has been recognised since 1901 (Kretchmer, 1971). Some degree of lactose intolerance has been confirmed in most non-white populations (McCracken, 1971). However, not all members of a particular ethnic group are affected.

There is evidence that persons with low lactase activity can build up a tolerance to lactose, presumably by shifts in the metabolic products of colon bacteria. An analysis of reports of milk consumption by various population groups indicates many lactose maldigesters continue to consume varying quantities of milk either without symptoms or despite mild symptoms (Scrimshaw and Murray, 1988). In New Zealand, unlike other countries, low fat milks are fortified with skim milk powder and hence have higher lactose levels than regular milks.

The belief that milk produces mucus is a misconception that has found to be widespread in the Australian community and is associated with a significant reduction in milk consumption (Arney & Pinnock, 1993). Milk-mucus believers were different from non-believers, reporting more respiratory symptoms and consuming less milk and dairy products. Symptoms consistent with the recognised effects of food allergy or intolerance were not reported.

There have been several recommendations for reducing fat in the diet, and the decline in milk consumption may be associated with negative attitudes towards fat content. An objective of the New Zealand Ministry of Health's National Plan of Action for Nutrition (MOH, 1995) is to decrease total fat intake by 20% by the year 2000. The 1997 National Nutrition Survey (Ministry of Health, 1999) showed that milk contributed 6% of the total fat intake. Women over 75 years had the highest proportion of total fat intake from milk (9%).

The selection of a particular milk type noticeably affects an individual's fat intake. In recent years the benefits in switching from consumption of higher fat milks to those with lower fat levels have been realised, especially given that milk contains mostly saturated fats. There is evidence that this switch is being made in many countries including America, the United Kingdom and in most European countries (International Dairy Federation, 1991).

A New Zealand study has shown that an increased intake of dietary calcium can be achieved whilst consuming low fat milk and dairy products (Walker and Ball, 1993). The study investigated the calcium intake of 50 women, aged 40 to 65 years on fat-reduced diets. The findings showed that three months later, after specific advice to increase calcium intakes, the intake of energy, fat, and saturated fat were unchanged (Walker and Ball, 1993). The mean calcium intake was initially 696mg per day, below that recommended for post-menopausal women. The mean proportion of energy from fat and saturated fat was 28.5% and 9.6% respectively. Three months later, the mean calcium intake was significantly higher at 938mg per day, with 88% having increased their intake. This was mainly achieved by the use of low fat milk and dairy products.

1.8 Summary

In America, the dairy industry has often been perceived as "sellers of fat" (Heaney, 1996). This image is thought to have earned many powerful and vocal enemies for milk among organisations such as the American Heart Association, whose dietary recommendations have, in the past, de-emphasised dairy products. That all of the nutrients in milk can be had without any significant level of milk fat has appeared to be lost in the ensuing wrangling. It is the view of Heaney (1996) that "the public health today demands that the various single-disease factions in our society find a way to get together and to tell a concerted, harmonious, story to both policymakers and the general public about what is best for the whole person's health".

In this chapter declining milk consumption has been identified as a problem for the milk industry. This has important consequences for the nutritional health of the population, especially its bone health. The trend towards increased consumption of soft drinks and the displacement effect on nutrients considered markers for milk consumption have been discussed. As milk is a primary source of calcium, an overview of the nutrition literature has been undertaken to establish its importance for population health. The role of calcium in preventing disorders such as osteoporosis, hypertension and colon cancer has been discussed. There are a number of nutritional factors related to milk avoidance such as lactose intolerance and the fat content of milk. It is not known to what extent these factors inhibit milk intake. Consumer awareness about calcium and the importance of milk for bone growth is also unknown. Therefore as part of this thesis I will assess whether consumers know "the truth" about milk or not and whether their attitudes to milk are in need of change.

Finally there is a wide range of environmental factors that impact on milk consumption as well as factors that can influence the food choices of the individual consumer. These factors will be examined in the following two chapters in relation to how they impact on the milk intake of New Zealanders.

Chapter 2

The Environmental Context of Milk Consumption

In this chapter the environmental factors that influence milk consumption will be examined. The availability of milk for purchase is dependent upon decisions made by organisations and social groups within the physical, business and cultural environments. In the first instance I will describe the subsystems within the food system and how production, processing, distribution and retailing influence the availability and purchase of milk. I will then illustrate how the global food system interacts with other systems such as the health care, governmental, economic, environmental, transport and cultural systems.

2.1 The food and nutrition system

There are various systems and processes within the external environment that influence milk consumption. These range from the availability of milk from the milk vendor or supermarket through to the external economic and political environment. External influences within the broader social-cultural environment such as the influence of households also have an important role to play.

Models of food and nutrition systems have been developed as conceptual tools to focus on the vital links between food production, food consumption and health. Heywood and Lund-Adams (1991) have developed a food and nutrition system model that has particular relevance to this thesis as it recognises the importance of the agricultural sector in the economy and the relationship of this sector to the health system (Figure 2.1).

Figure 2.1 Relationship of the food and nutrition system to the agricultural and health system (Heywood and Lund-Adams, 1991)
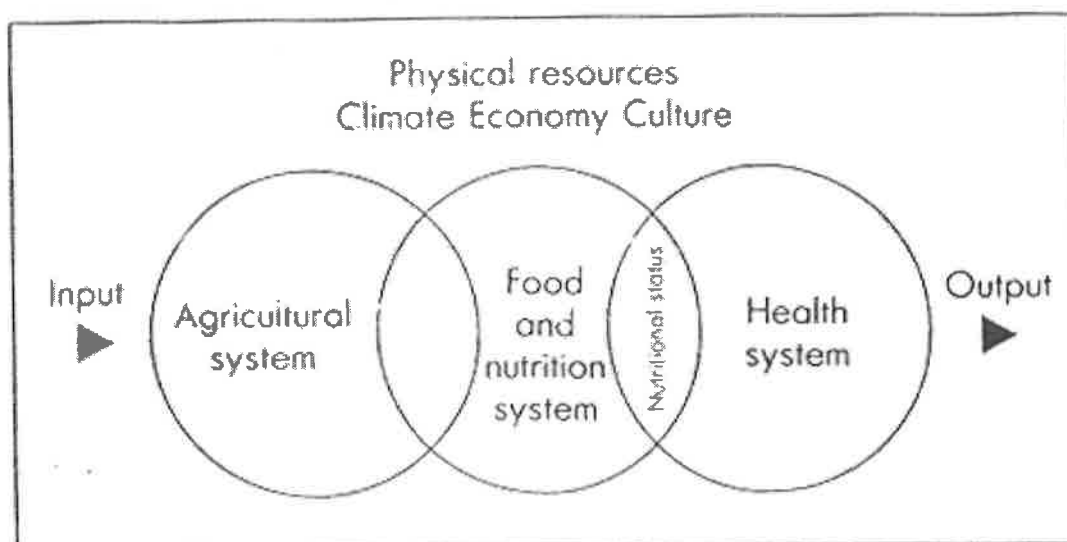
The food and nutrition system involves utilisation of solar radiation to convert inorganic substances into organic living compounds, control of the fate of these products by processing, storage and distribution, and their consumption by individuals within the population. For the system to be successful the activities, which lead to the utilisation of food, must be undertaken to ensure the adequate health of the consumer. The system is composed of four subsystems (Figure 2.2).

1 Food production
2 Food processing and distribution
3 Food consumption
4 Nutrition

Food production transforms resources into crops and commodities. The production subsystem includes the producers of milk, meat, cereals for grain and fruit and vegetables. New Zealand has a large agricultural sector, which is dependent on exports and it is continually exposed to international market conditions.

Food processing involves the transformation of primary produce to enhance its storage life, transportability and to prepare it for consumption. Food products for consumption are then moved from farm to factory to storage sites to wholesalers and then to retailers. Distribution is the transfer of output from food production and processing through multiple channels to outlets where foods are purchased.

The consumption stage focuses on eating and involves selection, serving and ingestion of food items. Food consumption and decisions about it mostly occur within the context of a household. However as a result of greater affluence and time pressures as well as changes in household structures there has been a rapid growth in the amount of food eaten outside the home. Factors such as socio-economic status, nutrition knowledge, cultural preferences and the availability of convenience food outlets and restaurants influence food choice and consumption behaviours.

The nutrition subsystem includes the stages of digestion, transport of food components to various parts of the body and metabolism that uses food components in physiological processes. Nutrition is widely recognised as a causal factor in a wide range of chronic diseases. Improved nutrition requires co-ordinated activities across a number of sectors. The nutrition subsystem as it relates to milk has already been described in chapter 1.

The subsystems of the food and nutrition system provide a useful approach for describing the environmental factors that influence milk consumption in New Zealand.

Figure 2.2 The four subsystems of the food and nutrition system (Heywood and Lund-Adams, 1991)
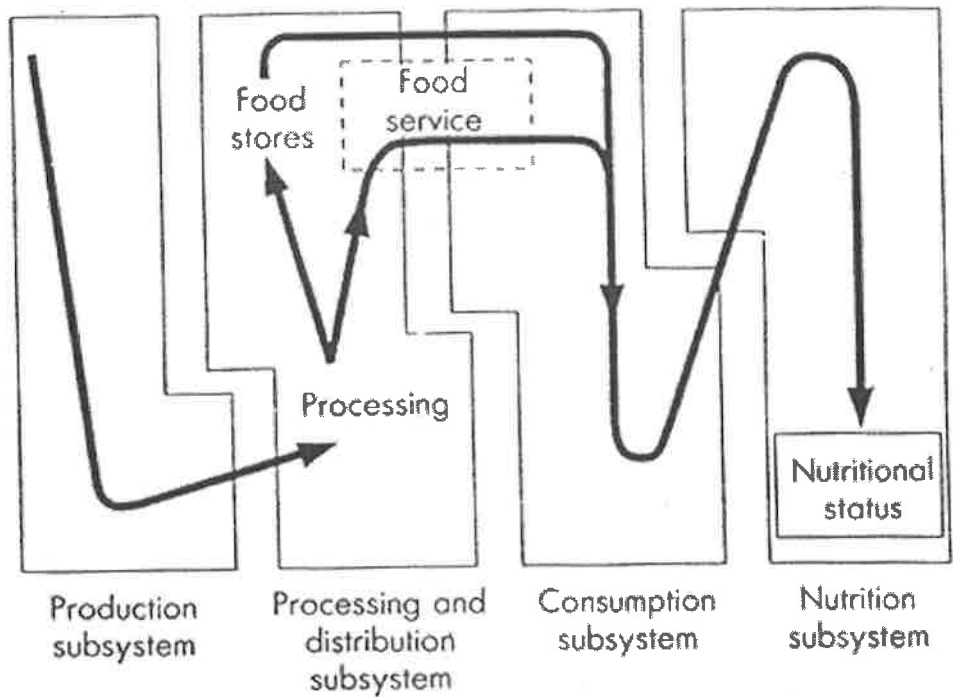
2.2 Food production

The food chain begins with the production of foods, or the commodities from which they are eventually manufactured, within the agricultural sector. This sector is an important part of the New Zealand economy. With high volume food production, and a focus on exports, New Zealand manufacturers are in the process of upgrading their facilities to meet the increasingly stringent quality standards demanded by their domestic and export customers (such as the implementation of ISO9000). Manufacturers strive for more sophisticated solutions to production situations to maximise quality and optimise production economies of scale.

2.2.1 New Zealand food exports

New Zealand's economic base was founded more than 100 years ago on the export of frozen lamb to Britain and to this day meat and meat products still comprise one of New Zealand's most important export groups. In the food and beverage sector, meat exports are second only to dairy produce. New Zealand is the world's largest exporter of sheep-meat, accounting for over half of world exports and has a long established reputation as a lamb exporter. Other meats have met with export success, notably pasture-fed venison (Ministry of Agriculture and Forestry, 1999).

During the last ten years, the New Zealand wine industry has made an impact on world markets with well reviewed and often award winning wines. Britain is New Zealand's major wine market taking about 72% of total wine exports. Growers hope

to triple the volume of wine available for export by the year 2000 and are investing heavily to meet this target (Ministry of Agriculture and Forestry, 1999).

Dairy products constitute 23 percent of New Zealand's total merchandise trade receipts every year. In the year to June 1995, dairy export receipts were $2,747 million for the four types of product made from milk powders, cheeses, milk proteins and milk fat. Nation-wide, the dairy industry comprises 14,000 farmers milking 2.8 million cows. New Zealand dairy farms are generally around 80 hectares in size, have 190 cows on average and are typically operated by one or two people. Around 9,000 million litres of milk is produced each year, of which 90 percent is exported after processing (Ministry of Agriculture and Forestry, 1999).

Some 96 percent of New Zealand's dairy herds supply milk for manufacturing. They are known as "factory supply" herds. The balance supplies milk for the domestic liquid milk industry "town milk". Farmers are paid per kg milk solids on a monthly basis and prices reflect the value of the products into which their milk is manufactured, and the efficiency of the dairy company processing the milk. This co-operative system provides economies of scale that could not otherwise be achieved.

New Zealand dairy export activities are co-ordinated through the New Zealand Dairy Board. The Board maximises returns to the country's farmers through marketing, operating a network of 80 marketing, manufacturing and distribution companies in more than 30 countries, and selling to over 100 markets globally (Ministry of Agriculture and Forestry, 1999).

The companies' desire to maximise profit from their manufacturing operations frequently conflicts with market demands identified by the board. In addition the industry has two or more plants manufacturing products that any one factory has the capacity to make. As a result, the formation of a mega co-operative dairy industry has been proposed to integrate manufacturing and marketing into a single company concept. The success of such a merger requires agreement on the mega co-operative's share structure. However after ten months of merger negotiations there had been an impasse between the two largest dairy companies, New Zealand Dairy Group and Kiwi Dairies.

2.2.2 History of the milk industry

In the early 1880s new refrigerated ships designed in New Zealand made it possible for farmers to begin to export dairy products and meat to the United Kingdom and the economy became heavily agriculturally based. In 1908 the government

appointed a representative to London on behalf of all dairy product exporters (New Zealand Dairy Board, 1999).

The 1944 Milk Act established a Central Milk Council and a milk marketing division and provided for the definition of local milk districts administered by milk authorities. The Council's principal functions were to guide and supervise the milk authorities and to report to government on matters affecting its objectives. The milk marketing division was responsible to the Minister of Marketing, who was in effect the price fixing authority for the industry. The division was to manage the national milk scheme, administer the milk-in-schools scheme and recommend prices and margins to the Minister. Milk Authorities were empowered to buy, sell and treat milk. No one could trade in milk without a license from the milk authority (Brown 1992).

In 1953 the Milk Amendment Act converted the Central Milk Council into an independent statutory board called the New Zealand Milk Board which was given executive authority to control the industry. The Minister of Agriculture replaced the Minister of Marketing.

The Milk Act was rewritten in 1967 with several major changes. Milk Authorities were abolished and responsibilities were taken over by the Milk Board. A Milk Prices Authority was established to fix standard margins for the processing and delivery of milk. Up until 1972 the milk industry had operated under the imperial measure system. A full change to metrication began and was completed in 1974. Prices were fixed on a cent per litre basis and bottled milk was supplied in quantities of 600ml, 300ml and 150ml. These replaced bottles of 1 pint, ½ pint and ¼ pint measures respectively. The 1980 Milk Amendment Act abolished the Milk Prices Authority and transferred its pricing and margin functions to the Department of Trade and Industry (Brown, 1992).

In 1988 the Milk Act was passed which repealed all previous legislation. The previous heavily regulated system of domestic milk processing and distribution came to an end. The structure put in place in 1988 was intended to introduce encouragement for competition in the domestic milk industry. 1993 saw deregulation of the domestic processing and distribution industries and exposure of the whole of the domestic milk industry to market forces (Brown 1992).

2.2.3 The milk and dairying culture

The New Zealand dairy industry is primarily farmer owned but the role of corporate farms is on the increase. Farmers supply their milk to one of nine manufacturing dairy company co-operatives. The co-operative dairy companies are independent commercial entities and they have full autonomy to make their own manufacturing decisions. More than 90% of dairy produce manufactured each year is sold overseas, the rest being used for the domestic market (New Zealand Dairy Board, 1999). As a result the dairy industry is primarily an export-focused business.

The culture of the dairy industry is influenced by the dominance of co-operative dairy companies that are controlled by the farmers who supply the milk. Though the

New Zealand dairy farmer is a firm believer in the private ownership of his/her own farm, an extensive structure of co-operative control of manufacturing has been built up. This is in order to keep costs to a minimum and to maximise returns to the dairy farmer (New Zealand Dairy Board, 1999).

The net returns from the sale of manufactured products are paid out to the suppliers of milk on the basis of volume and quality supplied. This is done by regular payments throughout the season with a final end-of-season payment (New Zealand Dairy Board, 1999). The latter shareholder payment is an important reflection of company performance and every endeavour is made to ensure that farmers receive maximum returns. This may be at the expense of curtailing advertising and promotions in the local market.

As co-operative dairy companies are registered under the Co-operative Dairy Companies Act only shareholders supplying milk may vote or stand for election to a company board of directors (New Zealand Dairy Board, 1999). Local market manufacturing and marketing decisions are usually scrutinised by members of the board.

The New Zealand Dairy Board, which is also controlled by the elected representatives of the dairy farmers, buys and sells all the export production of the dairy co-operatives (New Zealand Dairy Board, 1999). The dairy manufacturing sector in New Zealand is therefore tightly under the control of representatives of the farmers.

2.2.3.1 New Zealand Dairy Board

The majority of export product (75%) is bulk commodity for ingredient business and 25% is sold as branded product. The Dairy Board is the marketing arm of the manufacturing dairy company co-operatives exporting to over 120 countries.

The Dairy Board works with dairy companies to ensure their manufacturing programmes match the demands of the international marketplace. It integrates the industry's shipping, packaging, transport, storage and quality control needs and provides support services in the form of financial facilities, data processing, livestock improvement and administration (New Zealand Dairy Board, 1999).

Historically, the Board's main business was supplying butter and cheese to Great Britain. However, when that country joined the EEC in 1973, restrictions were placed on the amount of product that New Zealand could sell in Britain. Since then, the Dairy Board has moved to build more secure business by reducing dependence on its traditional markets and on sales of bulk commodity products.

The prevailing dominance of commodity products appears to reflect the organisational culture. Farmer control of the industry and its co-operative structure has meant that a key business driver is to maximise returns to the shareholders. Whilst the New Zealand dairy industry has become one of the world's lowest cost producers of commodity products and specialised ingredients, there is increasing competition from global dairy companies and an increasing need to produce value added products. It has been proposed that increased efficiencies and profitability

could be gained from deregulated exporting without statutory support (New Zealand Dairy Annual Report, 1998).

2.2.3.2 Dairy co-operative culture

The domestic operations of the co-operative dairy companies are undertaken by separate subsidiaries. There are two main companies that manufacture and market milk and milk products for the local market. They are New Zealand Dairy Foods, a division of the New Zealand Dairy Group of companies; and Mainland Products, a division of Kiwi Co-operative Dairies. While both of these companies are competitors in the fast-moving consumer goods (FMCG) business, dairy farmer ownership means that maximising sustainable returns to shareholders is the overriding factor. Marketing strategies or initiatives may be curtailed to ensure that shareholders receive a maximum annual payment. This presents a difficulty when competing in the FMCG market. It stands to reason that as a consequence the dairy industry has lost ground in competing with non-milk based beverages and that this is a significant factor in declining milk consumption.

The dairy industry is riddled with inter-company rivalry, shifting and destablising power plays and personal vendettas. In a recent move to establish a merger company by removing the Dairy Board's exporting monopoly the prevailing Dairy Board chairman was voted out. Farmers accused the chairman of forcing major industry changes without adequate consultation. Significantly, the 60-year-old chairman had been quoted as offending at least one woman shareholder, by phoning and asking for the "man of the house" (New Zealand Herald, September 4, 1999).

Male ownership and management have dominated the New Zealand dairy industry and may be a reason for the commodity focus. Distinct masculinity-femininity cultural differences have been identified amongst different countries and may apply to organisations (Hofstede, 1994). These differences were observed in a study undertaken in the 1970s among the employees of the Hermes Company (IBM) around 50 countries. According to Hofstede (1994) masculine versus feminine countries excel in different types of industries. Masculine countries have a competitive advantage in manufacturing, especially in large volume: doing things efficiently, well and fast. Feminine cultures have a relative advantage in manufacturing according to customer specification. There is an international division of labour in which countries are relatively more successful in activities which fit their population's cultural preferences.

New Zealand has a masculinity score of 58/100 on Hofstedes' masculinity index where 0 is the most feminine and 100 the most masculine (Hofstede, 1994). By contrast Denmark and the Netherlands have scores of 21/100 and 14/100 respectively and they excel in services and in agricultural exports (Hofstede, 1994). It is noteworthy that of the 16 Directors on the Board of New Zealand Dairy Group of companies in 1998, there was only one-woman representative (New Zealand Dairy Group, 1998). The higher masculinity score for New Zealand may reflect the manufacturing focus that has prevailed in the dairy industry. It may also explain the difficulties that have been experienced in securing strong industry co-operation.

2.3 Food processing and distribution

In New Zealand food processing makes up 25% of manufacturing production and the food industry is New Zealand's largest employer (ANZFA, 1996). Anchor Products is the largest processor of dairy products in New Zealand. It processes about 42% of all milk produced in New Zealand, 90% of which is exported overseas (New Zealand Dairy Group, 1997). It is the largest business unit of the New Zealand Dairy Group of companies and employs more than 1500 staff. The milk produced by the Group's 7000 supplying shareholders is processed into a range of bulk dairy produce, consumer products and specialist ingredients (New Zealand Dairy Group, 1997).

2.3.1 The deregulated milk market

Until 1993, the domestic milk market had been limited in consumer product choice. Consumers were unaware which milk company supplied their milk hence the brand was not an important factor in the purchase decision.

Since de-regulation many of the small milk suppliers have disappeared. Two major companies now dominate the industry. The New Zealand Dairy Group, the country's largest dairy company that markets the Anchor brand of products and Mainland Products that markets Tararua brand products. A number of small specialists also remain in the milk category with strong brand loyalty in the regions.

The changes since de-regulation have resulted in a rapid switch in emphasis from the dairy co-operative industry tied to supply, to companies operating as commercially orientated marketing entities and recognising that adding value is as important as reducing cost by scale. From being supply driven, the milk category is now driven by consumer choice.

These changes have meant that the milk industry has to compete with other manufacturers in the beverage industry. Both product and packaging innovations are now critical for success.

2.3.2 Milk retailing

Milk is distributed through several different retail distribution channels such as supermarkets, dairies, convenience stores, and service stations, and to the home gate. Of these channels retail growth is strongest in supermarkets. Sales of milk in supermarkets are approximately 37% of total milk sales (AC Neilsen, 1997). Milk is the fifth largest food category in the supermarket and is achieving volume growth of 9% per annum (AC Neilsen, 1997). To maximise returns most supermarket groups have added house brands to the competition for shelf space and market share. Woolworth's First Choice brand for example, is supported by promotions that are similar to a private brand.

Retail sales in service stations and convenience stores also show strong growth but home delivery of milk is decreasing. Home delivery is very regionalised. It accounts for 40% of milk sales in Christchurch in the South Island compared to 12% in

Auckland. The decrease of traditional gate-sales may be limiting milk sales since consumers may tend to use more milk, knowing more was being delivered regularly.

Under the new market environment, milk has being taken from commodity to a highly differentiated product. Branded milk needs differentiation to halt increase in housebrand growth. Inevitably this has demanded premium prices. The market is characterised by strong regional factors with brand strengths still strongest in their traditional local region. Anchor and Tararua are the only national brands. Anchor is the leading milk brand with 26% market share. It is particularly strong in the upper half of the North Island. Anchor is franchised in the South Island to achieve national distribution. It is manufactured and marketed under licence (New Zealand Dairy Foods, 1998).

Milk packaging re-launches are becoming more frequent with new graphics and packaging reflecting additional line extensions. Packaging has become an area of differentiation. Screw caps on cartons has been an innovation. The move from glass to H.D.P.E. plastic bottles and cartons has provided an ability to carry colour graphics and reinforce brand image. Considerations of shelf space, storage and easy handling have been added to packaging demands.

Nutrition and health considerations impact on milk retailing. Nutrition provides opportunities to move into value added products and create an opportunity for product differentiation. The fat levels of milk and the need for increased calcium in the diet impact on purchasing decisions. In 1999 the Anchor brand provided seven variants of milk in terms of composition (Table 2.1). Ten years earlier there was a choice of only whole, homogenised and trim (0.1% fat) milk.

Table 2.1 Anchor milk variants

Per 100ml	Breakfast	Blue Top	Lite Blue	Trim	Supertrim	CalciXtra	Cultured
Energy kcal	75	62	50	45	43	37	51
Protein g	3.3	3.3	3.9	4.1	4.4	3.7	3.4
Fat g	4.8	3.3	1.5	0.5	0.1	0.1	2.0
Carbohydrate g	4.7	4.7	5.2	5.8	6	5.2	4.8
Calcium mg	118	115	137	145	155	200	125

There has been a slow rise in demand for reduced and non-fat milk. Figure 2.3 shows that regular 3.3% fat milk dominated sales of milk in supermarkets nationally in 1997 (AC Neilsen, 1997) with approximately 65% market share. Market shares for milks with 1.5% or less fat and for calcium fortified milks were less than ten percent.

Figure 2.3 Percentage share of milk types in New Zealand supermarkets
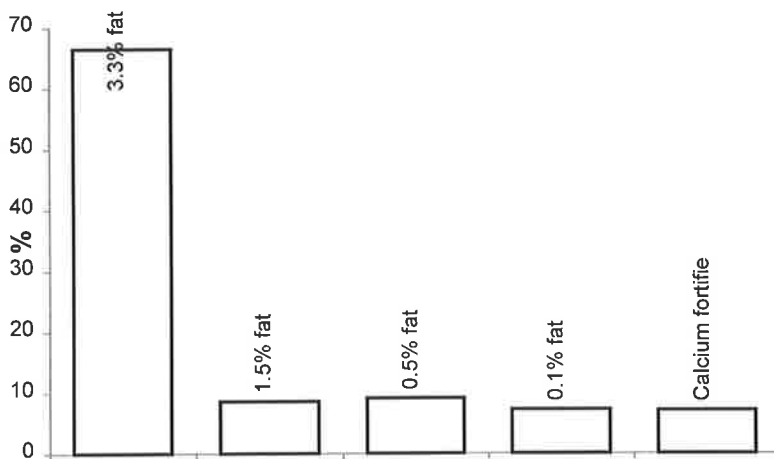
2.3.3 Milk transportation

The improvement of temperature control from the farm to the factory is an important factor in milk quality. The installation of refrigeration equipment on the properties of suppliers (farmers) is critical to quality maintenance.

Suppliers are provided with suitably sized refrigerated farm tanks to store milk at the farm dairy from which the milk is collected. The company-owned tanks are fitted with refrigeration and associated agitation equipment, and refrigeration service engineers are available to provide regular maintenance and emergency servicing.

Field officers provide farmers with technical advice, particularly regarding farm business and milk quality. They act as a link with farmers, keeping farmers up to date with what is happening in their company and bringing suppliers' concerns to the company's attention (New Zealand Dairy Group, 1998).

Every day, milk tankers throughout New Zealand collect milk from farms for processing into domestic milk dairy products. The tanker has a measuring device that gives the farmer an instant record of how much milk has been supplied. The driver takes two samples from each supplier's milk for testing at the factory. One sample tests the quality of milk and the other tests the level of milk fat and protein. The latter test determines the payment to the farmer (New Zealand Dairy Group, 1998).

In the factory the collected milk is pasteurised, homogenised and standardised. The standardisation process involves a compositional adjustment of the protein and fat content. Components of milk such as milk fat or milk solids may be removed or added. After packaging milk is transported under refrigeration either directly to supermarkets or to refrigerated depots. It is possible for milk to be collected from the farm and delivered to the supermarket shelf on the same day. A franchised system of milk distribution operates from the depots to deliver milk to food service and convenience outlets and directly to the doorstep. Franchises are separate,

independent businesses within a system intended to allow and promote competition with the suppliers of other beverage products.

2.4 Food consumption

As a dairy farming nation New Zealanders are exposed to milk and dairy products from an early age. Milk drinking is an accepted tradition embedded into cultural eating practices. As a staple food milk has a variety of uses in cooking, baking, meal preparation and as a beverage. Most food is consumed as part of family meals. As a result, eating behaviour is a reflection of family lifestyle, values and beliefs. Material and structural resources, which are available to the family, are a key influence.

2.4.1 New Zealand households

Food consumption decisions are made in the context of households. In New Zealand households comprising families made up 71.7% of all households at the 1996 census (Statistics New Zealand, 1998). There has been little change in household composition between 1986 and 1996. However, the number of households consisting of two or more families almost doubled. Europeans were more likely than other ethnic groups to be living in a one-family household (82.3%). Pacific island people were the most likely to live in two (18.3%) or three or more family households (3.5%).

Family structures are changing due to the increasing age at marriage, the increasing proportions of people who have been separated and divorced and relative declines in the number of children. Between 1986 and 1996, the number of households consisting of one person living alone rose slightly from 18.7% to 20.1%. Of all ethnic groups, Europeans (9.4%) were the most likely to live alone (Statistics New Zealand, 1998).

Of all families in 1996, 62.6% contained children, down from 65.2% in 1991. The majority of both two-parent families (81.3%) and one-parent families (75.2%) contained dependent children. The vast majority (83.1%) of sole parents in 1996 was women. Sole mothers were over three times more likely than partnered mothers to be aged under 25 years (12.8% compared to 3.6%). The proportion of sole parents who have never been married increased from 27.5% to 34.8% between 1991 and 1996.

There have been considerable changes in the labour force with more women working. In 1996 there were 19.6% of two-parent families in which the mother was not in the labour force and the father was working full-time. This has decreased from the 1986 Census figure of 31.2% (Statistics New Zealand, 1998).

The changes in household structures suggest that factors such as income and time pressures impact on milk purchasing decisions and usage. As the proportion of the food budget spent on convenience foods and eating outside the home increases it is likely that less milk will be used in cooking, baking and meal preparation.

2.4.2 The school milk scheme 1937-1967

There are many New Zealanders who experienced milk drinking in schools and their recollection of this experience appears to have had an impact on their attitudes to milk. The milk-in schools scheme commenced in 1937. It was introduced by the new Labour Government to provide additional nourishment for children as the country was just emerging from the Depression. The milk was delivered to the schools in time for the morning recess. The scheme was administered by the Department of Health and was fully government funded. To qualify for funding the milk had to be pasteurised and bottled. As a result it was subject to more stringent testing and inspection than other milk. The outcome was the upgrading of treatment facilities and widespread importation of bottling equipment all around New Zealand (Brown, 1992).

For the first 10 years school milk was supplied in half-pint bottles with a cardboard disc lid with a push-in hole for a straw. Later aluminum foils were introduced. In 1951 responsibility for school milk was transferred to the Department of Agriculture and, three years later, the New Zealand Milk Board took over administration of the scheme (Brown, 1992).

Public complaints about wastage were frequent. It was estimated that only 45% of Auckland schoolchildren drank their milk on a regular basis. In 1953 there was some recognition of the diminishing consumer acceptance. The fat level of school milk was set at 3.5%. Up until this time the fat content was sometimes as high as 5%. School milk was standardised in 1954 at 3.4% fat and from 1955, homogenised. The fat level was dropped again to a more acceptable 3 % in 1957 (Brown, 1992).

A major reason for the rejection of the milk was due to the flavour deterioration that occurred from exposure to sunlight. The Dairy Research Institute (1948) investigated the effect of sunlight on the nutritional properties and flavour of school milk in glass bottles. It was found that delivery of milk was frequently made from uncovered trucks, and the bottles were often held in wire crates offering no side protection from the sun's rays. The report showed that after exposure for only two hours in wooden crates to early morning autumn sunshine there were losses of 50-60% of the riboflavin and vitamin C contents, and that strong off-flavours developed rendering the milk distinctly unpalatable.

School milk remained controversial. The farmers were disgruntled that the half-pint school milk bottles took just as long to fill and handle, as did twice the volume of milk bottled for the public, yet they received a lower margin per gallon. Each annual conference of education professionals brought further criticism of school milk. In 1955 a school principal was quoted as stating (Brown, 1992):

' While the actual consumption of milk by the child took only five or ten minutes, there were other children involved for anything up to 40 minutes in collecting crates from the school gate, collecting the empty bottles, rinsing them and returning the crates to the pick up point. This undoubtedly interfered with schoolwork'.
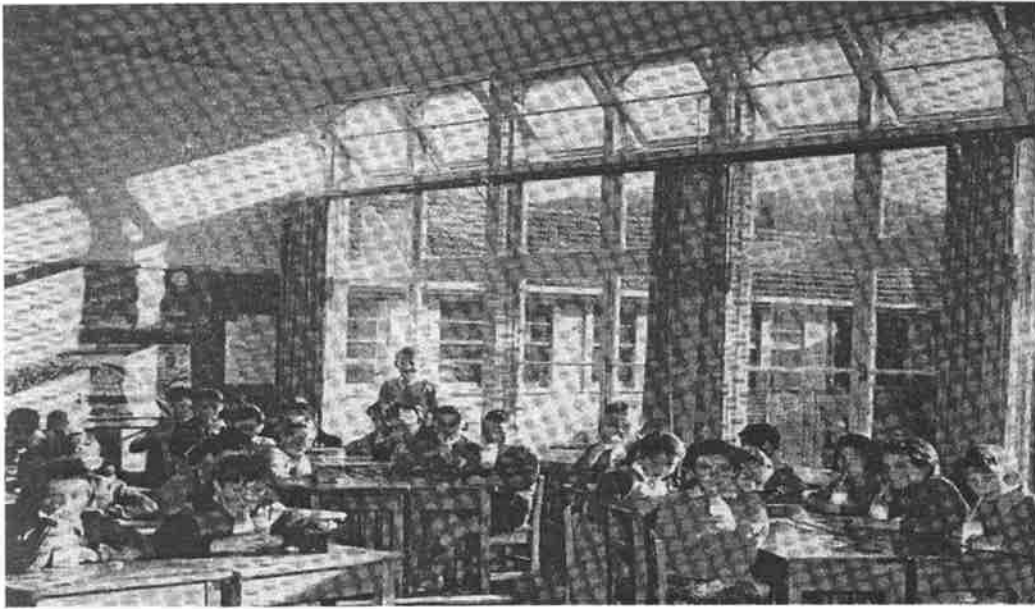
A local dentist made the headlines with a claim that the school milk scheme was one of the greatest evils in the country and suggesting that milk caused adenoids, sore tonsils and tooth decay (Brown, 1992).

In 1960 the Milk Board conducted a full enquiry on how to reduce costs and wastage, and improve efficiency. They also looked at means of increasing milk's acceptability to the children. In many classrooms less than half the children were consuming milk with more 'please excuse' notes than customers. Liaison officers were appointed to assist in arranging for proper care of the milk after its arrival, explain the full value of milk for growing children and to help headmasters with any problems affecting school milk.

In 1962 the scheme started to fall apart with the Hawke's Bay Education Board refusing to allow schools under its jurisdiction to participate. There were increasing claims that New Zealand children were receiving adequate nutrition from other food sources. By 1966 the cost of the national scheme was more than a pound for every taxpayer and the Government, in the midst of an economic crisis was looking to cut costs. When a proposal to terminate the scheme was voiced, neither the Department of Health nor the Department of Education was able to put up convincing arguments against the measure and the scheme ceased in 1967 (Brown, 1992).

Although the school milk scheme was discontinued over thirty years ago the experience of drinking warm milk in the classroom is still embedded in the minds of many adult New Zealanders. The unacceptability of milk during these years is likely to have created adverse attitudes to drinking milk as a beverage among many of the adults who partook in the school milk experience.

2.5 The relationship of the Food and Nutrition System to other systems

The food and nutrition system functions within biophysical and socio-cultural contexts and other systems interact with the food and nutrition system at many points (Sobal, Khan & Bisogni, 1998). These systems include the health care, economic, cultural, ecological, governmental, transportation and other systems (Figure 2.4). Exchanges with other systems are considered important forces for change (Sobal et al, 1998).

Within the milk industry, there are many examples of the ways in which these systems operate. Feedback loops and webs of relationships operate within these systems and between the food and nutrition system and the systems that make up its environments. This will be illustrated in the following sections.

Figure 2.4 Relationships of the food and nutrition system to selected other systems (Sobal et al, 1998)
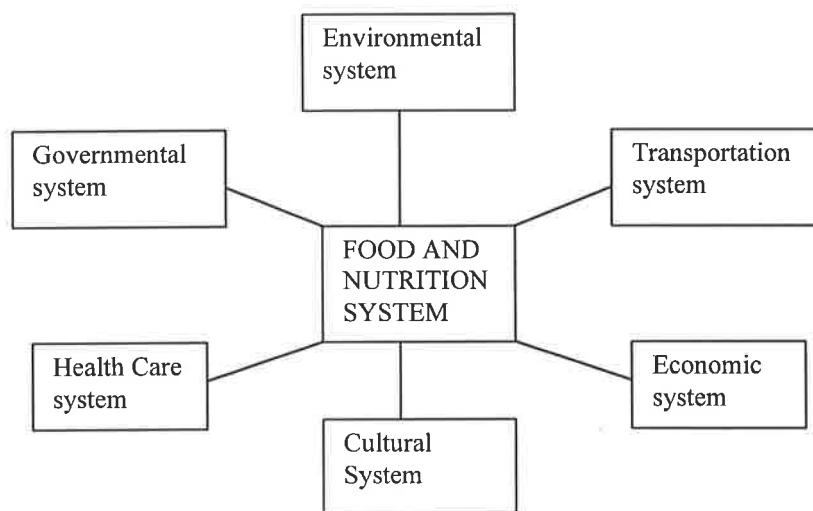
2.5.1 Influence of the health care system

There are several organisations that aim to promote health and nutrition in New Zealand, and these have implications for the marketing of milk. For example the National Heart Foundation's Pick the Tick food-approval programme aims to promote the development and sale of foods consistent with the New Zealand Ministry of Health's Food and Nutrition Guidelines. In general, 'approved' foods are lower in total fat, saturated fat and sodium than comparable foods.

The approval criterion for milk is for products with less than 2% fat (compared with 3.3% fat for regular homogenised milk). The Pick the Tick logo has strong consumer awareness and is an important component on the packaging of reduced

and low fat milks. In a nation-wide survey of 503 consumers, 78% of the sample had seen or heard of the Pick the Tick logo (Research International, 1998). It was found that 35% of respondents associated the logo with a healthy balanced diet and 40% believed the logo made shopping easier.

Agencies for Nutrition Action (ANA) was established in 1996 to address the growing problem of overweight and obesity in the adult population. ANA aims to encourage New Zealanders to understand the importance of a healthy body weight for quality of life. ANA is an example of intersectoral co-operation between the Cancer Society of New Zealand, the New Zealand Dietetic Association, the New Zealand Nutrition Foundation, Te Hotu Manawa Maori and the National Heart Foundation of New Zealand.

ANA has developed a framework for nutrition action. The framework illustrates a wide linkage of participating sectors, each with their own area of activity and programmes for encouraging a healthy lifestyle. Figure 2.5 shows recognition of the contributions from existing programmes within the community, the food industry, the health, education and physical activity sectors, the media, Maori, Pacific Island peoples and the workplace. This means that educational resources developed by the milk industry are made available to other sectors for use in education programmes.

Figure 2.5 Agencies for Nutrition Action

The Framework for Nutrition Action New Zealand
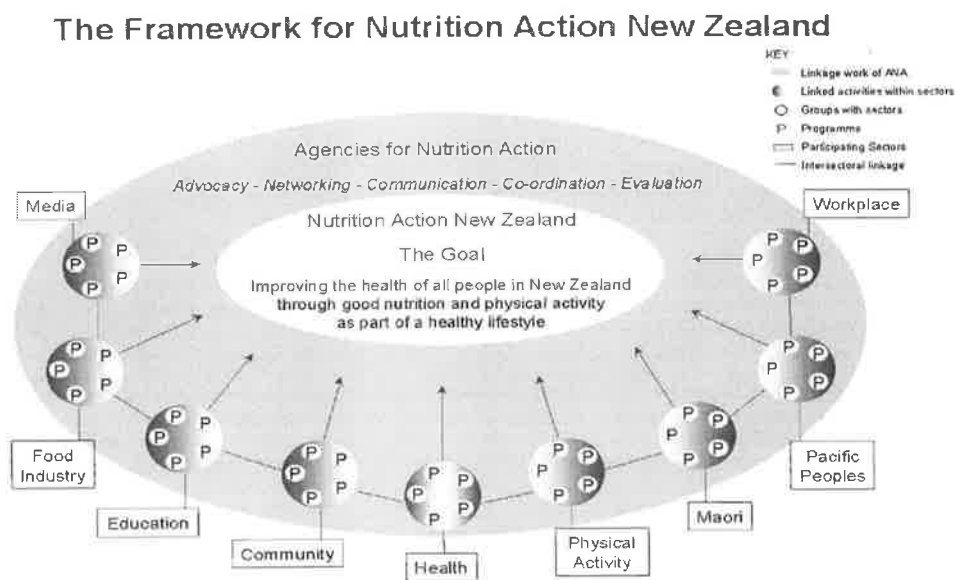
Intersectoral collaboration provides an effective means of using existing nutrition promotion programmes and establishing a stronger focus for addressing the problem of overweight New Zealanders throughout these sectors. For example, the ANA 'Fit Food Challenge' which aims to encourage men to eat better and be more active, provides an opportunity for the milk industry to promote the benefits of drinking low fat milk and to reinforce the campaigns' objectives in marketing communications.

The health care system has an important influence on milk consumption. It is therefore prudent that the milk industry collaborates with health care organisations and supports health education initiatives.

2.5.2 Influence of the governmental system

Government has been a key influence on the supply of milk to New Zealand consumers. For over 100 years the milk supply was influenced by national regulation, the state of the economy and the perceived need to ensure public access to milk at reasonable prices.

Prior to 1900 legislation was prompted by efforts to protect public health. Outbreaks of milk-borne disease led to regulations in 1881 enabling local boards of health to license and inspect farm dairies in their districts. Local government control of quality standards for milk was first introduced in legislation in 1883. Local statutes were later put in place to enable City Councils to license milk producers, processors and vendors in their districts and to fix prices for all sectors.

At the outbreak of the Second World War in 1939, Price Stabilisation Emergency Regulations were introduced for all commodities. The 1942 price stabilisation plan prevented any further increase in the retail price of milk. Increases in payments to the industry entailed government subsidy. This initiated the continuing consumer subsidy for town milk (Brown, 1992).

During 1985 the Ministry of Trade and Industry undertook a review of the milk industry with the objective of promoting competition and efficiency in the production, distribution and marketing of milk. There followed two years of industry debate before the 1988 Milk Act was passed which repealed all previous legislation and largely deregulated the milk industry.

As a result of government influence there was an 800% increase in the price of milk between 1978 and 1998 (Figure 2.6). Consumers who had purchased milk during this period are therefore likely to perceive the price of milk in today's market as relatively costly. Consumer beliefs about the cost of milk will therefore be examined in this thesis.

Food laws and regulations control all aspects of food manufacture, distribution and sale. In New Zealand both the Ministry of Agriculture (MAF) and the Ministry of Health (MOH) administer food legislation. This includes the Food Act 1981, the Dairy Industry Act 1952 and a large number of regulations. MAF is responsible for policy, regulation, inspection and quality audit of meat, game and dairy products, which are exported and sold domestically. The Food Regulations 1984 prescribe standards of composition and labelling for food.

The establishment of the Australian and New Zealand Food Authority (ANZFA) in 1996 provides a joint system for developing and reviewing standards for food available in Australia and New Zealand. ANZFA is a partnership between the Federal, State and Territory governments of Australia and the New Zealand government. Most of the Australian Food Standards Code has been adopted in New

Zealand as alternative food standards to certain provisions in the New Zealand Food regulations until a joint standards code is completed. The joint food standards will become the Australia New Zealand Food Standards Code.

Figure 2.6 Retail price of milk 1968-1998 (Price per litre)
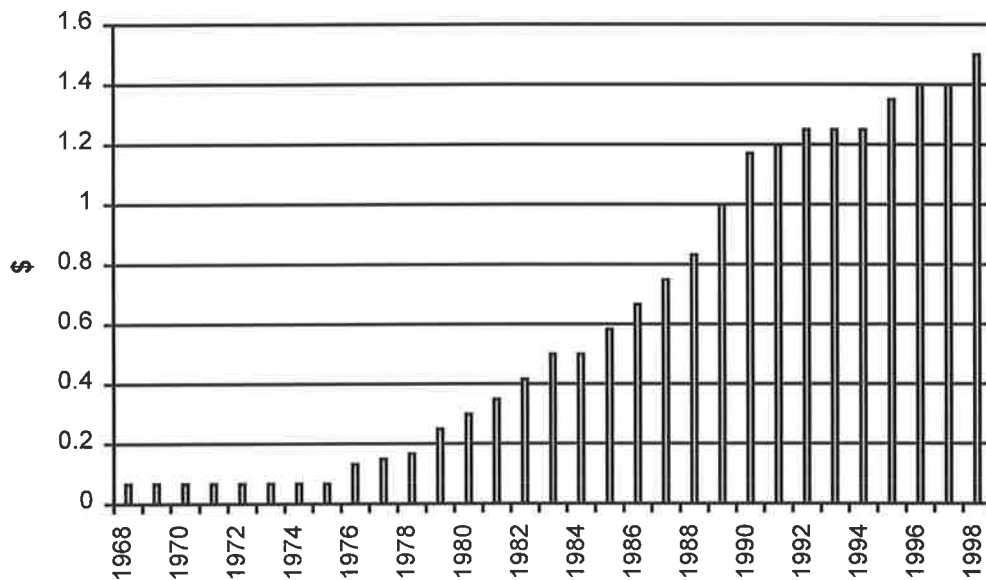
2.5.3 Influence of the environmental system

The New Zealand environment is ideally suited for dairying and rearing other livestock. The mild, moist climate provides a relatively long growing season for pasture. Dairy herds feed almost solely on grass and clover and the management of virtually all New Zealand dairy farms is organised around a low cost system of pasture grazing (New Zealand Dairy Board, 1980). The dairy herd is mated to calve in the early spring to maximise the use of pasture growth. Small amounts of surplus grass are conserved as hay or silage. Dairy research aimed at improving farm productivity is undertaken by the Livestock Improvement Corporation owned by the New Zealand Dairy Board and the Dairying Research Corporation, a joint venture between the New Zealand Dairy Board and the Ministry of Agriculture and Forestry (New Zealand Dairy Board, 1999).

The milk industry has an obligation to limit the impact of manufacturing operations on the environment. It is required to meet various environmental responsibilities under the Resource Management Act 1991 (New Zealand Dairy Board, 1999). Most companies show commitment to minimise environmental effects of their operations through management practices. However, dairy co-operatives have an obligation to maximise returns to their shareholders. Business strategies therefore focus on being the lowest cost producer so there is some reluctance to become involved in costly environmental issues.

As a result of the public outcry during the changeover from glass to plastic bottles and carton packaging by the New Zealand Milk Corporation in 1987, a 'Return All

Plastics' programme was instituted. The programme became unsustainable however and ceased in 1993. It was found that milk bottles represented only 30% of the total plastic waste returned and the programme was costing more than a million dollars (>1% of annual turnover). A further problem for the milk industry is that recycled plastic cannot be used for packing food. The low cost of plastic resin makes blow moulding new plastic a more viable option.

With the greater commitment by local authorities to waste minimisation and particularly through recycling there is now greater environmental acceptability of plastic milk containers (Packaging Council of New Zealand, personal communication). Currently most major cities have either kerbside or drop-off collection programmes for H.D.P.E. products providing environmentally acceptable disposal options for unwanted containers.

Consumer demand for natural and environmentally friendly products led to a 30% increase in growth of organic milk between 1996 and 1998 (AC Neilsen, 1998). Although a niche product in the New Zealand market, organic milk commands a premium price due to requirements for special sourcing and handling. Organic milk is supplied from Demeter or Biogro certified farms. Certification requires farmers to comply with stringent production practices. For example, strategies must be in place to identify accidental or background contamination from outside the farm. Inspectors visit the farm on a regular basis to check compliance. Factories to be Demeter or Biogro certified must apply for and then comply with a standard of practice. Due to the inability to pack in glass bottles organic milk is packed in plastic lined cardboard cartons as a compromise.

The organic food industry has been described as the fastest growing food industry worldwide (Saunders, Manhire & Campbell, 1997). In the United Kingdom health is considered to be the main reason that consumers buy organic food (Stopes and Woodward, 1998). There are however a variety of reasons why consumers purchase organic milk including environmental concerns. Adverse public perceptions of risk, ethical concerns and mistrust of the food industry may create further demand for organic food products.

The development of genetic engineering has raised issues beyond those generated by the science involved (Harlander, 1991). Concern over the environmental impact of this new technology has created a great deal of controversy. As a result of a public outcry and pressure from consumer groups, Iceland a food retailer in the United Kingdom banned genetically modified foods from its frozen food stores in May 1998. The ban boosted sales by 12% within a year (Jardine, 1999). Other supermarket chains including Sainsbury's and Safeway followed the stance. Concerns about the environment may therefore influence the type of milk that is consumed. Both health and environmental concerns provide the opportunity for the milk industry to differentiate milk. Over time such differentiation may increase milk consumption.

2.5.4 Influence of the transport system

Historically, refrigeration widened distribution networks and created export opportunities for the milk industry (Brown, 1992). More recently modern information technology in the domestic market has provided a means of maintaining the integrity of milk for longer periods throughout the cool chain system. Dairy farmers have access to a wide range of production information, assisting in overall farm management and refrigeration equipment has been installed on the properties of the dairy suppliers (New Zealand Dairy Group, 1998). Milk tankers are equipped with electronic data capture technology and improved milk pumping equipment (New Zealand Dairy Group, 1998). Such changes have meant that fresh milk is now very mobile. New processing methods in the future may extend the shelf life of fresh milk from the present ten days.

Developments in the transportation system will increase the opportunity to further increase distribution networks for milk. This would be a positive influence for increasing milk consumption.

2.5.5 Influence of the economic system

The New Zealand Dairy Board is New Zealand's largest company with an annual turnover in 1998 of $7.9 billion contributing 23% of New Zealand's total export earnings (NZ Dairy Board, 1999). As an earner of overseas exchange, the dairy industry, therefore, is of considerable importance to the economy of New Zealand.
The Dairy Board exports to over 120 countries and territories. However, only five percent of the total world's market for milk products is accessible. Trade barriers restrict the balance. The value of the major markets in NZ $million are Latin America $1853, South East Asia $1656, Europe and Africa $1487, North America $794, North Asia $675, New Zealand, Australia and the Pacific Islands $534 and the Middle East $306 (NZ Dairy Board, 1999).

Since the establishment of the dairy industry, dairy farm income has been largely determined by export market returns and has not been subsidised above this level by Government income support schemes. There has therefore been continued economic pressure to hold costs and increase efficiency in manufacturing. The co-operative ownership and direction by farmer suppliers has removed the need for outside equity capital.

The economic stability of the New Zealand dairy industry depends on world trade issues and sustaining international market returns. The long-term effect of the economic system on the milk industry is unknown. The future outcome may however effect the domestic supply and marketing of milk, and therefore consumption.

2.5.6 Influence of the social-cultural system

Milk consumption is affected by the social relationships within which domestic eating habits (food preparation, food purchase and cooking) are located and by the social organisation in which it takes place (Calnan and Cant, 1987). The material

and structural resources available to the family include food availability and accessibility, food costs and family income as well as the social organisation of food distribution and food choice. Socio-economic status together with material constraints such as low income, strongly shape family eating behaviours (Calnan and Cant, 1987).

Nutrition studies in Australia (Smith and Baghurst, 1992) and the UK (MAFF, 1986) have shown that individuals and families from a low socio-economic background are less likely to eat healthful food. Shops in low income areas in Australia are less likely to stock healthful food items, and menus supplied by various nutritional organisations as nutritionally ideal, were up to three times more expensive than less nutritious ones (Santich, 1992). It is also easier for people in higher income suburbs to buy nutritious food prepared outside the home (McWinnie and Carter, 1993).

In the United States, a study of a low socio-economic Latino population found that lack of availability in supermarket outlets was not an obstacle to increases in low-fat milk consumption (Wechsler, Basch, & Zybert, 1995). Rather, it was shown that whole milk dominated the market in this community because of genuine consumer preference for whole milk. Such preferences stem from lack of knowledge about low-fat milk and from culturally shaped positive attitudes toward the fat content in milk.

There have been similar findings in New Zealand among Maori and Pacific Islands people (Metcalf, Scragg & Tukuitonga, 1998). Maori and Pacific Islands participants consumed significantly more whole milk than Europeans.

Cost and availability of milk may therefore affect milk consumption in families of low socio-economic status. However, among New Zealand Maori and Pacific Islanders these factors may be less important than cultural attitudes in terms of the volume and type of milk consumed. Therefore it is important that social-cultural differences in perceptions about milk be investigated as part of this thesis.

In this chapter I have illustrated that there is a multitude of factors within the food and nutrition system and the systems that may influence the availability, purchase and consumption of milk. In the next chapter I will discuss the factors that influence the individual consumer. In particular, I will examine consumer attitudes and beliefs especially in relation to milk consumption behaviour.

Chapter 3

Factors Influencing Consumers' Milk Consumption

This chapter is divided into three parts. In Part 1 the relationship between consumer beliefs, attitudes and food consumption behaviour will be examined in relation to theories or models of consumer behaviour. Key influences on food (and milk) consumption will be discussed.

Part 2 reviews the literature related to attitudes and beliefs about milk. I will show that attitudes are influenced by negative and positive perceptions about its nutritional content as well as concrete attributes such as cost.

In Part 3 I will provide evidence that milk consumption behaviour is not just related to attitudes and beliefs. Many societal structures influence food behaviour. Membership of social categories such as gender, age, education, occupation and ethnicity impact on food choice so that people may not choose to eat food they prefer.

3.1 Introduction

To understand the changing milk consumption patterns of New Zealanders it is important to examine the multiplicity of factors that can influence the habitual food choices of the individual consumer. These include factors related to the external environment as well as social and psychological influences.

Sensory influences are often among the strongest and immediate influences on an individual's food acceptance. Other factors such as familiarity, price, convenience, advertising and availability all operate in the individual's mind at the point of purchase or use (Booth and Shepherd, 1988).

Individuals also carry into action their beliefs and values concerning health effects and social meanings of foods, as well as emotional needs such as the soothing effect that some foods can provide. Beliefs about the nutritional effects of food are almost always more important than the actual nutritional effects in determining a person's choice, and various marketing and economic variables may act through the attitudes and beliefs held by the person (Shepherd,1990).

Societies are made up of individuals, groups and categories of people that interact with each other. The attributes that form the bases for social categories include gender, age, education, occupational status and ethnicity. The food habits that individuals adopt are intimately linked to these social categories (Murcott, 1995). Food choice options are influenced by availability and accessibility of foods, their relative costs and the constraining effects of choice on low or limited income (Santich, 1996).

The prevailing values in society also need to be taken into account. Contemporary society places greater emphasis on the right to choose, in many different areas. Some people may prefer food that is environmentally friendly; packaged to

minimise pollution or to eat food with their friends rather than alone, and they may trade nutrition quality of food for the opportunity to eat with their social group. Personal values enable individuals to meet a variety of personal, social and community needs (Schwartz, 1994). They may conflict with meaningful but much more restrictive messages from health professionals. It may also result in conflict for an individual when circumstances constrain this freedom of choice.

Within society individuals are constantly surrounded by media messages from both the food industry and health professionals stressing the importance of the 'right' choice. Over relatively short periods of time consumers have received mixed messages about the value of milk in the diet. The school milk programmes of the 1940s to 1960s emphasised the healthiness of milk consumption. This was abruptly changed in the 1970s following the widespread publication of reports in the scientific literature, linking animal fat intake from foods such as milk and dairy produce, with coronary heart disease. In addition epidemiological studies showed that lifestyle factors were associated with the development of several non-communicable diseases (Beaglehole, 1990).

Perhaps as a result of an enormous increase in the amount of information available on nutrition, consumers are more confused now than they were ten years ago (Research International, 1998). For example, an Australian survey has shown that 60% of consumers think that most nutrition information is contradictory, technical or misleading (Research International, 1998).

PART 1: THEORETICAL MODELS OF FOOD BEHAVIOUR AND KEY INFLUENCES ON FOOD (AND MILK) CONSUMPTION

3.2 Lifestyle factors in food product selection

Consumer researchers have used knowledge from psychology and sociology to understand the minds of consumers. The practice has been to adopt and apply new developments in psychology as they emerge (Assael, 1987). These developments have had an influence on how the food consumption process is understood. It is not surprising then that several broadly similar models are pertinent to this thesis. The various theories or models of behaviour differ in the extent to which they concentrate on environmental or endogenous factors and the level at which behaviours are defined.

Grunert and colleagues, from the Aarhus Business school in Denmark, have devised a cognitive model to describe the main lifestyle factors that influence the individual consumer (Grunert, Brunsco & Bisp, 1993; Figure 3.1). The model uses a broad marketing approach with an emphasis on purchasing behaviour.

Figure 3.1 Cognitive structure model for food-related lifestyle
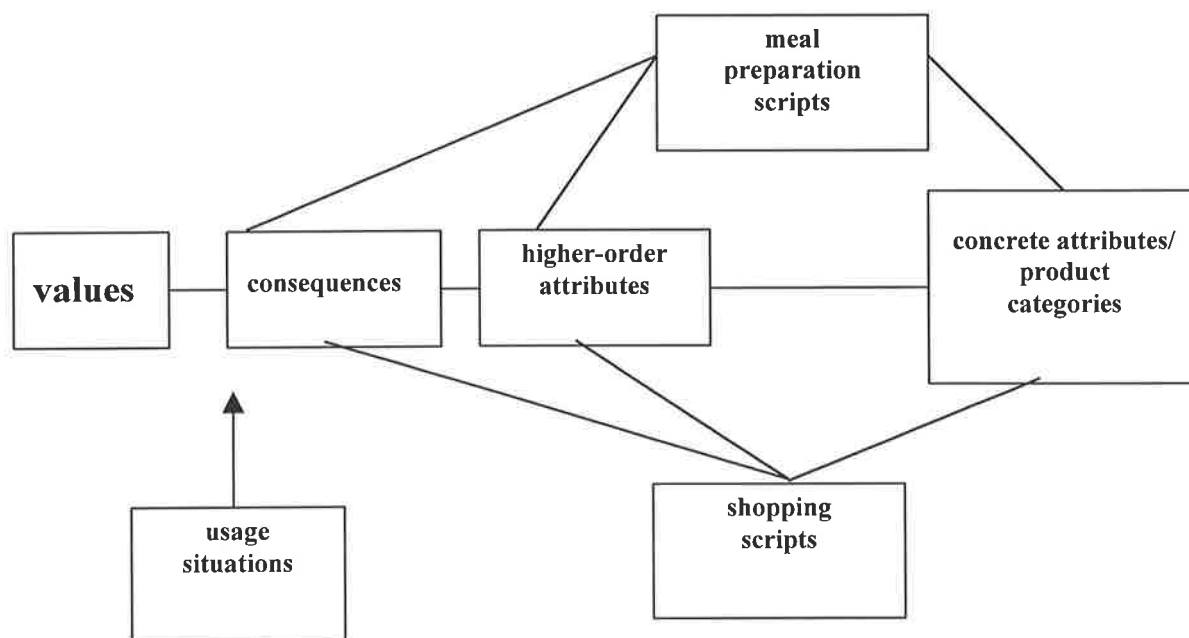
The lifestyle concept was introduced to consumer research in 1963 (Lazer, 1964) and was characterised as an example of psycho-graphic segmentation (Wells, 1975).

The Grunert model proposes that seven key sets of variables make up consumers' lifestyles. They link perceived food product characteristics with values. The relationship between the product and value attainment can be very indirect. The value attainment achieved depends not only on the product itself, but also on the usage situation and the way food products are transformed into meals (Steenkamp and Van Trijp, 1990). This allows consumers much freedom in the ways they use food products to express their values. This opens up the possibility of different food-related life styles. The lifestyle variables are as follows:

1 **Shopping scripts**: how people shop for food products. Whether their decision-making is characterised by impulse buying, or by extensive deliberation, whether they read food labels or rely on advice of experts, whether they shop for themselves or through other members of the family and in what sort of shops.

2 **Meal preparation scripts:** how products are transformed into meals e.g. whether preparation is characterised by efficiency or indulgence, whether it is a social activity or involves one family member, whether technology like microwave ovens is used.

3 **Desired higher-order product attributes:** refer to attributes which may apply to food products in general e.g. healthy, nutritious, natural, fancy, exclusive, convenient.

4 **Usage situations:** the products that are typical for meals, the types of meals, their settings and their social significance.

5 **Consequences:** the specific consequences likely to follow from purchase of the product, i.e. acceptance by members of the family; its emotional significance such as the likelihood of increasing body weight.

6 **Values:** the personal values of the purchaser, their degree of conservatism, desire for self-enhancement. Five features of the conceptual definition of values have been described which distinguish values from needs and attitudes (Schwartz, 1994). A value is a belief pertaining to desirable end-states that transcends specific situations, guides selection or evaluation of behaviour, people and events, and is ordered by importance relative to other values to form a system of value priorities. Thus, security and independence are values, whereas thirst and preference for the colour red are not.

7 **Concrete attributes/product categories:** refer to the product's perceived sensory properties, price, packaging, and its similarity to category characteristics, (e.g. 'it is a dairy food'), specific nutrition claims (e.g. low fat).

While this model broadly explores the cognitive contexts related to lifestyle in which perceptions or attitudes can operate, it does not include biological factors, which can also influence individuals' behaviours. These include physiological processes such as appetite and sensory factors, for example, the taste of food.

The model illustrates how factors such as the shopping script, packaging, cost, habitual usage, attitudes and beliefs about nutrition may all have an influence on

purchase behaviour. For the purposes of this thesis I will not be looking at how people shop for, prepare or use milk. These are important influences but higher order attitudes and concrete attributes overrule these. They are similar to beliefs and attitudes and are measured in the same way. Therefore examination of attitudes and beliefs will enable us to understand perceived benefits and threats associated with drinking milk and may help explain decline in milk consumption.

3.3 Fishbein and Ajzen's attitude-behaviour models

Food choice researchers have used models from social psychology that provide frameworks for the investigation of the relationship between beliefs, attitudes and behaviour (Shepherd and Towler, 1992). One such approach is the Theory of Planned Behaviour (Ajzen 1985). Its predecessor, the Theory of Reasoned Action (TRA) was originally proposed by Fishbein and Ajzen in 1975 and revised by Ajzen and Fishbein (1980).

These two theories incorporate measures of attitudes, intention and behaviour and provide a theoretical framework to examine the attitudes and beliefs held by consumers on food choice. Within these models the person's intention to perform an action, such as the purchase of food, is determined by the person's own attitude (i.e. whether the person sees the action as beneficial) and the perceived social pressure to perform the action (termed the subjective norm). The attitude is predicted by beliefs about the outcomes of the action modified by the person's perceptions of whether these outcomes are good or bad. The model emphasises the importance of social approval and the consequences of actions. The subjective norm is broken down into influence from specific people or groups such as family, friends and health professionals, which are termed normative beliefs. In the case of the Theory of Planned Behaviour (TPB), perceived control or self-efficacy, (confidence that one can perform the target behaviour(s)) is also included as a predictive variable (Ajzen, 1985).

These attitude-behaviour models propose that behaviour is closely influenced by beliefs and attitudes although they do not deny societal influences. They have been used in a number of studies of food selection. Several studies show that the attitudes and beliefs held about particular foods predict their consumption. These include the consumption of milks varying in fat content (Tuorila, 1987); the consumption of high fat foods (Shepherd and Stockley 1985); low fat milk consumption (Shepherd, 1988) and hamburger consumption (Axelson et al,1983). The predictive power of the Fishbein and Ajzen model (1980) towards food related behaviours has since been improved by insertion of an additional component of overall liking, or sensory evaluation, into the regression model (Tuorila-Ollikainen, Lahteenmaki & Salovaara, 1986 and Shepherd, Sparks & Bellier,1991).

These models show that attitudes and beliefs are useful predictors of food behaviour. Therefore Aim 1 of this thesis is to examine the relationships of a variety of attitudes to milk consumption.

Figure 3.2 The Theory of Planned Behaviour (Ajzen, 1985)
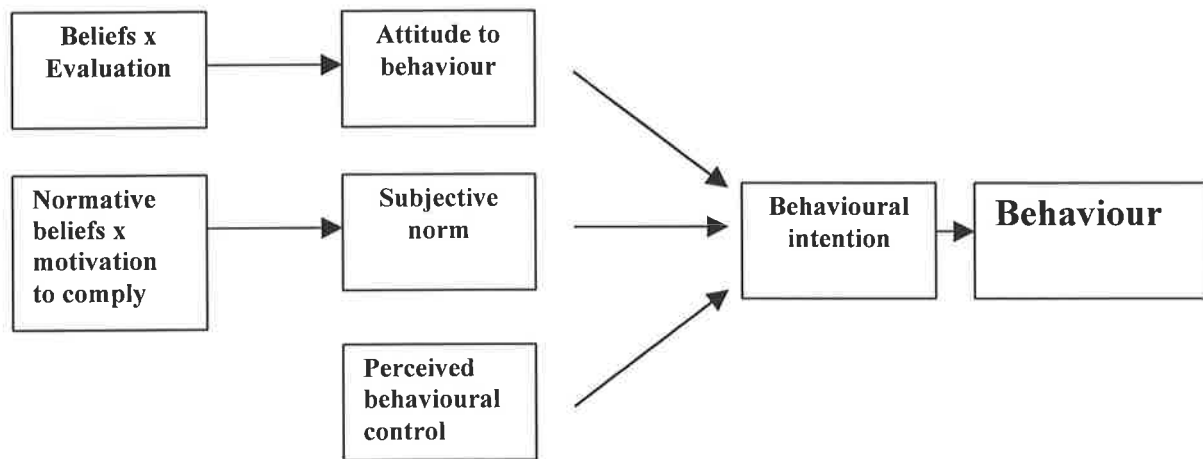
3.4 Becker's Health Belief Model

The Health Belief Model (HBM) is a cognitive model which was developed in the early 1950s in an attempt to understand the widespread failure of people to accept measures of disease prevention (Janz and Becker, 1984). The components of the HBM contribute to the explanation and prediction of individuals' health-related behaviours. These components are derived from the hypothesis that behaviour depends on the value placed by an individual on a particular goal and the individual's estimate of the likelihood that a given action will achieve that goal. That is, like the TRA, the HBM is fundamentally an expectancy value /attitude model. It includes a variety of modifying factors or stimuli that are necessary to trigger the decision-making process. These may be internal e.g. symptoms, or external e.g. mass communications. The model also assumes that diverse demographic and socio-psychological variables might affect the individual's perception and therefore indirectly influence health-related behaviours (Janz and Becker, 1984)

The 'benefits' or 'barriers' dimensions of the HBM are similar to the 'attitudinal' and 'subjective norm' in Fishbein and Ajzen's model. For example, the prospect of undertaking a socially approved behaviour would be seen as a benefit, while the performance of a socially disapproved action might be viewed as a barrier.

Like the TRA and TPB, the HBM is a psychosocial model and is limited to accounting for as much of the variance in individuals' health-related behaviours as can be explained by their attitudes and beliefs. The model is predicated on the premise that 'health' is a highly valued concern or goal for most individuals, and also that "cues to action" is prevalent.

Figure 3.3 Basic components of the Health Belief Model

Individual perceptions   Modifying factors   Likelihood of action
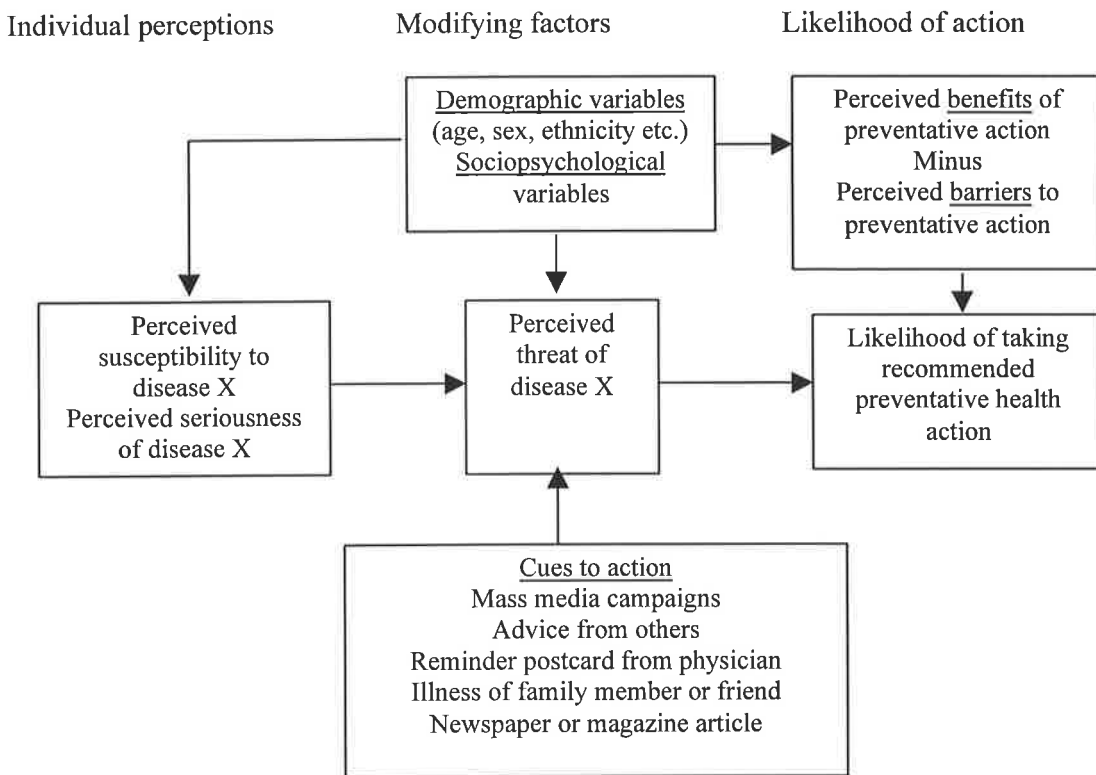
The HBM was used to provide the conceptual framework for a cardiovascular screening programme undertaken in supermarkets in Montreal and Quebec (Strychar, Potvin & Pineault, 1993). It was found that respondents increased their knowledge and reduced the frequency of consumption of high fat foods following the screening programme, particularly individuals with high blood cholesterol levels or high blood pressure, and women.

Similarly, feedback of personal blood cholesterol levels to men and women recruited for cholesterol screening from family medical centres in Quebec influenced intentions to adopt a low-fat diet (Aubin, Godin & Vezina, 1998). Subjects reported lower mean dietary fat intakes after 3 months than at baseline and the reduction was greater in those with abnormal screening results.

The HBM suggests that attitudes to the fat and cholesterol content of milk, its potential allergenicity and bone health benefits may be important. Clearly other forces may also influence health actions, such as economic factors. It is also important to recognise that health related behaviours might be undertaken for non-health reasons. For example, low fat milk may be preferred to whole milk in order to improve physical appearance and social acceptance. In summary, however, the HBM underlines the importance of attitudes and beliefs as predictors of behaviour, supporting Aim 1 of this thesis.

3.5 The transtheoretical model of behaviour change

The transtheoretical model or stage of change model addresses the readiness of individuals to change their behaviour (Prochaska, 1991). The model has been applied in interventions addressing high-risk behaviours such as smoking cessation (DiClemente, Prochaska & Fairhurst, 1991), exercise adherence (Lee, 1993) and reductions in dietary fat intake (Greene, Rossi & Reed, 1994). A key aspect of the success of the model is that it can help people progress through the stages by matching particular processes and principles of change to particular stages of change.

Traditional assessments of behaviour change relied on discrete measures based on assumptions that changes occur quickly, dichotomously, and without relapse (Prochaska, 1991). People were expected to shift dramatically from unhealthy to healthy lifestyles. In contrast, the stage model of change progresses through six stages of change: precontemplation, contemplation, preparation, action, maintenance and termination.

The model provides greater potential to assess the dynamics of change with some people progressing linearly from contemplation to maintenance, others relapsing back to contemplation, and others remaining in particular stages such as contemplation for long periods.

The stages of change are related to attitudes, knowledge and demographic variables (Lee, 1993). In a study of exercise adoption among Australian women, Lee found that in comparison to exercisers, pre-contemplators were older, had lower exercise knowledge, perceived lower levels of family support and expected fewer psychological benefits from exercise.

Wilson & Horwath (1997) applied the stage of change model to milk consumption in New Zealand women. Three dimensions of the stage of change model, socio-economic status and calcium intake were assessed by mail survey. Stages of readiness to increase milk product consumption were assessed during brief telephone interviews. The authors found no differences in self-efficacy, processes of change or decisional balance for increasing milk product consumption. However, women in higher status occupations recalled information about the benefits of milk products more frequently. More women from lower socio-economic groups consumed less than 560mg calcium per day, the lowest quartile of calcium intake for the population.

The stage of change model has been used to differentiate people with different attitudes towards health and nutrition. De Graaf, Van der Gaag & Kafatos (1997) divided 1000 subjects from 15 European countries into five different categories according to their attitudes towards 'changing their eating habits in order to eat healthier'. The taste of food was more important to subjects in the precontemplation stage, whereas health was more important to people in the maintenance stage.

Among Chinese Singaporeans, the stage of change model has been used to assess self-efficacy for increasing consumption of grains, fruit and vegetables (Ling & Horwath, 1999). By use of a validated food frequency questionnaire the authors

showed there were significant increases across the stages for consumption of these foods.

The transtheoretical model is currently the most popular of a number of stage theories being used to examine health behaviour change (Horwath, 1999). However, there are many methodological considerations when applying the model to eating behaviour change and further research is required to demonstrate the efficacy of stage-matched dietary interventions.

While stages of change were not determined in this thesis, it is likely that people who contemplate or undertake dietary change for health reasons have different attitudes to milk compared to those in the precontemplation stage. They may have more positive attitudes toward the health benefits of milk (e.g. calcium and bone health) or more negative attitudes to milk because of perceptions about fat and body weight.

3.6 Consumer values and links with attitude theory

The model for food related lifestyle (Grunert et al, 1993) describes how there are other influences on consumer behaviour. The personal values of the consumer are a key influence. According to Rokeach (1973), personal values are modes of behaviour that serve as guiding principles of varying importance in one's life. For example "wisdom", "peace" and "social recognition" are end state values; "helpful", "independent", and "obedient" are mode of behaviour values.

A person's values are organised in an hierarchy from most important as a guiding principle to least important, thereby forming that person's value system (Schwartz & Inbar-Saban, 1988). Combinations of value preferences are assumed to influence attitudes, which in turn influence specific behaviours.

Attempts to model relations between values and actions have been made by using expectancy-value theory (Feather, 1982). This relates a person's behaviour to expectations that the person holds and on to the person's subjective valuation of the outcomes that may occur following the action (Feather, 1992). The attitude and subjective norm terms in Fishbein's model are expectancy-value products.

There are five formal features of values recurrently mentioned in the literature (Schwartz & Bilsky, 1990). Values:

1	are concepts or beliefs
2	pertain to desirable end states or end behaviours
3	transcend specific situations
4	guide selection or evaluation of behaviour or events
5	are ordered by relative importance

Values understood in this way differ from attitudes in their greater generality or abstractness. Value priorities held by individuals underlie their beliefs, attitudes and behaviours. The variations in value structures across groups could be helpful to

marketers to understand the differences in the ways segments of the market organise their understanding of the world.

Schwartz (1992) has proposed a classification of value types. The hypothesis is that people's values are organised by specific motivational domains. These are:

Self-direction	Independent thought and action –choosing, creating, exploring
Stimulation	The need for variety and stimulation in order to maintain an optimal level of activation
Hedonism	Pleasure or sensuous gratification for oneself
Achievement	Personal success through demonstrated competence according to social standards
Power	Attainment of a dominant position within the social system (e.g. authority, wealth)
Security	Safety, harmony, and stability of society, of groups with whom one identifies, of relationships, and of self
Conformity	Restraint of actions and impulses likely to harm others and to violate sanctioned norms
Tradition	Respect, commitment, and acceptance of the customs and ideas that one's culture or religion imposes on the individual
Spirituality	A spiritual life, meaning in life, inner harmony, detachment, unity with nature, accepting one's portion in life, devout
Benevolence	Preservation and enhancement of the welfare of people with whom one is in frequent contact (helpful, loyal, forgiving, honest, responsible, true friendship, mature love)
Universalism	Understanding, appreciation, tolerance, and protection for the welfare of all people and for nature

An Australian study has shown that dietary supplement practices are associated with specific empathetic and life fulfilment value orientations (Worsley & Crawford, 1988). It was hypothesised that regular supplementers' concerns over the quality of the food supply, naturalness, and nutrition, together form part of a larger worldview.

In a further study a relationship between values and the attractiveness and choice of food in different contexts was identified (Feather, Norman & Worsley, 1998). For example, it was shown that people's ratings of the importance of tradition values related to how they rated the attractiveness of the traditional Christmas dinner.

Although Grunert's model shows that values are a key influence in food-related lifestyles, attitudes and beliefs (perceptions) are closer to behaviour. Fishbein and Ajzen's attitude-behaviour models maintain that beliefs and attitudes can predict behaviour. Therefore for the purposes of this thesis I will only investigate attitudes and beliefs.

3.7 Sensory and biological influences

All living organisms require food for growth and maintenance of body tissues. This supply is achieved through eating behaviour and the expression of this behaviour is controlled according to the state of the biological system (Blundell & Green, 1996).

The biological drive to eat can be linked with the satiating power of food. Food brings about this effect by certain mediating processes generated by the impact of food on physiological and biochemical mechanisms. There is evidence that high fat foods have a weak effect on satiety (Blundell, Burley & Cotton, 1993). The feeling of fullness induced by eating fat appears to arise from potent pre-absorptive satiety signals. High fat foods generate strong positive effects known as "mouth-feel" because of the texture and flavour retention properties of fat. This hedonic aspect of high fat foods makes them extremely palatable. This may be a partial explanation for the sustained market dominance of regular fat milk in New Zealand.

With reference to food choice, humans have three genetically based behavioural predispositions (Rozin & Vollmecke, 1986). Firstly, humans have innate taste biases. There is an innate preference and liking for sweet tastes and an innate dislike of bitter, sour and irritant tastes although there is wide variation between individuals but less variation across cultures (Fischer, Griffin & England, 1961). The second genetically based predisposition is an ambivalent response to potential new foods with a mixture of interest (neophilia) and fear (neophobia). Biologically, this relates to the possible nutritive value of a potential new food as opposed to the potential that it will contain toxins. The third predisposition involves special built-in abilities to alter food preferences or likes in response to the delayed consequences of ingestion of a particular food. This is illustrated by the ability to avoid foods that cause illness (acquired taste aversions) as well as the acquisition of liking for nutritious foods (Rozin & Vollmecke, 1986).

Biological influences on individual variations in food preference are probably manifested indirectly as a result of inherited metabolic differences among individuals and ethnic groups (Rozin and Vollmecke, 1986). A case in point is lactose intolerance; individuals carrying this inherited trait usually consume only moderate amounts of milk and milk products (Simoons, 1978).

Sensory influences are often among the strongest and most immediate influences on an individual's acceptance of a food or beverage (Booth and Shepherd, 1988). Sensory liking of a food is influenced by individual factors such as learning, memory context, expectation and physiology (Baghurst, 1998). Food acceptance is a combination of these factors.

Even before food touches the mouth, the sight and smell of food generates physiological signals. Individuals tend to reject foods that appear 'strange' or unsafe and expectations confirmed by a food's appearance strongly predict its perceived pleasantness. Similarly, the aroma of food has an important role in enabling individuals to avoid toxic or unsafe substances. The pleasure which foods and beverages provide depends mainly upon their taste, and to a lesser degree, their aroma (Tansey & Worsley, 1995). Sour, sweet, salt and bitter are the four generally

recognised tastes (Rozin & Vollmecke, 1986). These are associated with specialised receptors on the tongue and palate. Taste is often identified as a major determinant of food choice. If food does not appeal from a sensory perspective, consumption is unlikely.

In the UK sensory profiling of milk was undertaken to determine whether different milk fat levels were recognised during usage (Raats and Shepherd, 1992). In this study four commercial milk samples of different fat content were compared: Breakfast milk (4.8% fat), whole milk (3.9%), semi-skimmed milk (1.6%) and skim milk (0.1%). Significant sensory differences between the milks were noted when used with flavouring, Cornflakes, savoury sauce and tea but not with instant coffee, oat cereal or in whipped desserts. The skimmed milk was perceived as having a more thin/watery mouthfeel and the milks with a higher fat content as having a more creamy/rich aroma and a buttery/fatty flavour or mouthfeel. Terms usually not associated with dairy fats were used to describe the samples prepared with skimmed milk. The term "orange/tangy" flavour or aroma was used to describe flavoured milk samples and "peppery" flavour was used to describe savoury sauce samples.

Other researchers suggest that assessors rely heavily on visual cues to discriminate among milk samples of different fat content (Tuorila, 1986; Pangborn and Dunkley, 1964; Pangborn, Bos & Stern, 1985). Tuorila (1986) found significant differences in visual thickness between milk samples of different fat contents. When a textural agent was added to milks of differing fat contents the perceived fat content of the lower fat milks was greatly enhanced (Mela, 1988). This suggests that the perceived fat content in low fat milks is related to textural properties, such as viscosity, sensed with the oral cavity.

In a study of under, normal and overweight women in the United States it was found that few subjects could discriminate between non-fat milk and the fat levels in five other milks with added fat (Pangborn, Bos & Stern, 1985). Discrimination among and preferences for, the experimental samples of milk (ranging from 0.5 to 6.0% added fat) were also unrelated to body size or dietary fat intake. In all trials, preferred mixes exceeded the fat levels in milk that these subjects normally consumed. Therefore the women drank milk with a lower fat content than they really preferred.

The visual cues of transparency, gloss, and whiteness have been shown to be essential for flavour differentiation of milks varying in fat (Pangborn and Dunkley, 1964). Elimination of visual differences might account for why non-fat milk could not be discriminated from the higher fat milks in the study of under, normal and overweight women.

The sensory profile of milks of different fat content may not be very important particularly as consumers tend to find their most used type of milk suitable for all their uses of milk (Tuorila, 1986; Raats and Shepherd, 1991). Furthermore, Shepherd (1988) has shown that nutritional beliefs are more closely related to attitudes towards consumption of low fat milks than sensory properties. In this study, a principal components analysis of the belief-evaluation scores showed the nutritional beliefs (healthy, fattening, reduces my fat consumption) to be separable from the sensory beliefs (tastes nice, tastes watery, can have off flavours, leaves a

greasy taste in the mouth). The nutritional beliefs were more closely related to the person's attitude towards consuming low-fat milk and to actual consumption.

People can change their taste perceptions. In Finland consumers who changed from full fat milk to non-fat milk found it unpleasant at first, but if they believed that they should drink non-fat milk for their health and if they persevered for some weeks, they adapted to the taste and enjoyed it (Tuorila, 1987). They later found that whole fat milk was unpleasant.

Given the many determinants of everyday food acceptance, the assessment of sensory effects cannot be made in isolation. The effects of attitudes and emotions on the senses also need to be considered. For this reason sensory evaluation should include measurement of sensory influences on consumer acceptance behaviour at the individual level (Booth and Shepherd, 1988). This means that sensory influences should be measured in a way that relates to the normal context of use. As sensory influences are labour-intensive to measure, attitudes are useful surrogates for sensory tests.

The literature confirms that taste is a key determinant of food choice. Given that New Zealand is a dairy farming nation and fresh milk is widely accepted as a staple food it is hypothesised that New Zealanders will have positive attitudes towards the taste of milk.

Hypothesis 1

Aim 1: To investigate consumer attitudes to milk
Hypothesis 1   Most people will have positive attitudes towards the taste of milk

3.8 How people learn about food likes and dislikes

Eating involves three major components: the experience of food prior to entering the mouth, the experience of processing the food in the mouth, and the experience of swallowing the food (Oram, 1996). Prior to ingestion, contact with the food provides expectations of what the food will be like in the mouth and what the digestive consequences of eating it will be. People have strong feelings about objects that enter the mouth and the sensations they produce (Rozin and Vollmecke, 1986).

Although foods stimulate the taste, visual, thermal and tactile senses, it is the mental representation invoked by the sensory stimulation that is critical to a consumer's responses (Rozin and Vollmecke, 1986). All this means the food itself is at once a source of nutrition, a source of harmful toxins, a great source of pleasure and satisfaction, and a vehicle for the expression of social relations and values.

Individual food preferences and eating habits are acquired, largely by familiarisation (Booth and Shepherd, 1988). The association with enjoyable or beneficial social or physiological consequences of eating determines our preferences. Therefore, the most effective promoters of eating and drinking are the most familiar for the

individual from their own experience. This applies to the influence of sweetness on food acceptance in young infants. For example, it has been shown that infants exposed to sugary water in the first few months like it more at six months than those infants who are unfamiliar with the taste (Beauchamp and Moran, 1985).

Given that familiarisation is important in forming preferences, consistency of experience is needed for childhood preferences to persist later in life. A study of pre-school children served either water or milk at lunch, showed that children who were served milk, were more likely to choose milk at lunch four months later, than the controls (Koivisto et al, 1994). There were however, no differences in choice between milk and water after 12 months. Informal observations showed that children were unable to discriminate between milk products with different fat contents. The author's interpretation of these findings was that the children tended to associate the type of drink regularly served at a meal with that specific meal.

Other researchers have shown that by three years of age, children have learned culturally based rules about foods which are appropriate at particular types of meals (Birch et al, 1984). Preferences for foods vary with the time of day and with the rules of consumption. These findings have particular relevance to this thesis, as milk drinking with meals in early childhood may be an important factor for the development of milk-drinking habits and for the preference for milk to persist in later years. Among ten-year-old Australian children Worsley, Coonan & Baghurst (1983) showed that reported intakes of foods including milk were more closely related to those of their parents and peers than to either perceived "goodness" or food preferences.

In adults, changes in diet have been shown to affect the assessment of a food's pleasantness, which can be confirmed by objective psychological measurement (Booth and Shepherd, 1988). A substantial change in preferences is liable to take some time because the familiarisation processes take time to overcome ingrained prejudices. For example, it has been shown that people placed on a low sodium diet initially disliked the change but after several weeks they adapted to it and eventually the most preferred amount of salt was measurably reduced (Bertino et al, 1982). These findings are similar to those encountered when changing from regular to low fat milk (Tuorila, 1987).

Liking refers to a set of hedonic reactions to a food but is only one of the motivations that may account for a food preference (Rozin and Vollmecke, 1986). Perceived health value, convenience and economic factors are important influences on preference but may not affect liking (Kondl and Lau, 1982). A person on a weight-control diet for example, may choose to eat cottage cheese rather than cream cheese, but likes cream cheese better.

The power of familiarity and conservatism in food choice (Rozin, 1976) probably explains the expressed reluctance of consumers to shift from their own milk type. This may also explain why the majority of milk consumed by New Zealanders is regular fat milk and that despite health promotion efforts to reduce fat consumption across all food groups, there has been remarkably little change in the consumption of regular fat milk.

Preference or liking depends on the context that is largely specified by culture (Rozin and Vollmecke, 1986). Contextual influences can include aspects of the food, the situation or the individual. It can include the effect of one food on another, food variety, culinary context (such as the effects of herbs and spices) or the effects of packaging, branding or labelling which may influence acceptability.

Within cultures there are wide variations with respect to individual characteristics such as beliefs (including health beliefs), variety seeking, neophobia and restraint. Innate sensory preferences that appear to exist across populations may be less important when compared to culture-based, learned preferences and aversions for food (Cardello, 1996).

Humans tend to reject novel foods. Pliner and Pelchat (1991) obtained evidence for the importance of disgust as a motivation for the rejection of novel foods in a study in which participants were more likely to reject novel foods of animal origin than those not of animal origin. The findings showed that that there was greater neophobia associated with flesh foods such as fish, meat and poultry than with dairy foods. Similarly, in a review of pregnancy cravings and aversions, Pliner and Fleming (1985) showed that while nearly all studies found aversions to flesh foods, nearly all found cravings for dairy products.

These findings may have important implications for the introduction of new variants of milk. Food neophobia can be reduced by exposing individuals to or increasing familiarity with, the unfamiliar foods (Pliner, 1982). However, for emotionally based attitudes it has been shown that cognitively based change techniques are ineffective (Edwards, 1990).

In an attempt to understand the effects on willingness to taste foods, a study of college students in Toronto found that emotional reactions to animal foods including milk appeared to block the effect of nutrition information about the food (Martins, Pelchat & Pliner, 1997). Therefore, providing cognitive information about the nutritional properties of a new milk product may not have any influence if people are using an emotionally based attitude or belief to define their behaviour. Understanding of the motivational basis people use to define their behaviour may be necessary to market new milk products.

In summary, the literature suggests that milk preferences are likely to be determined by familiarity. There appears to be a reluctance to consume different types of milk, especially to change from regular to low fat milks. Therefore it hypothesised that many people will believe that there are too many types of milk available.

Hypothesis 2

Aim 1: To investigate consumer attitudes to milk

Hypothesis 2	There will be negative attitudes to the wide range of milks available

3.9 Consumer uses of milk

A range of factors including sensory attributes, preferences or attitudes influences decisions about the purchase of milks and beliefs towards the different types of milk (Raats and Shepherd, 1991). The contexts in which all beverages are consumed vary by meal, social situation and culture (Tuorila, 1991). Milk is used in many different contexts, and people's attitudes and beliefs towards milk consumption will vary across contexts (Raats and Shepherd, 1993).

In New Zealand, research on breakfast eating habits confirms that milk is a popular choice with breakfast cereals (Consumer Link, 1998). The research showed that 72% of New Zealanders eat breakfast every day and that cereal was the most popular breakfast food eaten by 67% of weekday breakfast eaters. Milk was chosen by 41% of respondents as an accompanying beverage (Consumer Link, 1998).

Working with dietary data from the USDA Continuing Survey of Food Intake by Individuals 1989 to 1991, Carson, Siega-Riz & Popkin (1999) showed that regular consumers of breakfast cereals had an improved nutrient intake at breakfast compared to non-consumers. The percentage of calories from fat was lower in breakfasts of regular consumers versus non-consumers; and the proportion of fibre, calcium, iron, zinc, vitamins A, C, E, and B vitamins as a percentage of the day's energy intake was higher. Milk is typically added to breakfast cereals. For most 5 to 10 year olds and 30-59 year olds, regular consumption was associated with improved daily intake of calcium. Therefore promotion of cereal and milk as a breakfast choice may help to enhance calcium and overall nutrient intake.

The repertory grid method (short structured interviews) has been used to study the place milk occupies in the total diet in Finland, France, the UK and the Netherlands (Raats and Shepherd, 1993). The results of the repertory grid use assessments suggest that consumers tend to find their most used type of milk suitable for all their uses of milk. This is in agreement with work carried out by Tuorila (1987). The main uses of milk were categorised into 20 classes. Differences in the main uses of milk for each country are shown in Table 3.1.

Table 3.1 Differences in use of milk across the different countries (Raats and Shepherd, 1993)

Finland	France	Netherlands	UK
Cooking or baking	In desserts	As a beverage	In hot drinks (tea, coffee)
As a beverage	As a beverage	In cooking, baking	In cereal, muesli
Coffee	In mashed potatoes	In flavoured milk, warm milk	In cooking, baking
Porridge	In sauces	In coffee	As a beverage
In Cereal	In flans, omelettes, quiches	In desserts, porridge	In desserts, porridge
In sauces	In cereal, muesli	In sauces	For children

60

Berg et al (1990) reported that 56% of Finnish consumers use milk at breakfast, 69% drink one or more glasses of milk per day and 44% use milk in coffee.

The use of milk as a beverage in France has diminished (Dupin et al, 1984). Knegt and den Hartog (1982) describe the main uses of milk in the Dutch diet as being as a beverage at breakfast and / or lunch and that at breakfast it can be used to make porridge or for other cereals. The major uses of milk in the UK diet are in tea (24%), on cereals (22%), in coffee (16%), in cooking (12%) and as a drink (12%) (Harris,1991).

The use of milk in tea or coffee is most popular in the UK, although milk is also used in coffee in Finland, the Netherlands and to some extent in France. The use of milk as a drink was found to be most popular amongst Dutch consumers followed by Finland, France and then the UK, though in other countries cereal, muesli, and porridge were also mentioned as uses. Flavoured or warm milk is a use that was only mentioned by Dutch and French consumers. These results illustrate differences in use of milk across the different countries.

In terms of the appropriateness of milk use, Raats and Shepherd (1991) undertook a study in the UK to identify consumer beliefs concerning different types of milk. A questionnaire sought the appropriateness of milk of differing fat content for 49 use attributes. It was found that high fat milk users used no particular use attribute to separate the milks. Low fat milk users separated milks to a greater extent than high fat milk users on 'when I want something low in calories', 'when I want something that contains little fat' and 'when on a diet'.

Milk consumption with meals or as a drink may depend on whether meals are eaten with family and friends. De Castro, Brewer & Elmore (1990) have shown that the amount eaten by humans in spontaneously ingested meals is positively correlated with the number of other people present. This social facilitation of eating is important regardless of whether a snack or a meal is eaten and regardless of when or where it is eaten. Simply eating with another person increases the average amount ingested in meals by 44% and with more people present the average meal size grows even larger (de Castro, 1997). Family and friends produce an even larger effect than companions do probably by producing relaxation and inhibition (de Castro, 1994).

The literature confirms that consumption of milk is related to its usage and that low fat milk users have specific use attributes. In New Zealand consumer uses of milk have not been specifically determined. For the purposes of this thesis I will refer to milk in general. However cereals are the most popular breakfast food chosen by 67% of consumers who eat breakfast during the week (Consumer Link, 1998). Therefore I will examine attitudes towards the use of milk added to cereals and to drinks.

Low fat milks are appropriate for people with high blood cholesterol and for people who are trying to lose weight. Low and reduced fat milks have less than 25% market share (New Zealand Dairy Foods, 1998) and their use attributes are not well promoted. Therefore I will examine consumers beliefs about low fat milks in relation to cholesterol and dieting. The following hypotheses are proposed.

Hypotheses 3-5

Aim 1: To investigate consumer attitudes to milk	
Hypothesis 3	Most people will have positive attitudes towards milk added to cereals and drinks
Hypothesis 4	Most people will be uncertain that drinking a low fat milk is acceptable for adults with high blood cholesterol
Hypothesis 5	Most people will be uncertain that you should only drink a low fat milk when on you're on a weight reducing diet

3.10 Consumer shopping behaviour

The food related lifestyle model (Grunert et al, 1993) proposes that food product selection is influenced by shopping situations and scripts. Although related to store choice, shopping behaviour is a distinctive form of consumer behaviour (Assael, 1992). Donovan & Rossiter (1982) found that shopping was frequently viewed as a pleasurable task associated with one or more of the following activities:

- Enjoying the store environment
- Browsing and exploring the store's offerings
- Talking to sales personnel
- Spending money

Most of these motives deal with the inherent values of shopping such as diversion, self-gratification and social interaction, rather than shopping as a means of deciding on the product to be purchased (Westbrook & Black, 1985). Studies of shoppers' motivations have led researchers to profile consumers by their orientation to shopping and to determine the characteristics of these shopper types.

There have been a number of consumer lifestyle changes in the last two decades that have affected shopping behaviour. The increase in the number of working women and the decrease in family size has meant a shift away from traditional gender roles. The working woman's greater affluence, independence and self-confidence has created a substantial change in women's purchasing roles.
In general, advertisers have tended to lag behind changing females roles (Assael, 1992). As a result, it is considered that most women no longer identify with advertisements that tell them how to clean the floors or how to make their husbands happy.

A further important lifestyle trend is the emphasis on health and nutrition. There is greater consumer awareness on the effects of dietary habits on health. This awareness has been translated into a change in purchasing patterns and in the United States there has been a remarkable increase in purchases of products making health claims (Assael, 1992). There is a higher level of self-awareness as reflected in the changing values of baby boomers. This has led to a significant increase in the

number of products related to self-improvement and to an increase in "natural" foods, based on the notion that better nourishment enhances health (Assael, 1992). Many consumers are demonstrating a more conservative way of life. For baby boomers, greater conservatism is reflected in more time at home with the family. This trend is sometimes referred to as "cocooning" (Popcorn, 1996).

The increasing proportion of working women has put a premium on time for most families. The focus on time-saving convenience has created "grazing", the need to eat on the run and "refuelling" which refers to less time spent in preparing and eating dinner (Assael, 1992). At the same time consumers are becoming increasingly concerned about the damage to the environment and are increasingly more willing to pay more for environmentally safe products (Assael, 1992).

The purchase of milk is increasingly made from supermarkets and convenience stores rather than by home delivery. The retail environment is particularly important as it can influence how people shop. For example, the shopping environment can affect whether people make impulse purchasing decisions or whether they read food labels and signage.

Underhill (1999) has undertaken behavioural research in the retail environment by filming and recording the retail experiences of consumers in the United States, Milan and Sydney. Underhill claims that the retail environment is becoming increasingly important because of the declining effectiveness of consumer advertising. In the United States, more TV channels, remote controls and VCRs allow consumers to remove advertising. The Internet and the shrinking newspaper business are contributing to this decline. Perhaps as a consequence, it is believed that we are now witnessing the erosion of the influence of brand names. It is not that brands do not have value but that the value is not as commanding as it used to be. As a result of these changes, it is believed that most purchasing decisions for groceries are made in store.

Several observations have been made that are relevant to milk (Underhill, 1999). Firstly, the traditional positioning of the dairy chiller in supermarkets was against the back wall. This is because almost every shopper needs milk and they will pass through the entire shop on the way to and from the rear. This positioning created an opportunity for competition. The convenience store industry is now said to exist because of its ability to put milk and other staples into shopper hands quickly. Some new supermarkets now feature a "shallow loop" –a dairy chiller up near the front of the store, so shoppers can "grab" milk quickly.

The convenience stores acquired this business by identifying the changes in women's lives. Women with full-time jobs have made big shopping expeditions obsolete for many American families. The increasing duration of single marital status has also contributed to that trend. As a result consumers now make more grocery shopping trips and buy fewer items each time.

Observations from studies in supermarkets in America also showed that:

- almost all of the women had shopping lists compared to less than a quarter of the men
- how much customers buy is a direct result of how much time they spend in store
- customers perceive waiting time at the cashier to be shorter if there are signs to read
- there is a clear connection between reading and buying, reading takes time and space but if women don't feel comfortable, they won't pause and buy
- less than 3% of all manufacturers' coupons are ever redeemed. Women's lives have changed and the concept of cutting out a coupon is considered as cost-effective as churning your own butter
- when a woman is in store with a man, she will spent less time than when alone, with another woman or with children
- men are particularly suggestible to the entreaties of children as well as eye catching displays
- products stocked too high or too low on shelves are virtually off-limits to the older shopper. It is not worth their trouble (Underhill, 1999).

These findings suggest that the environment can create opportunities for the marketing of milk. The consistent finding in studies of unplanned purchases is that in-store exposure to marketing stimuli is the most influential factor in the purchase decision. The positioning of the dairy chiller in store and features such as shelf position, shelf space, information on package (size, content, price), in-store promotions, display space and signs that shoppers will read can influence purchasing decisions. Further, food labels, type of packaging and leaflets for shoppers maybe important to increase brand value.

I have reviewed the non-attitudinal lifestyle factors proposed by Grunert and his colleagues in food product selection. I have shown that personal values of the consumer underlie their attitudes and beliefs. Biological factors explain some differences in food choice. There are some individuals who have preference or liking for their own milk type that may be explained by the power of familiarity. Milk consumption is related to consumer usage and may depend upon social facilitation at meals and snacks. Finally the shopping situation and script also has an important influence.

PART 2: SPECIFIC ATTITUDES TO MILK AND MILK CONSUMPTION

3.11 Consumer attitudes and milk consumption

Attitudes and beliefs about foods appear to be strong predictors of dietary behaviour (Tuorila, 1987; Tuorila and Pangborn, 1988; Tuorila, Pangborn & Schutz, 1990). Applications of the Fishbein-Ajzen model have shown relatively strong relationships between attitudes and beliefs and consumption of high-fat foods (Shepherd and Stockley, 1985; Shepherd and Stockley, 1987; Towler and Shepherd, 1992); milks varying in fat content (Tuorila, 1987); beef (Saap, 1991) and fruit and vegetable consumption (Brug, Lecher & De Vries, 1995). For a more detailed discussion on consumer attitudes and fruit and vegetable consumption see Appendix 3.

Nutrition knowledge, attitudes and behaviour are significantly related (Axelson, Federline & Brinberg, 1985). In a meta-analysis of food and nutrition related research Axelson et al (1985) demonstrated a significant relationship between nutrition knowledge and dietary intake, and between nutrition-related attitudes and dietary intake.

Liking for milk has been found to be a significant predictor of consumption (Tuorila and Pangborn, 1988). In a study of 100 American women, beliefs about nutrient content (e.g. getting calcium, protein, calories) and functionality (e.g. goes well with other items, quenches thirst) affected consumption positively, and beliefs about gaining weight and cost affected it negatively.

The influence on knowledge, behaviours and attitudes on milk consumption patterns has been investigated among a group of adults aged between 50 and 89 years participating in a community wellness program in the United States (Elbon, Johnson & Fischer, 1996). A total of 103 participants (of whom 82% were women) completed a mail survey of nutrition knowledge, attitudes and behaviour. Over half the respondents (55%) answered 9 to 12 (of 15) nutrition knowledge items correctly. The nutrition knowledge score was significantly correlated with education, attempts to reduce fat and cholesterol and attempts to increase dietary calcium intake. This supports the hypothesis of Axelson (1985) that knowledge and behaviours are likely to be significantly correlated.

Over 50% of the participants drank milk one or two times a day and nearly all participants drank milk with a fat content of 2% or less. Over 70% of the participants tried "a lot" to reduce dietary fat and cholesterol while nearly 60% tried "a lot" to get enough calcium from foods. Nearly all participants agreed that milk is convenient and packed in the right size. Over 25% agreed that containers were too difficult to open and that they would drink more milk if it were less expensive.

The type of milk consumed was significantly correlated with the nutrition knowledge score ($r = 0.32$, $p = 0.001$), education ($r = 0.23$, $p = 0.05$), attempts to reduce fat ($r = 0.41$, $p = 0.001$) and cholesterol ($r = 0.29$, $p = 0.01$) and to increase dietary calcium ($r = 0.27$, $p = 0.01$). The frequency of milk intake was significantly

correlated with the nutrition knowledge score (r = 0.27, p = 0.01); frequency of milk consumption during youth (r = 0.24, p = 0.05); attempts to reduce fat intake (r = 0. 21, p = 0.05); agreement that milk helps induce sleep (r = 0.26, p = 0.01) and that milk is packaged in the right size (r = 0.29, p = 0.01) (Elbon et al, 1996).

Table 3.2 Examples of Individual Nutrition Knowledge Items (Elbon et al, 1996)

	% right	% wrong	% don't know
Dairy foods are rich in many nutrients	98	2	0
Calcium is needed for your bones throughout life	100	0	0
People on a low cholesterol diet can eat low fat dairy foods	77	11	12
People on a low cholesterol diet should avoid low fat dairy foods	69	18	13
Dairy products are important for healthy bones throughout life	92	5	3
Skim milk contains only a tiny amount of cholesterol	77	8	15
There is more calcium in a cup of milk than in a cup of broccoli	34	23	43

In the UK beliefs about the health and nutritional benefits of low fat milks have been shown to be more important predictors of milk consumption than taste (Shepherd, 1988). Across occupations, women and those aged 26 to 45 believed more strongly than others that high fat foods are harmful (Shepherd and Stockley, 1985). The high fat foods were meat, meat products, butter or margarine, cheese, milk and fried foods, which are the highest contributors to total fat intake in the UK. This belief was associated with lower consumption of these foods.

In Finland Tuorila (1987) found that shoppers' consumption of three milk types (0%, 1.9% or 3.9% fat) was mainly determined by overall liking for product type i.e. an attitude. Subjects strongly preferred the milk type they usually consumed in hedonic tests; in survey ratings of liking; and in their beliefs about sensory attributes, nutritional and health value and suitability for various purposes.

All the user groups were reluctant to change their milk type (Tuorila, 1997). Most of the reasons given for shifts from one milk type to another were related to health and nutrition and not to sensory quality. However, the familiar milk type was strongly preferred. The Fishbein model explained 18-47% of the selections of the milk types. The attitude component was found to be a better predictor of behavioural intention than the subjective norm. This study shows that a consistent belief structure and positive attributes that defend the established behaviour against change support the use of particular milk types.

In the United States, Brewer, Blake & Rankin (1999) set out to determine the factors that influenced the consumption or avoidance of milk in 100 women. Respondents completed food frequency and milk attitude questionnaires and performed sensory evaluations of different milk samples. The findings showed that milk consumption among respondents was low; 23 respondents indicated that they

seldom or never drank milk. Data from the dairy frequency questionnaire showed that the primary milk for 42%, 36%, 27% and 18% of the milk drinkers was skim milk (0.1%), 2% fat milk, 1% fat milk and whole milk, respectively. (The subjects were able to indicate consumption of more than one type of milk).

Although subjects evaluated food they considered 'low in calories" and "good for me" highly, 36% chose 2% fat milk instead of lower fat varieties. Possible reasons for choosing 2% fat milk were the influence of household members' preference for 2% milk (44%) and whole milk (41%) contrasted with respondent's preference (39%) for skim milk. This suggests 2% milk may have been the compromise choice. In addition most respondents were more familiar with 2% milk, which received the highest score for the belief item "I am used to it" among women (Brewer et al, 1999).

Sensory evaluation indicated that subjects liked whole milk more than skim milk and 1% milk ($p < 0.05$), and as the percentage of fat increased, so did the sensory score for liking. Nevertheless, more subjects believed lower-fat milks were "good for me". These results suggest that the group as a whole equated lower-fat milk with a more healthful product. As in Finland (Tuorilla, 1987), health concerns outweighed sensory concerns for milk drinkers.

No significant effects of demographic variables were found on the consumption of specific milk types or the frequency of milk use. This study illustrates that some women consume skim milk for reasons other than beliefs about taste and texture or actual sensory preference (Brewer et al, 1999). In summary, positive attitudes appear to be important predictors of milk consumption.

3.12 Perceived threats to milk consumption

The literature suggests that there is a strong relationship between nutrition knowledge, attitudes and consumption behaviour. While several investigators have shown a relationship between specific attributes of milk and consumption, the influence of a comprehensive set of variables related to perceptions of milk has not been examined.

Therefore consumers' perceptions of a wide array of nutrition and milk related items including concrete attributes such as cost will be investigated as part of this thesis. This will provide evidence for the hierarchy of relationships between attitudes, and milk consumption behaviour. For the purposes of this thesis I will use the term 'attitudes' to include attitudes and beliefs.

There are several perceived threats to milk consumption, which will be investigated in the consumer surveys, as follows.
- Fat
- Cholesterol
- Weight control
- Lactose intolerance and allergy
- Cost

3.12.1 Fat

As illustrated in the studies outlined above, consumer attitudes to the fat content of milk appear to be important predictors of consumption. This might be expected since a diet low in fat has been recommended as one way to reduce the risk of chronic disease. Moreover, magazines and advertisements, which are principal sources of information for consumers, link fat to obesity. For this reason consumers' interpretations of the importance of fat intake may differ from scientific evidence.

In the United States there is concern that the focus on overall diet quality is often lost in the national obsession with lowering fat intake (Lichtenstein, Kennedy & Barrier, 1998). However the consumption of dietary fat has shown little change in recent years (Hunter and Applewhite, 1986). A diet low in fat doesn't always mean a diet low in calories. The US draft dietary guidelines propose a diet that is based on sensible food choices; low in saturated fat and cholesterol and moderate in total fat (Johnson and Kennedy, 2000).

There is ample evidence that consumer attitudes predict consumption of high fat foods. The literature suggests more positive attitudes to and higher consumption of high fat foods by men, lower social class and older subjects (Shepherd and Stockley, 1985; 1987; Towler and Shepherd, 1992 and Tuorila, 1987).

Specific fat containing foods appear to elicit unique sets of beliefs. Tuorila and Pangborn (1988) found that milk, cheese, chocolate and ice cream were related to different belief structures, and that none of them was rated similarly to generic 'high fat foods'. The findings suggested that consumers attach different meaning to integrated food entities rather than to ingredients. The symbolism of individual foods is quite distinct.

Although people may be familiar with current guidelines recommending reductions in fat intake, there may be a general failure to recognise what comprises dietary change. In the United Kingdom, results from a survey of attitudes and beliefs towards low fat diets showed that regardless of actual fat intake, the majority of respondents believed that their diets were healthy and were not high in fat (Lloyd, Paisley & Mela, 1993).

The effects of health and nutrition claims on consumer perceptions of fat also appear to be important (Corney, Issanchou & Shepherd, 1996). In surveys with both British and French consumers it was found that label claims were seen to be more important than a collection of single sensory and nutritional attributes. Regression analysis showed that in both groups while enjoyment was of more concern than nutrition, perceived healthiness was still statistically significant. The presence of claims e.g. 'low in fat' appeared to have more impact on British consumers. They rated products with claims as significantly more informative.

In New Zealand, 31% of urban householders believe that dairy products contain too much fat (CM Research, 1998). However, dairy products include cheese and butter, which have a higher fat content than milk. New Zealanders' perceptions of the fat

content of milk are not known. Therefore this will be investigated in the consumer surveys.

3.12.2 Cholesterol

Fat and cholesterol are commonly associated in animal foods. While the current emphasis in nutrition guidelines is on reductions in total and saturated fat intakes, rather than dietary cholesterol, this is still an area of confusion in the public mind. In the past, health education targeted cholesterol in food as something to avoid and this has been taken up by food marketers with 'cholesterol free' products and claims.

A New Zealand survey undertaken in 1991 showed that 83.5% of all respondents (n=753) believed that less cholesterol should be eaten in food to reduce the risk of heart disease (Wiseman, 1991). Avoidance of cholesterol was considered significantly more important by women (85.6%) than men (79.2%).

The New Zealand National Heart Foundation promotes blood cholesterol screening to raise awareness of elevated cholesterol levels as a risk factor for coronary heart disease. As part of the evaluation of the National Heart Foundation's Heart Food Festival in 1988-89, it was found that almost one in eight food shoppers knew their cholesterol levels and a further two thirds wished to know them (Worsley, Worsley & McConnon, 1991). In Canada it has been found that being informed of personal blood cholesterol levels may effect an immediate change in eating habits that translates into reduced intake of dietary fat (Aubin, Godin & Vezina, 1998).

New Zealanders who have been screened for cholesterol and need to make dietary changes may seek to avoid fat and cholesterol containing foods. It is unlikely that many consumers (or general practitioners) are aware that low fat milks contain less than 5mg cholesterol in a 250ml glass and that this level of cholesterol is inconsequential. The National Heart Foundation recommends less than 200mg cholesterol per day for people at risk of heart disease.

Although it has not been clearly established it is likely that some consumers believe milk contains large amounts of cholesterol and therefore avoid its consumption. Therefore, beliefs about cholesterol in milk will be investigated as part of this thesis

3.12.3 Weight control

Women's concerns about weight appear to directly encourage consumption of low fat foods. A study of young Australian women found that most of them diet at some time (Abraham, Mira & Beumont, 1983). This suggests that many women may experience distress about eating and body weight. In a study of 100 American women Tuorila & Pangborn (1988) measured the beliefs, liking for and consumption of milk, cheese, ice cream, chocolate and high fat foods. These foods were selected because of their common use, relatively high fat content, and different but desirable sensory properties. The women reported liking all the foods except the high fat foods. They thought that milk and cheese were "good for you" whereas the remaining items were "bad for you." Liking was the predominant predictor of

reported consumption of all the foods, but beliefs related to concern about weight, also significantly predicted consumption.

Similar findings related to weight concerns were observed in a survey of the consumption of regular and diet soft drinks among American women (Tuorila, Pangborn & Schutz, 1990). Both user groups reported liking for their 'own' soft drinks. Beliefs that differentiated the two types of soft drink were superiority of taste, perceived efficiency to quench thirst and perceived compatibility with other menu items. Users of diet soft drinks were more concerned about weight-related issues than users of regular soft drinks. These findings suggest that the selection of soft drink is not only a choice between two beverages but may reflect a whole set of attitudes towards one's own body.

In a survey among US college men and women, low fat foods were consumed by almost half of the respondents (Alexander and Tepper, 1995). It was found that women used the foods primarily for weight control purposes, whereas men tended to use the foods for a variety of reasons. Only 12% of the men in the study attempted to achieve weight loss whereas, 40% of the women did so. In fact, almost 20% of the men were trying to gain weight. It was also found that women who exhibited moderate or high dietary restraint had a higher body mass index than women low in restraint, but this outcome was not observed in the men.

A study in Northern Ireland found fat phobic attitudes in women were inversely related to intake of fat through a reduced intakes of chips, butter and sausages (Barker, Thompson & McClean, 1995). In contrast, men's fat phobic attitudes were not strongly correlated with fat intake. Consumption of chips and sausages were negatively correlated, but cake/biscuits, buns/pastries and milk consumption was positively associated with fat phobic attitudes. These differences may reflect women's greater knowledge of food composition.

Dietary restraint has been shown to be a key predictor of food choice in a group of US men (Tepper, Choi & Nayga, 1997). The men in this study were recruited from the US (Army) National Guard. They were reservists who participated in military training exercises during one weekend a month. It was found that men with high dietary restraint scores were less likely to consume whole fat dairy foods and eggs, beef and cured meats, fast foods, fats and oils and regular soda than those with low restraint scores. Whole fat dairy foods included whole milk, cheese and ice cream. Restrained eating was found to have a more consistent impact in the regression models on food consumption than other well-known predictors of food choice such as income, age and nutrition knowledge.

This study suggests that restrained eating may be an important determinant of food choice in adult men, particularly among those who are successful at controlling their weight. In terms of milk consumption, researchers often overlook restraint by adult men. Perceptions of the role of milk in weight reduction will be examined in the consumer surveys.

3.12.4 Lactose intolerance and allergies

Many people believe that milk causes digestive problems as a result of lactose intolerance. The role of attitudes and beliefs to lactose intolerance and milk is unknown. Therefore it is important that beliefs about lactose intolerance be examined as part of this thesis.

The production of gastrointestinal symptoms in certain individuals by consumption of lactose-containing foods has been recognised since 1901 and has taken on "a global, historic and anthropological mystique" (Kretchmer, 1971). A review of available data does not establish a clear correlation between lactose malabsorption, lactose intolerance, and milk intolerance (Johnson, Semenya & Buchowski, 1993). The reasons for this includes the subjectiveness of symptoms and the quantity of lactose or milk required to produce symptoms of lactose maldigestion.

Johnson et al (1993) evaluated lactose tolerance in 164 African Americans who claimed intolerance to one cup (240ml) or less of milk. With use of a breath-hydrogen test with 25g lactose as a test dose and the presence or absence of symptoms, 50% of the subjects were classified as lactose maldigesters and intolerant, 8% were maldigesters but tolerant, 15% were digesters but intolerant, and 27% were digesters and tolerant. From the maldigesters and intolerant group 45 subjects were further tested for milk intolerance in a double blind study. The results showed that 67% of the subjects reacted appropriately to the presence or absence of lactose in the milk whereas 33% reported symptoms to both low-lactose milk and milk containing lactose. Therefore, this study showed that the cause of milk intolerance in as many as one third of the subjects who attributed their symptoms to less than a cup of milk was not due to its lactose content.

When lactose is provided in an amount and form that would normally be consumed, most people with lactose malabsorption experience mild or no symptoms of intolerance. Although the degree of lactose malabsorption varies between people, studies have indicated that more than three quarters of lactose malabsorbers can consume a glass of milk (250ml), providing around 12g of lactose, without intolerance (Tin, Hwang & Wu, 1988). Therefore, milk may be unjustly blamed for adverse symptoms.

Milk allergy is a reaction to protein(s) in milk, which involve a response by the immune system. Development of milk allergy depends on heredity, intestinal permeability, immune responsiveness and exposure, such as when excessive quantities of milk are consumed (Wham, 1987).

Reactions to cow's milk are most common in the first two years of life when milk forms the most significant part of any child's diet. The incidence of cow's milk sensitivity is about 1-3% during the first two years of life, representing those children who require medical attention (Bahna, 1978).

Exclusion of milk results in elimination of many nutrients and unnecessary avoidance of milk may pose nutritional hazzards (Wham, 1997). Of the recommended intakes for age (Australian NH&MRC,1989) a two year old obtains approximately 100% calcium, 50% protein, 24% energy and 100% riboflavin from 500ml of cows milk.

In most children, milk allergy resolves by three years of age. Host, Jacobsen & Jalken (1995) found on review that 45% to 65% of children had recovered by one year, 60% to 77% by two years, and 71% to 87% in three years.

In adults, milk allergy is quite rare. However, being "allergic" to milk has become a fashionable problem (Birkbeck, 1999). On the basis of self-diagnosis of vague symptoms often associated with misinformation from the media, it is surmised that many people attempt to eliminate milk from their diet. Among 1050 urban New Zealanders 19% believed allergies to be a problem with eating dairy products (CM Research, 1998). There are no studies of attitudes to lactose intolerance and milk allergy and their influence on milk consumption. Therefore, these will be included in the consumer surveys together with perceptions of other milk characteristics.

3.12.5 Cost

One of the characteristics of food that may determine preference and therefore consumption is cost. This is a very relevant factor for milk. As already described in Chapter 1 the cost of milk has almost doubled in the last ten years. By contrast, the cost of soft drinks halved over the same period of time. This relative change in cost may have created a barrier to milk drinking.

Glanz, Basil & Maibach (1998) investigated the importance of taste, nutrition, cost, and convenience and weight control on personal dietary choices. They found that while taste was the most important influence on food choice, cost was the next most important factor. In a nutrition education intervention programme in Scotland, cost was found to be a barrier to increased fruit and vegetable consumption (Anderson, Cox & McKellar, 1998). In the United States, Elbon et al (1996) showed that participants in a community wellness programme said they would drink more milk if it were less expensive.

Lack of money restricts food choice in families and is a barrier to the improvement of nutrition status in low-income families. In Australia adults in low-income families sometimes go without food in order to stretch the family budget (Crotty, Rutishauser & Cahill, 1992).

In New Zealand, Wilson & Horwath (1996) investigated 500 women's confidence to increase their milk product intake. It was found that the expense of milk products was significantly more important to women from lower socio-economic groups (24%), compared to middle (15%) or upper (12%) socio-economic groups.

Women in lower socio-economic groups indicated that they more frequently noticed that because milk products are often on "special" at the store, it is easier to buy them. High occupational status women more frequently recalled information about

the benefits of milk products and they found the wide range of low fat milks made it easier to include them in their daily food consumption.

These observations are consistent with the findings of McConaghy (1989) who found that people in lower socio-economic groups are more concerned with the cost involved in improving dietary behaviours. Further, the 1991 Life in New Zealand survey showed that of the women who wanted to make a change to their diet, 14% in lower socio-economic groups would do so to save money, compared to only 9% in higher socio-economic groups (Russell and Wilson, 1991).

Socio-economic status has an important influence on food choice and the cost of milk may be a barrier to its consumption. There is no other study that has compared the perceived cost of milk in relation to other attitudes and beliefs. Therefore it is important that this is also included for investigation in the consumer surveys.

3.13 Perceived benefits of milk consumption

As outlined in Chapter 1, milk contains several nutrients that are important for health. Accordingly, milk is promoted as one of the four essential food groups required every day. Consumers' perceptions of a collective group of positive milk attributes have not been examined previously. Therefore I will examine beliefs towards a range of nutrients that are likely to be familiar to consumers.

- Calcium and bone growth
- Goodness (protein, vitamins and minerals)
- Energy
- Iron

3.13.1 Calcium and bones

Communications about calcium, bone health and osteoporosis are widespread in women's magazines, health promotion leaflets and in advertising. In the United States 100% of participants in a community wellness program were aware that calcium is needed for bones and 92% were aware that dairy products are important for healthy bones (Elbon et al, 1996). Although 34% correctly answered that 'there is more calcium in a cup of milk than in a cup of broccoli', 43% of participants were unsure (Elbon et al, 1996).

There is also high awareness about calcium and bone health among New Zealanders. In a survey undertaken for the Dairy Advisory Bureau, 86% of householders (n=550) were aware of osteoporosis (CM Research, 1998). Spontaneous recall of factors that could prevent it included calcium 68%, milk 13%, dairy products 7% and cheese 2%. Most people (82%) were aware that bones and teeth were affected by a low calcium diet.

Sixty one percent of participants expressed concern about the calcium in their diet and 43% reported a change in their food purchasing behaviour because of their concern. Twenty four percent purchased more milk, 17% more low fat milk, 14% more high calcium milk and 11% more calcium tablets (CM Research, 1998).

Householders were also surveyed about their knowledge of the calcium content of food. Spontaneous recall of the best food sources were: milk 74%; cheese 42%; dairy products 42%, fruit and vegetables 20%; yoghurt 20% and fish and meat 12% (CM Research, 1998). These findings suggest that some consumers have the mistaken belief that fruit and vegetables are the best sources of calcium.

Perceptions of milk as a good source of calcium and its role in bone growth are important, as they are key health benefits. Therefore perceptions about calcium in milk and the role of milk in bone growth will be included as part of the attitude studies.

3.13.2 Goodness in milk (protein, vitamins and minerals)

Milk is a unique beverage because it contains a wide range of inherent nutrients including protein, vitamins and minerals. Protein is important for growth and development especially in young children. Beliefs about the 'goodness' in milk have not been examined, especially in relation to other beverages such as fruit juice.

In the United States Elbon et al (1996) showed that most people (98%) believe that dairy foods are rich in many nutrients. Tuorila and Pangborn (1988) found beliefs about nutrients in milk were positively associated with consumption.

CM Research (1998) found that only 7% of New Zealanders (n=1050) perceived that protein, vitamins and minerals were the benefits derived from eating dairy products. Although consumers may be aware that milk contains a wide range of nutrients they may not be perceived to be important.

Therefore, it is important to identify whether milk is perceived to provide "goodness" as this may be positively related to consumption. In addition, I will investigate whether fruit juice, a major competitor, is perceived to contain more "goodness" than milk. Therefore, beliefs about the "goodness" of milk and whether 'fruit juice is better for you than milk' will be examined in the consumer surveys.

3.13.3 Energy

Energy may be regarded as a source of calories (chemical energy) or a source of vigour or liveliness. Standardised milk (3.3% fat) provides 276 kJ (67 cal) per 100ml. Health professionals generally recommend standardised milk for children because it provides an appropriate level of energy (calories) for growth. As a result, caregivers of children may have positive attitudes about the energy content of milk for their children.

Energy may be viewed negatively however by weight conscious people because of its associated calories. Fat provides more calories per unit weight than carbohydrate or protein. Low fat milks have lower energy values.

There is an increasing availability of "energy drinks" e.g. 'Red Bull' which are claimed to provide an "energy boost". Consumers of these products may perceive energy as "providing vigour" or "get-up-and-go".

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There are no studies of consumers' attitudes to energy and milk, or its influence on consumption. Therefore it is important that this be included in the consumer surveys.

3.13.4 Iron

Iron is a nutrient that is commonly featured in the popular press. It is a mineral widely available in meat and meat products and although present in vegetables and cereals it is poorly absorbed from these foods. Milk has a low concentration of iron, and studies in infants show that its absorption is poor (Lonnerdal, 1990).

Iron deficiency is the most prevalent single-nutrient deficiency of the world's population. Infants and toddlers are at greater risk because of their increased needs for growth and limited food choices (Dalman, Siimes & Stekel, 1980). Although the New Zealand diet is usually characterised as containing generous amounts of meat as many as 70% of New Zealand women under 65 years are consuming less than the recommended daily intake of iron in their diets (Ministry of Health, 1999).

Symptoms of iron deficiency include tiredness, loss of appetite and impaired exercise performance. Iron deficiency in children is also associated with abnormalities of behaviour and cognitive function, some of which may improve with the administration of iron (Oski, Honig & Helu, 1983; Walter, Kovalskys & Stekel, 1983; Pollitt, Soemantri & Yunis, 1985).

Since 1995 the New Zealand Beef and Lamb Marketing Bureau has undertaken extensive television advertising to raise awareness about iron in food. CM Research (1998) found that 4% of consumers (n=1050) suggested iron was a nutrient present in dairy products. This perception may have arisen from the television advertising. There are no studies of attitudes to iron in milk. Therefore, this will also be included in the investigation.

Milk is a complex food and contains many nutrients that provide benefits and threats with its consumption. Consumers' perceptions of these aspects of milk have not previously been examined in an integrated study. Therefore the investigation of consumers' attitudes and beliefs will be a "first" for milk.

Aim 1 of this thesis is to investigate consumer attitudes to milk. From a review of the literature a number of broad expectations can be surmised. These expectations are too general to be formalised as hypotheses. However they are likely to influence milk consumption. A summary of these expectations is provided (see box).

There will be a general perception that all milk is high in fat because fat is a dominant negative nutrient found in milk

There will be a perception that milk causes high blood cholesterol because cholesterol is also a dominant negative nutrient linked to fat intake

There will be a negative perception to drinking milk on a weight reducing diet because of perceptions about fat

There will be a negative perception that people with lactose intolerance cannot drink small amounts of milk because of misconceptions about lactose intolerance

There will be negative perceptions about the cost of milk because milk has steadily increased in price

There will be a perception that milk is expensive compared to fizzy drinks

There will be a high awareness that milk is a good source of calcium

A small percentage of consumers will prefer to take calcium supplements than drink milk

There will be a high awareness that milk is important for bone growth

Most people will perceive that milk contains a lot of goodness because of consistent advertising messages

There will be a neutral perception that milk provides energy

There will be a positive perception that milk is a good source of iron because of high awareness about iron generated from meat industry advertising

PART 3: DEMOGRAPHIC INFLUENCES ON MILK ATTITUDES, BELIEFS AND CONSUMPTION

Food choice is not just about attitudes and beliefs. Food behaviours are a product of the environment in which they exist. Most food is consumed as part of family meals. Food behaviour is therefore a product of family lifestyle, values and beliefs. These in turn are shaped by the material and structural resources that are available to the family. There are also structures in society that influence behaviour and actions. The membership of social categories such as gender, age, education, occupational status and ethnicity may influence food selection behaviours and the attitudes and beliefs on which they depend.

3.14 Gender differences in food choice and attitudes

Distinctions between the food preferences of men and women are frequently observed. When food preferences are rated on pleasure (i.e. "tastes good"); health (i.e. "good for me"); and convenience (i.e. "expensive, easy to get") it has been shown that women give higher ratings on each of these variables to healthy meals (Rappoport, Peter & Downey, 1993).

Gender related attitudes toward food are deeply rooted in underlying values and cognitive structures. In so far as the health value of food is concerned, men are considered to have a much simpler cognitive structure than women (Rappoport, Peter & Downey, 1993).

In a survey of adults and college students in Belgium, France, the United States and Japan more women in each of these countries tended to view food as a source of guilt (Rozin, Fischler & Imada, 1998). In particular, women worried more about food, were more concerned about the healthiness of food habits, modification of diet with reduced salt/fat foods and nutritional as opposed to culinary associations with food.

These differences may be derived from concern among Western women about weight, body shape and appearance (Rozin and Fallon, 1988). Indeed, women in all the four countries above felt their current body appearance was heavier than ideal, whereas the men did not (Rozin et al, 1998). A further reason for the gender difference might relate to women's greater concern for nurturance (Worsley, 1987). Women's greater concern, with respect to food, may be related to the fact that in most countries, women bear a disproportionate responsibility for selecting and preparing food (Murcott, 1995).

In a similar vein Tuschl, Laessle & Platte (1990) observed that food choice was associated with dietary restraint in German women. Restrained eaters selected low fat dairy products twice as often, and, full-fat dairy products half as often, as did unrestrained eaters. The dairy foods included yoghurt, milk and cheese.

Gender differences in body weight and health concerns have been observed among Australian teenagers (Nowak and Crawford, 1998). In a survey of 902 high school students (mean age 15 years) the relative importance of health and the role of food

was examined. It was found that girls were mostly concerned about their weight and boys, their fitness. Similarly a British study confirmed that the food choices of many adolescents, particularly those of girls were influenced by their preoccupation with dieting and body weight (Wardle and Beales, 1986). Adolescent girls had stronger health beliefs than boys, and they were more likely to attribute obesity to eating the wrong kinds of food.

Shattuck, White & Kristal (1992) investigated the long-term effects of a low fat dietary intervention on husbands of women who participated in the Women's Health Trial (US). They found that the wife's attitude to fat and fat intake was among the most important predictors of her husband's fat intake. After 12 months intervention, intervention husbands consumed 33% energy from fat (n=188) compared to 37% among control husbands (n=180). This study suggests that women's attitudes to foods such as milk may strongly influence their husbands' consumption.

Wiseman (1994) showed that New Zealand women were more likely than men to believe in the importance of dietary fat reduction to reduce their risk of heart disease. Most respondents (91%) believed that less fat should be eaten to reduce the risk of heart disease (Table 3.3a). Avoidance of cholesterol was considered significantly more important by women than men.

Most respondents (73%) believed that less whole milk should be consumed to reduce the risk of heart disease and this belief was significantly more prevalent in women (79%) than men (63%). Overall only 3% of respondents believed that less trim milk should be consumed (Table 3.3b). The results showed some confusion about the fat content of milk types given that the fat content of whole milk and homogenised milk were similar (Table 3.3c). This study supports the notion that women are more concerned with the reduction of dietary fat intake although, ironically, New Zealand men are at greater risk of heart disease than women are.

Table 3.3a Percentage of respondents who believed that less fat and cholesterol should be eaten to reduce the risk of heart disease

	All respondents	Men N=317	Women N=506
Fat	91	90	91
Cholesterol	84	79	86 *

* Indicates significant difference between men and women

Table 3.3b Percentage of respondents who believed that less whole milk and trim milk should be eaten to reduce the risk of heart disease

	All respondents	Men N=317	Women N=506
Milk, whole	73	63	79 *
Milk, trim	3	4	3

* Indicates significant difference between men and women

Table 3.3c Respondents beliefs about the fat content of different types of milk

	% High in fat	% Low in fat
Whole milk	59	4
Homogenised milk	24	16
Trim milk (0.5% fat)	1	89

Studies, mainly in the UK, have shown that men generally are more likely than women to have conservative food tastes (Wilson, 1989). Working class men were found to be less adventurous with food than middle class men, and were unwilling to try different foods. Women were the main food providers, taking on the role of shopper and cook regardless of socio-economic status. However, working class women were less likely to challenge this stereotype than middle class women.

Calnan and Cant (1987) found that lower occupational status men are less likely to do the shopping compared to middle class men. This suggests that lower occupational status men are probably less aware of the different types of milk available and because they have conservative food tastes, may be less willing to try them. However, these UK influences may not apply to New Zealand.

Despite their food provider role, women do not generally have unrestricted control over the food budget or what foods are to be purchased. Women of all classes tend to defer to the food preferences of others, usually the spouse and the children (Murcott, 1995). Middle class women are more likely to make food purchase decisions on the basis of 'health' and to make changes to what the family eats according to dietary recommendations (Calnan and Williams, 1991 and Steele, Dobson & Alexander, 1991).

When women co-habit with men they are less likely to eat healthily (Worsley, 1988). Therefore it appears that while women may have the responsibility for family food provision and are targeted as change agents of family food patterns, their capacity to alter the family diet may be limited, and the limitations may be greater in less affluent groups. Therefore marital status may be an important influence on milk consumption.

In summary, the literature shows that with respect to food choice, women have more concerns about nutrition and health than men, and have higher pleasure ratings for healthy meals. In particular women appear to be more concerned about avoiding fat and cholesterol in food. Women's attitudes to nutrients such as fat may influence the food choice of their husbands. There appear to be complex interactions between different sociodemographic influences. Although women are usually involved in food purchase and selection they tend to prepare foods that meet the preferences of their husband and children. Such compromise is more pronounced in women of lower socio-economic status. Therefore, the following hypotheses are proposed.

Hypotheses 6-8

Aim 1	To investigate consumer attitudes to milk
Hypothesis 6	Women will have more positive attitudes than men regarding the goodness (nutritional content) of milk.
Hypothesis 7	Women will have more concerns than men about the fat content of milk
Hypothesis 8	Women will have more negative beliefs than men as to whether people with lactose intolerance can drink milk

3.15 Influence of age on food choice and attitudes

In the United States, studies in food cognition have shown that there are significant age differences based on the evaluation dimensions of pleasure, health and convenience (Rappoport, Peters & Downey, 1993). The idea that people commonly employ such criteria to conceptualise their everyday food behaviour is supported in other studies (Betts, 1985 and Rozin & Fallon, 1980).

To investigate the meanings underlying these evaluative criteria (pleasure, health and convenience), Rappoport, Peters & Downey used a free association technique. This technique explored gender and age differences in the meanings of nine familiar foods. Below are three questions that were asked about each food.

1 What is the first thing that comes to mind when you think of...
2 What sort of feelings or emotions do you associate with...
3 What sort of social relationships do you think of in connection with...

Age differences in the responses were found for all nine foods. The free associations of older people (>21 years) indicated they were more likely than younger people (<20 years) to express their positive or negative feelings about food or to make no response at all. Younger people were more likely than older people to associate foods with places/behaviour settings, the media or with persons (Rappoport et al, 1993).

This suggests that there is a structural basis for understanding distinctions between the food preferences of younger and older men and women. Attitudes are deep rooted in underlying value and cognitive structures. This may explain why food habits are so resistant to change through conventional attitude change programmes. The findings are particularly important in the context of milk drinking. They suggest that for younger people, milk needs to be available in places they frequent, such as fast food outlets. The media, and their peers, influence the social acceptability of milk drinking.

Amongst Australian high school students, more than 50% of girls and boys considered food to be very or quite important to reduce the risk of future illness

such as heart disease, high blood pressure and diabetes (Nowak and Crawford, 1998). This indicates an understanding of the long-term importance of good nutrition. However, the students ranked current health and nutrition issues higher than issues related to future health or risk of disease. The older the students were, the less concerned they were about future ill health, and the more concerned they were about looks and energy.

Similar findings have been found amongst adolescents in the UK (Watt, 1997). The main reason adolescents had for reducing sugar or fat intakes was a desire to improve physical appearance through weight loss.

There is evidence that food and nutrition related behaviours established during youth are reflected in adulthood (Hertzler, Wenkam & Standal, 1982). Nutrition knowledge and frequency of milk consumption during adolescence have been shown to be important determinants of milk consumption in American adults (Elbon, Johnson & Fisher, 1998). Participants in this study were aged between 50 to 89 years. In their youth, over 80% of the participants indicated they drank milk one or more times a day and nearly all drank whole fat milk (97%). The frequency of milk intake in later life was significantly correlated with milk consumption during youth.

In another study which investigated nutrition knowledge and attitudes towards high-fat foods and low-fat alternatives in three generations of women, mothers and their adult daughters resembled each other in nutrition knowledge and attitudes (Stafleu, Van Staveren & De Graaf, 1996).

In summary it appears that food outlets, the media and role models have an important influence on the food beliefs of young people. For them, physical appearance appears to be a more important factor than concerns about future health. As milk consumption behaviour may be established during youth and may be reflected in adulthood, appropriate milk advertising, accessibility, and convenience packaging for this age group may be important factors in the promotion of milk consumption among young people. Increases in the nutrition knowledge of young women may have important consequences for the behaviour of their children.

New Zealanders over 30 years of age may have different attitudes to milk as a result of the compulsory milk in schools programme that operated between 1937 to 1967. Qualitative research undertaken in New Zealand (CM Research, 1991) revealed a number of barriers to drinking milk related to individual's age and previous experiences.

The research involved three group discussions with 8-10 respondents primarily responsible for the household shopping, as well as five family group discussions which took part in each family's home. Family groups were segmented according to life-stage ranging from young couples without children to older couples whose children were no longer at home. Several factors inhibited the use of milk including school milk, allergies, other beverage choices (fizzy drinks) and the notion that milk is mainly for children (see box).

School milk

There was a strong and prevalent attitude among respondents aged 30-50 years that the compulsory milk of the 1940's, 1950's and 1960's in New Zealand schools tended to turn some consumers off milk. This attitude is illustrated by the following comment.

"It was awful and you'd sit there at morning tea...that's right playtime and you weren't allowed to go until you had finished your milk.. It was warm in the summer after sitting at the gate all morning and very nearly frozen in the Winter ...I think that's half the reason we don't like milk today"

The recollection of warm school milk by the adult respondents suggests that their childhood experiences may have engendered an element of disgust. Rozin and Fallon (1987) have identified that some individuals may consider foods disgusting because of its social history. It is not known to what extent these feelings of disgust about school milk might persist into adult life.

Health

Many individuals had ambivalent attitudes toward milk. On the one hand, milk was perceived to be a very healthy food and an essential component of a balanced diet. On the other hand, milk was perceived to cause children's allergies, to be fattening and to be implicated with sinus problems and bronchitis. In families with young children the perceived incidence of allergies in children was very high. Most parents of young children reported knowing of several other children with allergies or intolerance to milk.

Other beverage choices

Several teenage boys indicated they drank copious quantities of milk until they turned about 14 years and then their milk consumption dropped significantly, primarily because they discovered beer, but coca cola and other non-alcoholic beverages were also an attraction.

"It's like if you're drinking milk you're not drinking beer. Coke is more of a thirst quencher than milk, like milk is more like a food or breakfast food not a drink or you don't think to drink it really"

The notion that milk is not socially acceptable as an adult drink

The concept of school milk also tended to reinforce the notion that milk is more of a child's drink, and by inference, not an adult drink. Other factors also contributed to the notion that milk is a child's drink including its perceived importance in infancy and early childhood. Adults also drew attention to the notion that milk is not perceived to be a socially acceptable beverage. Adults commonly joked about the notion of offering friends a glass of milk when they visited.

Changing eating patterns

Eating fewer "milk" puddings, white sauces and less home baking using milk were also identified as reasons why less milk was used in the home.

Given the wide age range of subjects who participated in this research, the findings are likely to exhibit both cohort and ageing effects. For example subjects over the age of 30 years would have been part of the cohort of children who were exposed to school milk whereas those less than 30 years were not. Subjects' attitudes were also likely to have been influenced by ageing. For example, subjects who had become parents were likely to have altered perceptions about milk allergies in children.

In general, school milk appears to have generated negative attitudes to milk consumption among respondents aged 30 to 50 years who took part in the scheme. This is a concern because food habits established during youth continue into adulthood. Young New Zealanders (under 30 years old) would not have experienced school milk and are therefore more likely to have positive attitudes to milk during childhood.

A further problem for milk is that younger people have been attracted to the refreshment and associated imagery of fizzy drinks and they are more likely to have positive beliefs about them. In addition, people with families are more likely to be aware of problems with allergies among young children and may have negative perceptions about allergy to milk. Therefore the following hypotheses are proposed.

Hypotheses 9-13

Aim 1: To investigate consumer attitudes to milk	
Hypothesis 9	People under 30 years did not experience the school milk scheme that operated between 1937-1967 and therefore are more likely to have positive attitudes to milk
Hypothesis 10	People over 30 years with young families will tend to perceive that milk causes allergies in a lot of children
Hypothesis 11	People under 30 years will tend to have more positive attitudes to fizzy drinks
Hypothesis 12	People over 30 years will tend to perceive that milk is for toddlers and children
Hypothesis 13	People over 30 years who experienced the school milk scheme will tend to feel more obliged to drink it

3.16 Influence of education on food choice and attitudes

Education is not often measured in studies of consumer attitudes to food and there is a scarcity of studies in the literature. Most studies in this field use other indicators of social class such as occupation.

In Australia, McConaghy (1989) found that 77% of respondents claimed to be making changes to their diet in line with the Australian Dietary Guidelines. Those

with a higher educational level or in a higher occupational group were more likely to be making a greater number of dietary changes than the lower educational and occupational groups. Since one of the dietary guidelines recommends reduced consumption of fat, it is likely that those in higher educational groups may have different attitudes to fat in the diet and in relation to milk intake. Therefore it can be hypothesised that higher education is associated with more concern about the fat content of milk.

Hypothesis 14

Aim 1: To investigate consumer attitudes to milk

Hypothesis 14	Higher education is associated with more concern about the fat content of milk

3.17 Influence of occupational status on food choice and attitudes

Social class refers to the position of an individual or family on a social scale based on criteria such as occupation, education and income (Najman, 1988). Social class differences in health are seen at all ages, with lower socio-economic groups having greater incidence of chronic disease. Risk factors including lack of physical exercise and poor diets are clustered in the lower socio-economic groups (James, Nelson & Ralph, 1997).

Lower socio-economic status may constrain the ability to participate in healthy eating behaviours. Smith, Baghurst & Owen (1995) have shown that factors such as lack of transport, inflexible working hours and a lower likelihood of working close to the city may discourage participation by lower socio-economic groups.

Australian and overseas studies have found that respondents in low socio-economic groups are least likely to purchase foods that meet dietary guidelines recommendations. Researchers have proposed that this consistently observed association is partly due to structural, material and economic factors that differentially affect socio-economic groups (Coveney and Baum,1996).

In Australia, data obtained during a community based study of risk factors for heart disease showed that people in higher occupational groups (and women more than men) exhibited food consumption patterns which were more consistent with current health promotion messages (Steele, Dobson & Alexander, 1991). For example, more of them reported drinking skim or low fat milk, which have lower levels of cholesterol. In addition people in higher status occupational groups consumed more wholemeal bread, fruit and vegetables, and less eggs and sugar in hot drinks or on cereals (Steele, Dobson & Alexander, 1991).

These results are consistent with findings from Finland (Laitinen, Rasanen & Viikari, 1995). A study of the diets of Finnish children showed that children from

lower socio-economic groups were more likely to consume high fat milk and children from higher socio-economic groups were more likely to consume low fat milk. The calcium content of the diets of the two groups of children was not significantly different, which suggests that there was no difference in overall milk consumption.

In the United States, analyses of the NHANES II data for differences in calcium intake found no differences in children aged 3 –18 years of different socio-economic status as assessed by parental income (Eck & Hackett-Renner (1992).

It appears that those with higher occupational status have greater nutritional knowledge about milk and are more likely to consume lower fat products because of concerns about heart disease and cholesterol. Therefore the following hypothesis is proposed.

Hypothesis 15

Aim 1: To investigate consumer attitudes to milk

Hypothesis 15	People of higher occupational status will have negative attitudes to fat and cholesterol in milk

3.18 Influence of ethnicity on food choice and attitudes

There have been many studies of food consumption and ethnicity but for the purposes of this thesis, discussion will be mostly confined to the situation in New Zealand and to milk consumption.

In the United States the high mortality from diet-related diseases among African Americans strongly suggests a need to adopt diets lower in total fat, saturated fat and salt and higher in fibre. However, such changes would be contrary to some traditional African American cultural practices. A focus group study was used to explore cultural aspects of eating patterns among low- and middle-income African Americans recruited from an urban community in Pennsylvania (Airhihenbuwa, Kumanyika & Agurs, 1996). Cultural attitudes about where and with whom food is eaten emerged as being equivalent in importance to attitudes about specific foods.

European New Zealanders' eating practices have developed from a traditional British diet over the past century with a major change between 1950 and 1970 due to influence from the United States and Asia (Bailey and Earle, 1993). New Zealand is a farming nation and early immigrants enjoyed the products of good land and mild conditions, eating meat at every meal and using large amounts of dairy products. As a result it is likely that farming communities within New Zealanders have strong beliefs in the goodness and value of what they produce (meat, milk, cheese) and the importance of these foods in the diet. Suggestions that these foods should be eaten less frequently may be seen as a threat to the livelihood of many families.

A recent study of 5677 workers' eating habits in New Zealand suggested that cultural factors are more important than socio-economic influences (Metcalf, Scragg & Tukuitonga, 1998). The study compared the diets of Maori, Pacific Islands and European people living in New Zealand, who participated in a health screening survey of a local workforce to determine whether nutrient intakes varied between ethnic groups.

The findings showed that ethnic differences in food consumption included greater frequency of consumption and larger portions of most foods among Maori and Pacific Islands participants. However, although Maori participants consumed more milk (cups per month) than Pacific Islands participants, their consumption was less than for European men and women (Metcalf et al, 1998).

Europeans consumed low fat milk in much larger amounts than non-Europeans (Metcalf et al, 1998). There were ethnic differences in the type of milk consumed. Eighty eight percent of Pacific Islands people, 84.7% of Maori and 70.7% of Europeans (p <0.0001) consumed whole or homogenised milk. Low fat milk was favoured by 25.0% of Europeans, 11.4% of Maori and 8.2% of Pacific Islands participants. Approximately 4% of each ethnic group did not consume milk at all.

In nutrient terms the survey found that Maori and Pacific Islands men and women consumed larger amounts of total energy per day, but less carbohydrate, fibre and calcium, and more protein, fat, saturated fat and cholesterol than European men and women.

The 1997 National Nutrition Survey (Ministry of Health, 1999) also showed that there were ethnic differences in the type and amount of milk consumed. More Maori and Pacific Islands people consumed milk as a beverage at least once a week than Europeans and others (43% of Maori men and 41% of Maori women; 40% of both Pacific Islands men and women compared to 36% of European men and 31% of European women).

Among Maori and Pacific Islands people, compared with European and others, regular homogenised milk was more popular and the reverse was true for reduced fat milk. Pacific Islands people were more frequent consumers of hot beverages made with milk, than other ethnic groups (Ministry of Health, 1999).

It is likely that ethnicity has marked effects on both milk consumption and attitudes. Maori and Pacific Islands people consume significantly more regular fat milk than Europeans (Metcalfe et al, 1998; Ministry of Health, 1999). Therefore the following hypotheses are proposed.

Hypotheses 16-17

	Aim 1: To investigate consumer attitudes to milk
Hypothesis 16	Europeans are more likely to have negative attitudes towards the fat content of milk
Hypothesis 17	Maori and Pacific Islands people are more likely to perceive milk as a refreshing drink because they consume more milk than Europeans

In summary, milk consumption behaviour is related to demographic influences such as gender, age, education, occupational status and ethnicity. Therefore it is important that these influences be examined as part of the investigation of consumer attitudes to milk. I will also determine the hierarchy of the relationship between demographic influences and attitudes to milk and milk consumption.

In this chapter I have reviewed the multiplicity of factors related to milk consumption behaviour amongst individuals and as a result of societal structures. Grunert's food-related lifestyle model also allows us to consider one of the most favoured tools of marketing, advertising. In the next chapter I will illustrate how images and perceptions about milk might be changed with effective advertising.

Chapter 4

The Advertising of Milk

In this chapter I am going to decribe the rationale for the advertising of milk by the dairy industry in New Zealand. Firstly, I will discuss how advertising works and provide two examples of effective advertising campaigns. I will then briefly discuss the concept of branding. Next I will overview the advertising of milk in New Zealand and discuss the television advertising campaigns that were undertaken during the study period. Finally, I will discuss how advertising is evaluated by reference to an Information Processing Model for advertising effectiveness. I will also review the relevance of the milk advertising that was undertaken to the target audience.

4.1 Introduction

The problem of declining milk consumption has implications for public health because the inadequate intake of some of the nutrients in milk may increase the risk of disease.

For the New Zealand milk industry the decline in volume of milk sales has reduced profitability. Milk does not have a guaranteed level of consumption and it must compete for its share of purchase with other beverage products. For marketers, increasing milk consumption is important for maximising the market share of branded products. Brand advertising is frequently employed as part of the marketing strategy to increase product sales.

The advertising message is intended to inform and persuade. To be effective, advertising must be appreciated by the target audience, be appropriately branded, communicate something strategically relevant about the brand and must have the desired effect on the audience to encourage repeat purchase.

The Anchor brand has been built on the tradition of the New Zealand heritage and has been used on milk and dairy products for over 100 years. This brand is predominant in the northern region of New Zealand but is largely unknown in the South. With the primary aim of growing milk consumption, a new advertising campaign for Anchor was developed in 1997. The campaign provided the opportunity to investigate consumers' attitudes to milk as well as their perceptions of the advertising campaign. Therefore, this was an opportunistic study and the Anchor advertising campaign was used as a case study.

4.2 How advertising works

Advertising is one of the most important forms of marketing communication. The advertising message is meant to inform and persuade. Informational objectives may be directed toward announcing new products or changes in existing products or providing information on price and availability (Assael, 1987). Persuasive objectives may be directed toward convincing the consumer of product benefits, trying to induce a first time purchase or reducing uncertainty about buying the

product. Advertisers can communicate product benefits through emotional appeals or more directly through rational appeals (Assael, 1987). Advertising can work in several different ways.

A model of the influence of advertising on consumers has been developed for the advertising industry (Prue, 1998). The 'Alphabetical Model' provides a simple schema to evaluate advertising strategies by reducing the elements required for effective advertising to four key issues: **Appreciation**, **Branding**, **Communication** and **Desired effect on the brand** (Figure 4.1).

Figure 4.1   The Alphabetical Model (Prue, 1998)
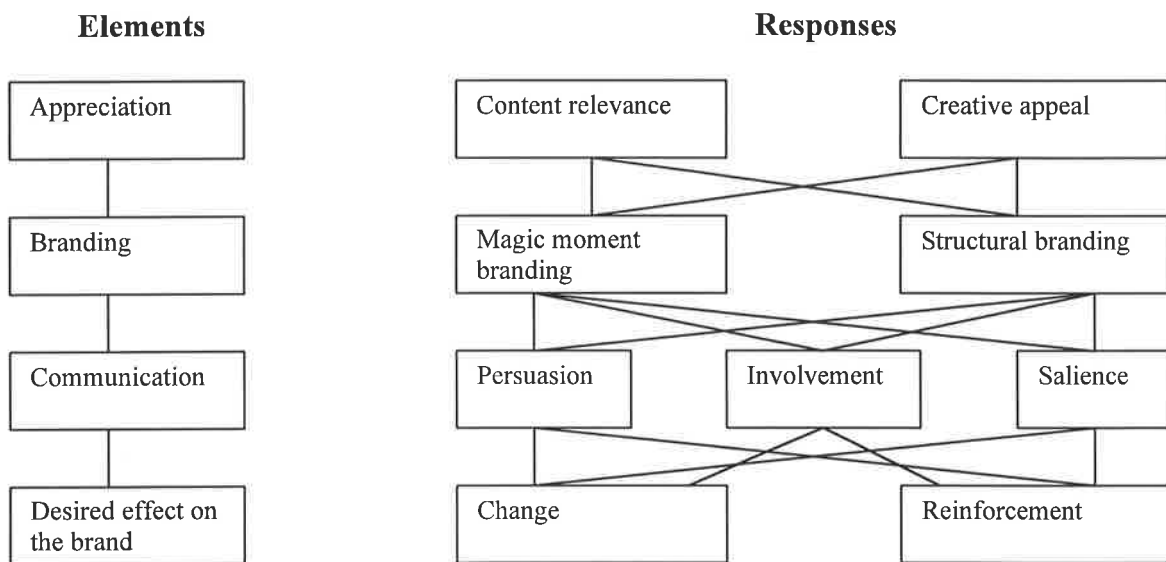
The four elements in the model (**Appreciation**, **Branding**, **Communication** and **Desired effect on the brand**) are not stages that a consumer must pass through but indicate what the advertising itself must achieve. The desired responses to the advertising shown alongside these four elements are interconnected. For example, for the advertising to gain the appreciation of consumers, the content must be relevant and the creative message of the advertising must be appealing.

1 Appreciation
For any advertising to be effective it must be appreciated by its target audience. It must be considered to have sufficient value for it not to be ignored. For a campaign to gain appreciation from its creative message, research will need to show that it is well liked.

2 Branding
The next requirement is that the advertising should be appropriately branded. If a message is interesting and relevant the consumer has more incentive to attend to the brand. Interest is not only generated by what is communicated but how the message is communicated. Both the advertising message and its execution must be of interest to consumers.

3 Communication
The third requirement is that the advertisement should communicate something relevant about the brand by persuading or involving the consumer, or in some way is outstanding or salient to the consumer.

Advertising which communicates by persuasion will present a rational view of the brand with the intention of directly influencing beliefs about its quality, usefulness or suitability. Persuasion usually works by telling consumers something is new which affects the way they think about the brand. The aim is to provide a rational reason for trial purchase which then may or may not lead to a change in attitudes.

Advertising which involves the consumer aims to create an emotional response which will tranfer to the brand. This type of advertising communication is more subtle.

"Salient advertising" aims to be strikingly different and make a big impact on its target group. For example, in 1994 Benetton caused controversy with a campaign showing the blood stained uniform of a soldier killed in Bosnia. The fame or notoriety associated with salient advertising has the effect of making the brand seem bigger and more significant. The model places no restriction on precisely what may be regarded as a 'desired' effect on the brand.

4 Desired effect on the brand
Finally, the advertising must have the desired effect on the sales of the brand. Advertising creates a specific expectation that a brand will provide an experience. If the consumer purchases the brand, then they will form specific beliefs about the brand. Subsequent advertising can reinforce the behaviour, to build brand loyalty.

Advertising is a process of bringing about change in cognition, attitudes and behaviours (Pollay, 1986). Studies have found that positive attitudes towards an advertisement are likely to increase attention directed to the advertisement. It has been found that positive feelings about a television advertisement increase the viewing time of the advertisement, and by implication, increase attention to and comprehension of the advertisement (Olney, Holbrook & Batra, 1991).

Most studies have found that when consumers have a positive attitude toward an advertisement, they are more likely to have a positive attitude toward the advertised brand (Gardner, 1985). These findings suggest the desirability of creating a positive mood or feeling so that a positive attitude toward the advertisement will carry over to the brand (Mitchell & Olsen, 1981).

Advertising also communicates cultural values. Rokeach (1968) defined cultural values as beliefs that a general state of existence is personally and socially worth striving for. Striving for success because of a desire for achievement is an example of a cultural value. Family and society from birth may have instilled an individual with this value, and, as a result much day-to-day behaviour may be directed to personal success. When applications of cultural values are relevant to marketing strategy, advertising should appeal to existing values. If advertising attempts to change cultural values it is doomed to fail (Assael, 1987). For example, attempts to reverse downward trends for categories like men's hats were doomed to failure

because they attempted to reverse changes in cultural values. If cultural values result in an upward demand trend however, advertising can contribute to this trend by creating product awareness. The introduction of diet products, for example, conformed to the value placed on slimness and youth. In this case, advertising was reinforcing a cultural trend.

4.3 Effective advertising

Example 1: The Australian sugar campaign
(Advertising Federation of Australia, 1990)

The Australian sugar industry was experiencing similar difficulties to the milk industry in the early 1980's where after 80 years of stability, per capita consumption was rapidly declining. In an environment of mounting awareness and concern about diet and health, sugar was being subjected to a heavy barrage of criticism. Research was undertaken to explore the relationship between attitudes toward sugar and sugar consumption patterns. The research findings provided a basis for developing a five year programme to re-position sugar.

The objectives were to change the negative attitudes held about sugar among consumers as well as health professionals, government, politicians and the media and to halt the decline in per capita sales, by improving attitudes and changing behaviour.

As part of a well defined strategy, five television advertisements were produced based on five key communication points uncovered from the research. The advertisements conveyed that sugar is a simply processed and natural food, that sugar provides natural energy, that it has a role in a balanced diet and that sugar is an important national industry.

The television advertising was supported by five, full page advertisments in women's magazines. Other marketing activities included seminars for health professionals, publication of "Sugar Abstracts" providing communications to doctors, pharmacists and nutritionists, as well as a public relations campaign to counter misconceptions and the development of information kits for government officials.

As the campaign took hold and marketplace conditions changed, strategies were continually refined and evolved for maximum effectiveness. At the end of the five year programme the original objectives had been achieved. By 1984, twice as many people felt positive towards sugar, compared to those who had negative attitudes. This peaked in 1987, with a ratio of 6:1 positive to negative. Changes in attitudes preceeded changes in behaviour (consumption) with a lag of 12 to 18 months.

By 1988 the decline in per capita consumption was not just halted but actually reversed, returning to the position it held just prior to the start of the advertising campaign. In view of the success of the campaign, the objectives were revised and a

dual strategy of emotional advertising conveying a more relaxed attitude to sweet foods and drinks, underpinned with more factual 'issues' based advertising, was employed.

In 1990, the tracking of consumer attitudes showed continued improvement in likely increased consumption.The advertising over this time had also proved to be cost effective. The return on investment increased from a ratio of 2:1 in the first year, to a cumulative ratio of 9:1 by 1990.

The Australian sugar industry campaign illustrates that advertising can work. With clearly defined objectives, carefully developed strategies and consistency over time, advertising proved to be a powerful and cost effective tool. The campaign provides evidence that purchasing behaviour for a generic food such as sugar can be altered. It also suggests that advertising can work for milk.

Example 2: The British Diabetic Association campaign
(Advertising Effectiveness Awards, 1994)

In 1980, the Advertising Effectiveness Awards were established by the Institute of Practitioners in Advertising (IPA) in the UK. These biennial competitions provide an opportunity for advertisers to demonstrate that advertising can be proved to work using measurable criteria. In 1994 the British Diabetic Association was an award winner for an advertising campaign that increased awareness of diabetes symptoms. In order to reach potential diabetics, their family and friends, the target audience for the campaign was the adult population.

The advertising strategy was to make the target audience aware of the symptoms of diabetes and the possible diagnosis. The tone of voice was optimistic. It was the advertiser's contention that traditional public health awareness campaigns tended by their very nature either to be frightening or condescending. The advertisers considered that given diabetes was nobody's fault they had an immediate factual advantage in terms of people not having to give something up or change their habits. Action could be taken if you had diabetes and the condition was controllable.

Throughout the creative development, the advertisers had to ensure that they did not alienate the million existing people with diabetes. The media objectives were to maximise coverage of all adults and to limit media exposure to within two test towns so that monitoring could be more effective. The media choices were posters and newspaper advertising because they provided the best possible coverage of all adults living in the two test towns at a cost level that could be replicated on a national basis.

The research programme involved 500 street interviews in each location at both pre and post stages. The sample was representative of the adult population in each location. The results showed the level of ignorance of any symptom was substantially reduced. Lack of knowledge of any symptoms of diabetes was shown to have decreased from 55% in the pre stage to 39% in the post stage. The campaign

was particularly successful in increasing awareness of two of the major symptoms of diabetes (i.e. increased thirst and tiredness) and the level of unprompted awareness quadrupled over the campaign period.

During the 10 weeks before and during advertising, 43 general practices monitored the number of their patients who specifically requested tests to exclude diabetes. Compared with the pre-advertising phase there was a 71% increase in such presentations during the advertising phase (99 vs 58). The numbers of new patients with non-insulin dependent diabetes increased by 70% (17 vs 10). The test campaign proved that it was possible to educate the public and increase their knowledge of the symptoms of diabetes. The results of this small-scale test led to funding to extend the campaign nationally.

The diabetes campaign is relevant to this thesis because the target market was all adults together with general practitioners who had an important supporting role. Similarly, in a media campaign which aims to increase milk consumption it is important that general practitioners are supportive of the campaign message. General practitioners are one of the main influences on consumers and they can provide positive guidance to their patients with regard to milk drinking and health.

For this reason a media strategy for the milk advertising campaign described in this thesis was devised to reach general practitioners, to educate them about the health implications of declining milk consumption and to enlist their help in removing some of the barriers that prevent people from drinking milk. Therefore, a further aim for this thesis was to investigate general practitioner's attitudes to milk. As key influences and decision makers on health and related issues, the opinions of general practitioners are likely to impact on the attitudes of consumers.

Aim 4.   **To investigate general practitioners' attitudes to milk**

4.4 Branding

Advertising generally is linked to the promotion of brands. A brand is a name, symbol or design, which is intended to identify goods and services and to differentiate them from those of competitors (Kotler and Armstrong, 1990). The brand is a means of recognition. Brands provide consumers with instant information about product benefits.

The function of the brand in distinguishing the goods of one producer from those of another provides the consumer with freedom of choice. The relationship between a brand and a consumer is in many ways a 'pact'. The consumer recognises that the benefits gained when purchasing a brand are both tangible and intangible and rightly expects the brand owner to deliver value in both these areas. The consumer

will also expect that the intangible emotional benefits they are buying will be maintained. Satisfaction with a brand based on past experience may result in purchasing by habit. In this way brands provide a way of simplifying decision making by reducing the need for information search and evaluation of brand alternatives (Kotler and Armstrong, 1990).

In order for the consumer to identify brands with their respective manufacturers, the brands are sold with distinctive features supplied by the manufacturer. Components of brand identity can be tangible such as a brand name, logo, symbol, colour, packaging or a slogan; or intangible such as character or imagery created by the brand (Zaichowsky, 1995).

Consumers often assume that a familiar brand is probably reliable since it is in business for the long term and is of reasonable quality. Raised brand awareness increases the likelihood that the brand will receive serious consideration for purchase (Baker, Hutchinson & Moore, 1996). It has been shown that some consumers adopt a decision rule to buy only familiar, well-established brands (Jacoby, Syzabillo & Bustato-Sach, 1977).

4.4.1 The Anchor brand

The Anchor brand is one of New Zealand's largest earners of foreign currency. The brand is owned and operated by the New Zealand Dairy Group (NZDG) within New Zealand and by the New Zealand Dairy Board (NZDB) in export markets.

Henry Reynolds, a Cornishman who immigrated to New Zealand to take up dairy farming, first used the Anchor symbol as a brand for butter in 1886. He later built a butter factory in the Waikato province. Reynolds provided the vision for pioneer farmers to share their products with the rest of the world. Early distributors of Anchor butter and cheese in the United Kingdom wrote:

> *"We do not think there is any finer quality butter or cheese produced in the world than that which New Zealand produces. The great advantage that New Zealand possess over all other butter and cheese that we handle is that the texture and quality are far superior to any of them. There is more stamina in New Zealand products"(Anchor 100 Years, 1986).*

Shipped on refrigerated vessels, Anchor food products soon became known as the benchmark for quality. Customers were found in Europe, Great Britain, the United States of America, Canada, Central and South East Asia and Australia.

Within New Zealand, the Anchor brand has been used on butter, cheese, powdered milk, UHT and fresh milk. Built on the tradition of the New Zealand heritage Anchor has become a household name. The Anchor brand is dominant in the Auckland province (upper half of the North Island), mainly due to its historic position as a result of regulated markets. Its presence within this region and the market leadership of Anchor fresh milk give the brand strong visibility. The Anchor brand is identified across all product categories by the logo illustrated in Figure 4.3. The logo provides a distinctive and consistent feature for the brand.

Figure 4.2 The Anchor brand logo

4.5 Milk advertising in New Zealand

A number of issues have affected the advertising of milk in New Zealand. Prior to deregulation of the milk industry milk processors were not free to sell their product outside their own area, therefore milk was largely unbranded. Since deregulation, processors have been able to sell their product anywhere in the country. As a result the number of brands has increased and supermarkets have created their own housebrands. Consumers now have access to more brands and product types. Trade customers and retailers can now restrict access of brands to their channel and dictate pricing strategies.

A further issue for the advertising of milk in New Zealand is the relative media expenditure on other beverages. During 1998, the media expenditure on beverages such as soft drinks, fruit drinks and juices, energy drinks and water was $35.4 million (AC Nielsen, 1998). The expenditure on beverages had increased by 39% from the previous year. This increase was largely due to increased expenditure by the Coca-Cola group, the juice category and the Energy drink category.

For all milk brands, the media expenditure for 1998 was $5.2 million (AC Nielsen, 1998) an increase of 15% from the previous year. (Figure 4.4).

Figure 4.3 Media expenditure on milk versus cold beverages, 1997-1998
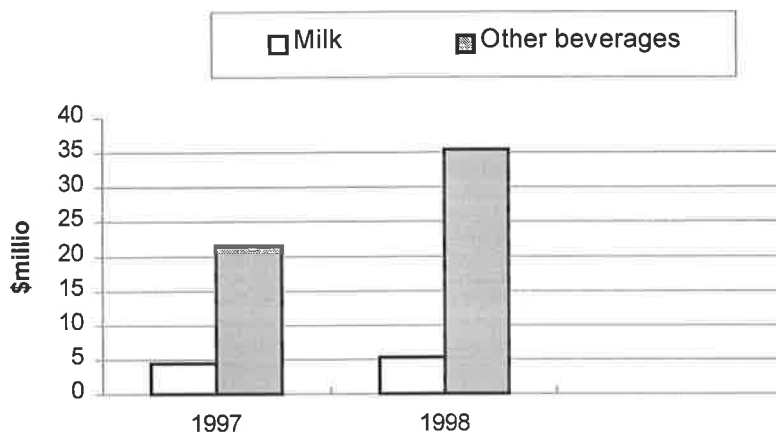
As a result of the recently deregulated market the volume share of milk in New Zealand is very regionalised (Figure 4.5). Anchor is the strongest brand in the New Zealand market with 48.5% total share and 78% share in the upper North Island. Tararua is the second leading national brand with 30% total share and 86% share in the lower North Island. In the South Island, the Meadow Fresh brand of milk is market leader with 66% share and 14.5% total share. Meadow Fresh has a strong homegate base and the advertising for Meadow Fresh is very regionalised. As a result, the brand would be unknown to consumers in the study sample and therefore it was excluded for the purposes of this study. Other regionalised milk brands with very small market shares were also excluded.

Figure 4.4 Milk brand share by volume by region
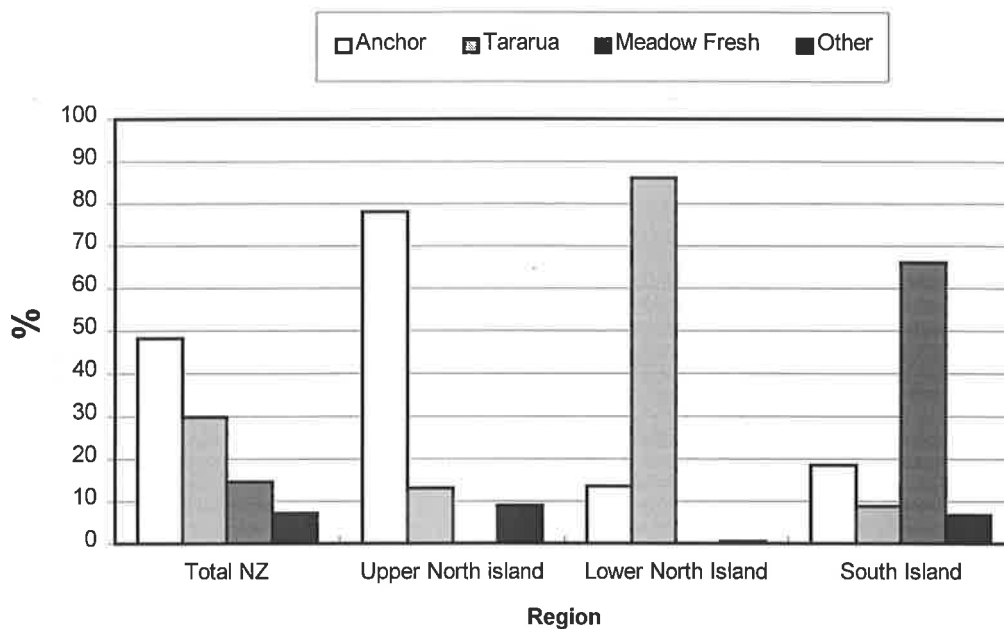
The majority of the New Zealand advertising for milk that took place during the study period (October 1997 to October 1998) was undertaken by marketers of the Anchor brand, the Tararua brand and the Dairy Advisory Bureau who are responsible for generic advertising of milk throughout New Zealand. The thesis study will evaluate each of these advertisements.

4.5.1 Anchor milk advertising

Prior to 1997, the major marketing support for the Anchor brand had involved television advertising of the "Anchor family". The advertisement focused on a family in crisis and became an advertising icon but it was not driving milk sales upwards.

The new advertising campaign was based on research that identified milk to be among the healthiest of beverages, that indicated consumption drops off sharply in the teenage years, that it has a negative fat perception and that the product is seen as

childish and unexciting. A new product positioning was required. The positioning strategy needed to communicate that 'today's' milk can help you become attractive, fun and dynamic and that milk has the nutrition your body needs to look and feel terrific. The position statement *"Life. Milk It. Anchor"* was created.

Michael Jones, a Samoan All Black rugby player, was chosen to personify the Anchor values in the advertising executions. Michael Jones is a household name in New Zealand. He is regarded as a world class athlete, highly regarded by the Samoan community and is well renowned for his dedication and commitment to healthy living. Michael Jones also represented someone who is famous for getting as much out of life as possible.

While this is so, the choice of the role model was unusual in terms of the target audience who had been identified as mothers or female household shoppers. In my opinion there were a number of assumptions made that were inconsistent with the values of the target audience.

There appears to be the assumption that women within this target segment will identify with the rugby culture and a Samoan sports hero. It also assumes that New Zealand women live their lives through men and rugby. While this may be true for some women, I believe that it may also have the effect of alienating others. Grunert et al (1993) have proposed that consumer values are linked to food selection behaviour. It would seem prudent that the target audience have the same cultural values as portrayed in the advertisement.

The objectives for this campaign were to demonstrate the health benefits of milk focusing on its low fat and high calcium contents, and to position milk as a modern product that can compete with other beverages. These objectives suggest that it is important for the campaign to be of interest to household shoppers who are mainly women. It is therefore ironical that the campaign chose to use a rugby player and ran the risk of alienating this target segment.

The campaign was launched on 7 November 1997. Executions included a 45-second and three 15 second television commercials, magazine advertising and billboards. The 45-second television commercial was set on a rugby field. It depicted a child's life from 8 to 35 years, via a run the length of a football pitch. The commercial features Michael Jones drinking Anchor Blue Top (regular) milk. The voice over reads:

"As you go through life, you're gonna hit barriers. The test of a person is how they deal with them. What keeps me going is what I get from on high, hard work, a balanced lifestyle and Anchor milk". The script reads: *"Keep up with the Jones's, drink up 2 glasses a day. Life. Milk it. Anchor."*

The 15-second commercials also feature Michael Jones in three different settings. The first is set on a rugby playing field, where a group of children are tackling Michael Jones. The voice over reads: *"When things are getting on top of me, I take two of these".* (Anchor Blue Top milk).

The second commercial is set on the back lawn of a house where Michael is playing rugby with a young boy. The voice over reads: *"You know just two glasses of Anchor milk helps provide the calcium, energy and protein essential for growing kids. No matter how old the kid is".* (Commercial features Anchor Blue Top milk).

The third commercial is set on a rugby field. A young woman is yelling from the sideline. The voice over reads: *"Every young athlete knows there's nothing more important than a strong and energetic coach. Two glasses of Super Trim provides all the essential calcium. And with just 0.1% fat".* (Commercial features Anchor SuperTrim milk).

In addition to the television advertising, poster size leaflets featuring Michael Jones and a simple health message were inserted into women's magazines. To ensure health professional support for the nutrition messages appearing on packaging and advertising, a campaign was devised to direct communication to general practitioners and practice nurses through print advertising (Appendix 4.1).

To support both the consumer and health professional campaigns a web site (www. Anchor.co.nz) was established. The web-site address was provided on billboards and consumer leaflets.

4.5.2 Tararua milk advertising

Kiwi Dairies, located in the lower North Island, market milk under the Tararua brand and have dominant market share in the lower North Island region. Over the

twelve months to August 1997, the Tararua brand of fresh milk had grown 21% by volume in the North Island (AC Nielsen, 1997). This growth is a reflection of Tararua's strategy to move aggressively into other regions.

During the study period promotional activity undertaken by Tararua included a new product positioning, a new logo, new packaging, two new television commercials and print advertising. Reflecting the values of the Tararua brand the new positioning statement *"Tararua – Goodness for your world"* was created. This was accompanied by a more graphically flowing new logo and modernised milk packaging.

The new television advertising for Tararua commenced in October 1997, just one month earlier than the Anchor campaign. The advertising consisted of a 60-second and a 30-second commercial. The first commercial is set at a rugby test match where a player is getting ready to convert a try. The voice over is of the rugby commentator:

"Well it's 26 all and time is up on the clock, MacKinnon to convert after scoring that brilliant try has this kick that could win the game. He certainly made a sensational impact in his first year as an international player. He scored all the points in every game in the entire series. It's no wonder the experts are calling him the best international player ever. You can hear the chants. This man is a perfectionist. Well, here's that characteristic taking off of the boot. No one did that before MacKinnon and now everyone's doing it. Hang on what's this? There's someone on the pitch. It's MacKinnon's Mum. Yes, it's Mrs MacKinnon and she's carrying milk".

The film reverts to a woman carrying milk and biscuits on a tray across the back yard towards her son kicking a ball. Voice over of woman: *"How's the game going then?"*
Voice over of young boy: *"I think we're going to win this one Mum."* Meanwhile the commentator's voice over begins again: *"The crowd will tell you...."* The script reads: *Tararua. Goodness for your world.*

The second commercial is set inside a military submarine. The conversation proceeds between two sailors as follows: *"Up periscope. Ah yes" (a ship is spotted on the horizon). There you are my pretty baby". "I'll take control". "No, I've got control". "Look, I'm the boss here." "But you steered last time". "Alright, but I get to fire the torpedoes". "OK". "Right, now for your wake up call. Oh, I'll cancel that, the supplies have arrived."* The camera focuses on a woman carrying a tray of milk and biscuits across a lawn to where two boys are playing in a make believe submarine made of wooden boxes. *"Come on boys, its morning tea time. Who wants a drink?"* The boys drink the milk. *"I thought it was time you refuelled".* The script reads: *Tararua, Goodness for your world.*

As with Anchor, the Tararua advertising focuses on a narrow market segment and assumes that the target audience identifies with the cultural values portrayed in the advertising. The masculine rugby culture is again paramount. In these advertisements the woman is depicted in a meek, subordinate role whereas the imagery of the men is very macho.

One point of view is that the advertising may be considered to be patriarchal. It seems extraordinary that the two leading milk brands would risk alienating some of their target market by choosing to ignore the inherent values held by some people within our society. It also raises many questions about the culture of the milk industry that have already been discussed in Chapter 2.

The magazine advertising for Tararua portrayed several different concepts. 'Tararua Teeth' portrayed a young child with just two front teeth. The type reads *"Strong teeth, strong bones, strong bodies, mums know that kids need milk. When your children have outgrown breastmilk and formula, then it's time for Tararua to provide the essential amino acids and nutrients their young bodies need to grow. Keep smiles on your kid's faces, put Tararua in their diet. Tararua, Goodness for your world."*

A second advertisement featured a young girl wearing a Tararua milk moustache. The advertisment type read: "Kids love milk. Your kids need milk. Milk is an essential part of your family's diet. Tararua milk provides the *calcium* necessary for kids to grow and maintain healthy teeth and good *strong bones*. You know there's miles of smiles in every glass of Tararua. Tararua, Goodness for your world."

These advertisements reflect more traditional values. The focus on health and nurturance is in sharp contrast with the masculine imagery portrayed in the television advertising.

Magazine advertising for milk over the study period by rate-card cost was highest for the Tararua brand. Full-page colour advertisements of Tararua milk were placed in three women's magazines and in one trade magazine. The advertisements were inserted between the months of October 1997 and April 1998 (Appendix 4.2).

4.5.3 Dairy Goodness Advertising

The Dairy Advisory Bureau is responsible for the generic advertising of dairy products on behalf of the New Zealand dairy industry. By marketing nutrition

benefits of milk and by countering nutrition misconceptions the Dairy Advisory Bureau aims to enhance milk consumption. As part of the marketing strategy, activities are targeted to consumers at all life stages and to key influencers such as general practitioners, teachers, parents, coaches and community health workers. The position statement used by the Dairy Advisory Bureau is *"Thank Goodness for Dairy"*.

During the study period two 30 second television commercials primarily targeting women 18 to 44 years were featured. The first featured the imagery of a "bone woman." The objective for this advertisement was to convey that milk is the best source of calcium for strong bones and to counter misconceptions about the fat content of milk. In the advertisement the image of a bone is transposed into a nude women elegantly posing for an artist. The voice over reads: " *You probably already knew that because milk is high in calcium, it's good for your bones. But what may surprise you is that because it contains less than 3.3% fat, ordinary everyday milk is also good for your body"*. The camera focuses on a woman drinking a glass of milk. The script reads: *Thank Goodness for Dairy. Homogenised milk contains only 3.3% fat.*

The second commercial focuses on milk as a *low fat* product. It is set in an elegant restaurant. Two women are sitting at a table gossiping. On the background wall of the restaurant hangs the portrait of the nude woman. This and the distinctive operatic music provide a strong connection between the two commercials. The voice over begins: *"Have you ever been the victim of vile gossip or had malicious rumours spread about you? We have. But people still won't believe that everyday milk has only 3.3% fat."* The camera then focuses on a jug on milk centred on a table of fresh fruit. The script reads: *Thank Goodness for dairy. Homogenised milk contains only 3.3% fat.*

These advertisements very positively strengthen the perceived link between milk, calcium and strong bones but in my opinion mislead the consumer with the message that homogenised milk is low in fat. Although homogenised milk is consumed more often than low fat milk, two (250ml) glasses provides 16.5g of fat. For women who might typically consume a 1500-calorie diet the recommended fat intake is 55g (30% of total energy). In effect, the two glasses of homogenised milk provide almost a third of the recommended daily fat intake. Furthermore, 67% of the fat in milk is saturated fat. Drinking two glasses of homogenised milk a day almost reaches the maximum recommended saturated fat intake.

The message that 'homogenised milk only contains 3.3% fat' conflicts with the Anchor advertising that SuperTrim milk provides 'all the essential calcium with just 0.1% fat'. My concern is that the different fat percentages in these messages may increase consumer confusion.

To reinforce messages in the Dairy Goodness television advertising, advertorials were placed in women's magazines. These consisted of a double page spread featuring information about bone health, the calcium and fat content of dairy products and a coupon to redeem free information booklets (Appendix 4.3).

4.5.4 So Good advertising

The soy market in New Zealand has experienced rapid growth in New Zealand in the last few years, growing 115% in volume since 1992 (AC Neilsen, 1998). Nevertheless soymilk has only 3.4% of fresh milk sales in supermarkets and only 43% of fresh milk is sold in supermarkets compared to 95% of soymilk. Sanitarium So Good dominates the soymilk market with 57% share (AC Neilsen, 1998) and is the only soymilk advertised on television.

During the study period a 15 second television advertisement for So Good was featured during the months of November 1997 and January 1998. So Good's main proposition was " So Good lowers cholesterol when replacing with whole cow's milk".

The advertisement featured a woman or a man drinking So Good through a straw. In the first frame of the advertisement there is a voice over and words on the screen. *"There's a simple way to lower cholesterol"*. Words only. *Replace whole milk with 500ml of So Good everyday as part of a healthy diet.* Frame two. Voice and words. *"You can do it in just 15 seconds per day"*. Words only. *Replace whole milk with 500 ml So Good everyday as part of a healthy diet.* Frame three. Picture of woman drinking through a straw. Voice over. *"But some people like to take a little longer"*. Frame four. Picture of So Good. Voice over. *"So Good blended from ingredients shown to lower cholesterol"*. Words. *Proceedings of Soy Seminar, 1996; New England Journal of Medicine, August 1995.*

The advertising was based on Sanitarium sponsored research undertaken in Australia among 40 mildly hyper-cholesterolaemic men. The research claimed to show that replacing a litre of whole cow's milk with So Good had a cholesterol lowering effect.

In my opinion the advertising was misleading because it was based on research which used whole cows milk with a higher fat content than homogenised milk (3.5% versus 3.3% fat) or So Good (3.2% fat). The cholesterol lowering effect was observed when subjects consumed 1000ml of So Good or whole cows milk. It is unlikely that the majority of consumers would consume such a large volume of milk.

So Good magazine advertising focused on benefits for the heart (reducing cholesterol) for the bones (providing calcium without saturated fats) and for digestion (for people with lactose intolerance). Sanitarium actively position the company with expertise in nutrition by providing informational pamphlets to general practitioners and their patients about cholesterol lowering and heart disease. The informational pamphlets provide a free phone to call the Sanitarium dietitian.

Sanitarium's target market is teenage girls and women aged 16 to 30 years (Retail Today, July 1998). Sanitarium claim that men and women in their mid 40s switch to soymilk because of concerns about cholesterol.

4.5.5 Milk advertising to General Practitioners

The Dairy Advisory Bureau operated a support programme for health professionals during the study period. This consisted of sponsorship for nutrition meetings and conferences, distribution of nutrition publications and a quarterly newsletter to raise awareness and understanding about milk and health.

As an adjunct to the television advertising featuring rugby player Michael Jones, Anchor undertook a print media campaign to communicate the benefits of milk to the medical profession. Double page advertisements featured in a range of publications read by general practitioners and practice nurses. The publications selected for the period October 1997 to March 1998 are shown in Table 4.1.

Table 4.1 Publications selected to reach the medical profession

Publication	Frequency	Circulation	Number of advertisements
GP Weekly	Weekly	4500	6
NZ Doctor	Weekly	4367	3
Healthwise	Bimonthly	40,000	2
Kaitiaki (Nursing NZ)	Monthly	21,000	2
Primary Healthcare NZ	Monthly	4,500	1

The advertisement aimed to enlist the help of the medical profession to increase milk consumption. The advertisement featured a photograph of Michael Jones on one page with the wording: "THIS MAN NEEDS YOUR HELP TO ACHIEVE A GOAL".

The copy on the second page read as follows:

"We have an opportunity to strengthen a whole generation of New Zealanders. We really do.
It's a fact that New Zealanders aren't getting enough calcium.
Over the last fifteen years, our milk consumption has fallen consistently every year. Down to levels where most 13 and 14 year olds are getting no more than 70% of their recommended daily intake.
Calcium (and in its richest form, milk) is not simply good for kids, as you know, it's essential. Michael Jones is our milkman with a mission. He's the focus of a new million-dollar campaign to ensure each person in New Zealand has their quota of calcium. But he can only do so much. We can talk about the benefits of milk till the cows come home. But we can't tackle this and win without your help. Together, we need to lay to rest a number of milk myths.

Milk Myth #1: Milk is fattening.
Anchor Lite Blue is 98.5% fat free, CalciXtra and SuperTrim are both 99.9% fat free. Not very fat, we think you'll agree. An apple contains more fat than two glasses of Super Trim.

Milk Myth #2: Calcium is readily available from other foods.
Milk is still the most accessible, digestible and palatable source of calcium for all age groups. No other single food is as complete.

Milk Myth #3: Milk is just for kids.
Adults need milk too. For calcium and other essential nutrients like protein, zinc riboflavin and vitamin B_{12}. We've poured the latest findings about milk into a leaflet that we feel will go a long way to re-establishing the goodness of milk. If you're in the Auckland region, supplies of this free brochure will be sent to you soon. Other regions are welcome to call 0800 ANCHOR for prompt delivery. Our website, www.anchor.co.nz is a rich source of milk information, too. With your backing, ultimately, Michael can help us to convert a generation of New Zealanders.
Life. Milk it. Anchor

Leaflets (Very Smart Drink Guide) outlining the benefits of the Anchor milk variants for various age groups and addressing milk myths were distributed to general practitioner clinics in the upper North Island. A free phone number was provided so that more copies of the leaflet could be ordered. The leaflet also invited consumers to free-phone Anchor for further information and to visit the Anchor web site.

The leaflet proved to be very popular and after several reprints a company was contracted to refill the leaflet holders in general practitioner clinics as required. Researchers at Otago University investigating the calcium status of young boys requested copies of the leaflet to entice milk drinking amongst their study group. It was felt that the presence of rugby player Michael Jones on the cover of the leaflet was more enticing than alternative educational leaflets available.

4.6 Evaluation of the milk advertising

Earlier in this chapter a model for consumer-based understanding of how advertising influences people (Prue, 1998) was discussed. For any advertising to be effective it must be appreciated by its target audience and well liked, it should be appropriately branded, It should communicate something strategically relevant about the brand and finally the advertising must have the desired effect on the brand.

There are several ways for the marketer to obtain feedback to evaluate the effectiveness of the marketing communication. Assael (1992) has devised an Information Processing Model for advertising effectiveness (Figure 4.5).

Figure 4.5 An Information Processing Model for advertising effectiveness

EFFECTIVENESS TESTS	STEPS IN PERSUASION PROCESS
Circulation Reach	EXPOSURE
Viewer Recognition	ATTENTION
Recall	COMPREHENSION
Brand Attitudes, Purchase Intent	MESSAGE ACCEPTANCE
Recall over time	RETENTION
	PURCHASE BEHAVIOUR
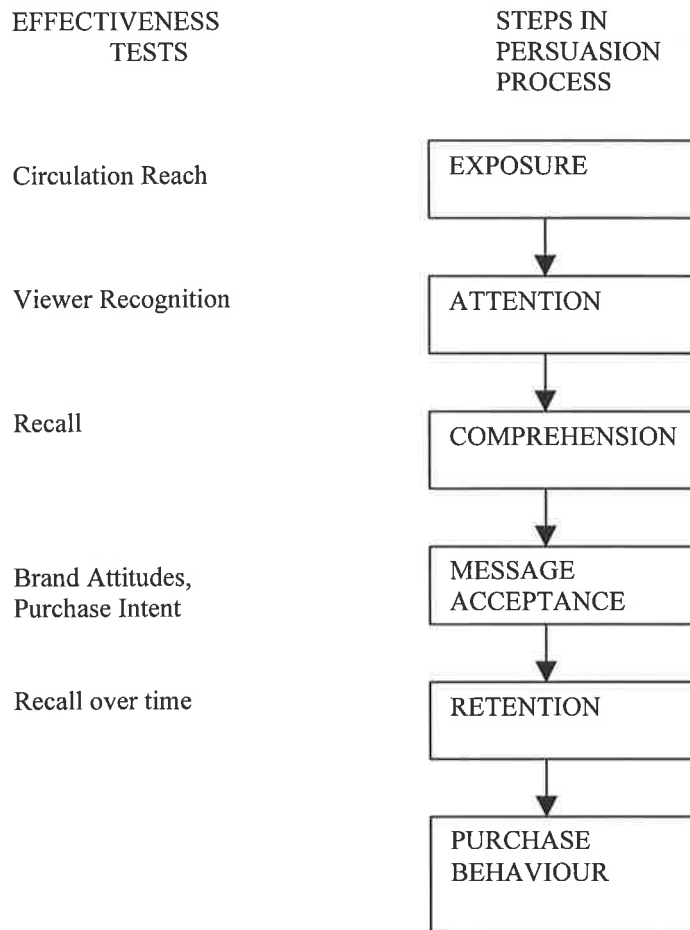
Exposure can be measured for print media by circulation and for TV media by reach. Circulation figures are generally available for magazines and are usually broken down by demographic characteristics to allow advertisers to determine the best media to reach their target audience. Magazine advertising for milk over the study period by rate-card cost was highest for the Tararua brand.

Television advertising placement is based on the advertising weighting and is measured by TARPs (Target Audience Rating Points). TARPs is a measure of the advertising reach multiplied by the advertising frequency. The reach refers to the percentage of people in the target audience that have the opportunity to see the advertisement in a given time frame and the frequency is the average number of times that person is likely to see the advertisement.

The television TARPs for Household Shoppers, 20 to 49 years, for the Anchor and Tararua brands, the "Dairy Goodness" advertising undertaken by the Dairy Advisory Bureau, and Sanitarium's So Good soy milk during the study period are shown in Figure 4.6.

Figure 4.6 Television TARPS –Upper North Island, October 1997-October 1998
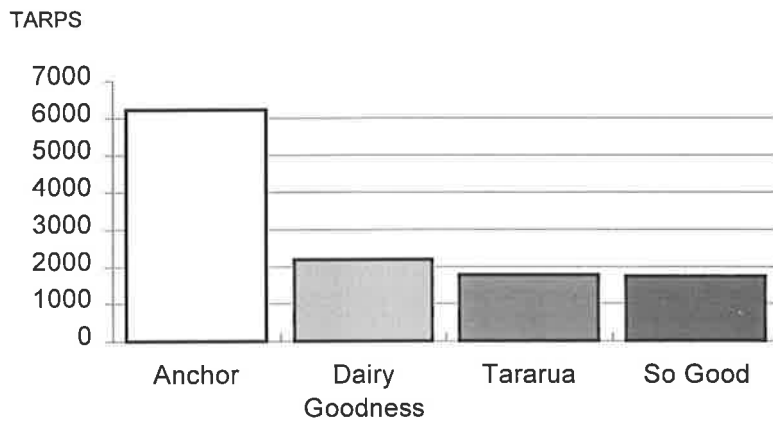
TARPS

The TARPS for television advertising over the study period was significantly greater for the Anchor brand of milk (51.2%) compared to Tararua (14.6%), Dairy Goodness (19.7%) and So Good (14.3%). This is to be expected given that the Anchor brand predominates in the upper North Island and the Tararua brand predominates in the lower North Island.

Attention can best be measured by recognition of an advertisement. In the present study, consumers were asked whether they had seen any advertising for milk and whether they could associate it with a brand or manufacturer.

Comprehension is measured primarily by tests of recall of specific points in the advertisement. Advertisers can use "day-after-recall" tests to measure comprehension of TV commercials by probing consumers who recalled the advertisement to play back specific points in the commercial. The increase in emotional advertising has led to a decrease in the use of day-after-recall measures because they do not account for reaction to the advertisement. For the advertising of milk, this method was not used.

Message acceptance is best measured by its impact on brand attitudes or purchase intent. For example, attitudes towards the brand can be measured prior to and after exposure to print or TV advertisements. Comparisons of matched groups of consumers exposed to the message and those not exposed can show the effect of the message on attitude change. In hindsight this would have been a useful for the purposes of this thesis, but attitudes to brands were not measured before the advertising campaign commenced.

Retention is measured by recall of the advertising message after a period of time. Consumers are likely to forget messages over time unless they are repeated. The most repeated messages are those that are likely to be retained longest. For this reason the Dairy Advisory Bureau regularly monitor consumers to test retention of

nutritional messages. For example, 'milk is a rich source of calcium' and 'calcium is needed while you are young to build strong bones'.

An alternative method of evaluating advertising effectiveness is by looking at the relevance of the advertising to the target audience. In social marketing this is a particularly useful method as there are a number of market segments competing for resources and in many cases health promotions target "non-users". A model has been devised to systematically compare and select appropriate target groups (Donovan, Egger & Francas, 1999). The TARPARE model assesses previously identified segments on the following criteria:

T	The Total number of persons in the segment
AR	The proportion of At Risk persons in the segment
P	The Persuasibility of the target audience
A	The Accessibility of the target audience
R	Resources required to meet the needs of the target audience
E	Equity, social justice considerations

The assessment can be applied qualitatively, or by assigning scores to each segment. Using this model for the purposes of this thesis we can assume that the television advertising for milk conducted during the study period targeted household shoppers between 20 to 49 years of age, in the region north of Taupo. This is a population segment of mainly women from both urban and rural dwellings and from varying demographic backgrounds.

The Persuasibility of the target audience in this model refers to a consideration of how feasible it would be to change attitudes and behaviour in the segment. Given the target audience rating points (TARPS) for the milk advertising conducted during the study period, the target audience would have been three times more likely to have viewed the Anchor campaign than the TV advertising by Tararua, Dairy Goodness or So Good.

As previously discussed the Anchor advertising featured a well-known Samoan rugby player. Although there are many women who take an interest in the sport and support the rugby culture, many do not. Therefore, the choice of role model over the twelve-month period seems incompatible with the target segment. Given the objective was to increase milk consumption it would seem rational that the advertising was more relevant to the lives of women. The advertising may then have been more persuasive in changing women's attitudes.

The Tararua campaigns may also have alienated some of the target segment in that they that they featured a rugby and a make believe military submarine scenarios. While women were portrayed in a nurturing role the macho subject matter and language used in the advertisements is unlikely to have broad female appeal. The masculine approach of the two leading milk brands appears to be slightly destructive.

The generic advertising campaigns employed by the Dairy Advisory Bureau (DAB) were likely to have greater relevance to the target segment. However the advertisements bore no resemblance to the other milk advertising campaigns. In fact the reference to 3.3% fat milk as a low fat product may have created confusion with respect to the reference to 0.1% fat milk in the Anchor Supertrim milk campaign.

A further problem was that the So Good soy milk advertising over the same period took the opportunity to leverage the benefits of soy milk against cows milk. The soy milk advertising provided hard hitting messages about the cholesterol lowering effects of soy milk compared to whole cows milk.

In the discussion on the Australian sugar campaign earlier in this chapter, it was evident that any attack on sugar consumption was immediately rebuffed by a counter attack. This campaign was effective because of the consistency of the approach. As marketplace conditions changed, strategies were continually refined and evolved for maximum effectiveness.

It would seem that synergies could have been gained for milk advertising with a more cohesive industry approach. In terms of the TARPARE model the generic advertising approaches were not a good use of industry resources. The TARPS for the DAB advertising was a third lower than for the Anchor campaign. Had the advertising messages reinforced each other the resources required to persuade the target audience might have been maximised.

The final segment on the TARPARE model concerns equity. This relates to the inclusion of social justice considerations. In health promotion this might refer to groups such as teenage girls who might consume very low intakes of calcium. In commercial advertising we might regard equity in terms of the values held by the target audience. It has already been outlined in this thesis that values underlie an individual's beliefs, attitudes and behaviours. Attitudes towards a brand depend on the consumer's set of values. This can be related to the advertising for milk. For example, milk presented in plastic bottles might hinder the attainment of the value "preservation of nature". Consumers buy what they value most and avoid anything that blocks attaining their values. In the same way, advertising that portrays a rugby game might alienate women who do not subscribe to the rugby culture. The outcome may be avoidance.

Knowledge of the variations in value structures across groups could be helpful to marketers to understand the differences in the ways segments of the market organise their understanding of the world.

Therefore two further aims of this thesis are to look at people's perceptions of the advertising of milk and to monitor changes in attitudes to milk as a result of the advertising (see box).

Aim 2	**To look at people's perceptions of the advertising of milk**
Hypothesis 18	The brand recall for advertising of milk will be greater for Anchor than for other brands because the TARPS for television advertising over the study period was significantly greater for Anchor (51%) compared to Tararua (15%), Dairy Goodness (20%) and So Good (14%).
Hypothesis 19	Men will have higher recall and liking of the Anchor television advertising featuring Michael Jones because of the rugby culture.
Hypothesis 20	Women's liking of the advertising will be more negative than for men since the rugby images portrayed are not as relevant to women.
Hypothesis 21	Younger men will have more positive perceptions of the Anchor advertising than older groups because of the portrayal of the rugby hero Michael Jones with whom they are likely to strongly identify with.
Hypothesis 22	There will be more positive perceptions of the Anchor advertising amongst Maori and Pacific Islanders because of the portrayal of Samoan rugby hero Michael Jones.
Aim 3	**To monitor changes in attitudes to milk as a result of advertising**
Hypothesis 23	There will be increased positive perceptions about the nutritional goodness of milk as a result of attention, persuasion and exposure to the Michael Jones advertising. *"You know just two glasses of Anchor milk helps provide the calcium, energy and protein essential for growing kids"*.

Chapter 5

Aims and Hypotheses

A case for the aims and hypotheses for the consumer studies has been made in the preceding chapters. A summary is now provided.

Aim 1   Attitudes are related to food consumption, therefore consumer attitudes to milk will be investigated

Hypothesis 1	Most people will have positive attitudes towards the taste of milk
Hypothesis 2	There will be negative attitudes to the wide range of milks available
Hypothesis 3	Most people will have positive attitudes towards milk added to cereals and drinks
Hypothesis 4	Most people will be uncertain that drinking low fat milk is acceptable for adults with high blood cholesterol
Hypothesis 5	Most people will be uncertain that you should only drink a low fat milk when on you're on a weight reducing diet
Hypothesis 6	Women will have more positive attitudes than men regarding the goodness (nutritional content) of milk
Hypothesis 7	Women will have more concerns than men about the fat content of milk
Hypothesis 8	Women will have more negative beliefs than men as to whether people with lactose intolerance can drink milk
Hypothesis 9	People under 30 years did not experience the school milk scheme that operated between 1937-1967 and therefore are more likely to have positive attitudes to milk
Hypothesis 10	People over 30 years with young families will tend to perceive that milk causes allergies in a lot of children
Hypothesis 11	People under 30 years will tend to have more positive attitudes to fizzy drinks

Hypothesis 12	People over 30 years will tend to perceive that milk is for toddlers and children
Hypothesis 13	People over 30 years who experienced the school milk scheme will tend to feel more obliged to drink it
Hypothesis 14	Higher education is associated with more concern about the fat content of milk
Hypothesis 15	People of higher occupational status will have negative attitudes to fat and cholesterol in milk
Hypothesis 16	Europeans are more likely to have negative attitudes towards the fat content of milk
Hypothesis 17	Maori and Pacific Islands people are more likely to perceive milk as a refreshing drink

Aim 2 — To investigate people's perceptions of the TV advertising of milk

Hypothesis 18	The brand recall for advertising of milk will be greater for Anchor than for other brands because the TARPS for television advertising over the study period was significantly greater for Anchor (51%) compared to Tararua (15%), Dairy Goodness (20%) and So Good (14%).
Hypothesis 19	Men will have higher recall and liking of the Anchor television advertising featuring Michael Jones because of the rugby culture.
Hypothesis 20	Women's liking of the advertising will be more negative than for men since the rugby images portrayed are not as relevant to women.
Hypothesis 21	Younger men will have more positive perceptions of the Anchor advertising than older groups because of the portrayal of the rugby hero Michael Jones with whom they are likely to strongly identify with.
Hypothesis 22	There will be more positive perceptions of the Anchor advertising amongst Maori and Pacific Islanders because of the portrayal of Samoan rugby hero Michael Jones.

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Aim 3	To monitor changes in attitudes to milk as a result of advertising
Hypothesis 23	There will be increased positive perceptions about the nutritional goodness of milk as a result of attention, persuasion and exposure to the Michael Jones advertising. *"You know just two glasses of Anchor milk helps provide the calcium, energy and protein essential for growing kids".*

Chapter 6

Methodology

Chapter 5 provided the main aims and hypotheses related to this thesis. This chapter will outline the methodology for the investigation of these aims. Firstly I will describe the methodology for the baseline survey (Study 1). I will then provide a description of the methodology for the follow up survey (Study 2) where differences in questionnaire design occurred.

I will outline the sampling method, procedure, questionnaire development and data analysis for both studies. Finally the validity issues related to the studies will be addressed.

Study 1: The baseline survey

6.1 Sampling

The respondents were randomly recruited from the database of Startel Teleperformance, an international consumer research company with a base in Auckland. The database contains a random sample of white page phone subscribers. Startel Teleperformance is a company experienced in random telephone interviewing using CATI (computer aided telephone interviewing) techniques.

The sampling frame was the Auckland region telephone directory. The sample consisted of 713 randomly selected respondents, equivalent to their proportions for age and gender in the New Zealand population, with a margin of error of 1.5 to 3%.

6.1.1 Ethical approval

The studies reported in this thesis conformed to the policy of the University of Adelaide for conduct of surveys. For details of this policy refer to Appendix 6.1.

6.2 The Procedure

Startel Teleperformance undertook the telephone survey in November 1997. The research objective, sampling methodology, data administration, outline of the questionnaire and reporting requirements designed by the candidate were explained in writing to the company before the survey was undertaken.

The research objective was to survey a random sample of residential households within the Auckland region in regard to their milk consumption and attitudes and beliefs about milk. The proposed strategy was to contact 713 Auckland householders to complete the questionnaire. Proportions in the New Zealand population (Table 6.1) determined the sample size with quotas for age and gender.

Table 6.1 Proposed age and gender quota for the baseline survey sample

	Men	Women	Total
16-20 years	34	40	74
21-35 years	102	110	212
35-50 years	84	82	166
51-65 years	87	86	173
65 years +	48	47	95
Total	355	365	720

An outline of the questionnaire, description of the pre-test, and an estimate of the timing to undertake the telephone interview were provided. The reporting requirements were discussed with the company. This included requirements for the completion date and the presentation of the interview data in Excel 97 format.

The research company provided a quotation for costs. This included a set up fee for administration and reporting of the raw data, computer programming of the script, and training of telephone interviewers.

Experienced interviewers with training in telephone techniques were briefed by the research company about the questionnaire objectives and outcomes required.

Interviews were conducted on weekdays both during the day and in the evenings. To overcome any bias created by women answering the phone each interviewer asked to speak to the adult in the household who last had a birthday.

The central telephone interviewing facility used in the current study greatly assisted the conduct of the telephone interviews. It ensured that calls were made in the most systematic and efficient manner. However, potential difficulties can arise in coding subject's responses. For example, educational attainment was recorded as one of four options. The results showed that there were marked differences in the educational attainment of subjects in the baseline and follow up surveys. For example, in the follow up survey nearly a quarter (23.4%) of the sample had attained a technical or trade certificate compared to only 15% in the baseline survey. Therefore the results for educational attainment had to be treated with more than usual caution.

6.3 The Questionnaire

The development of the questionnaire was based on a review of the literature and consumer research undertaken by the milk industry. The first draft of the questionnaire was provided to marketing personnel within the milk industry, staff at the Department of Public Health, University of Adelaide and researchers at the Research Company. Comments were offered with respect to content, wording, length and structure. Based on this feedback, changes were made to the questionnaire (Appendix 6.2). It was then pre-tested on 20 members of the public to ensure comprehension and to check the time taken to complete the questionnaire.

6.3.1 Attitudes to milk

The interviewer asked 27 questions that were given in the questionnaire in which the items were in the same order for all of the respondents, about attitudes to milk. From a review of consumer attitudes to milk consumption in Chapter 3, the attitude items were categorised to reflect the main themes of consumers' interest in milk. For example, sensory, cost and usage, health and nutrition and age related.

Sensory
Milk tastes good
Milk is refreshing

Cost & Usage
There are too many types of milk available
Milk is good added to cereals and drinks
I used to like milk as a child
Milk is expensive compared to fizzy drinks
Milk is good value for money

Health & Nutrition
Milk causes allergies in a lot of children
Milk is important for bone growth
Milk can cause high blood cholesterol
Milk is better for you than fizzy drinks
Fruit juice is better for you than milk
Drinking milk is better than taking calcium supplements
I only drink milk because I feel I should
Milk is a good source of calcium
Milk has a lot of goodness such as protein, vitamins and minerals
People with lactose intolerance can drink small amounts of milk
Milk provides energy
All milk is high in fat
Drinking a low fat milk is Ok for Adults with high blood cholesterol
It is important to drink milk when you're on a weight reducing diet
You should only drink a low-fat milk when you're on a weight reducing diet
Regular Milk (Blue Top) is high in fat

Age and Gender Requirements
Adults over 65 need more milk than young adults
Women need more milk than men
Milk should be the main part of a toddler's diet
Milk is more important for children than adults

The questions were closed in that the respondents were asked to give one of five responses depending on the degree of agreement to the attitude statement where:

```
Strongly agree  was coded as 1
Mildly agree              = 2
Neither agree or disagree  = 3
Mildly disagree           = 4
Strongly disagree         = 5
```

Responses were recorded for each of the respondents in the sample.

6.3.2 Demographics
The interviewer asked 10 questions related to demographics as follows:

6.3.2.1 Gender
The respondent's gender was recorded as:
Male   = 1
Female= 2

6.3.2.2 Age
Respondents were asked their age and this was recorded in years.

6.3.2.4 Living in the household
Respondents were asked how many people lived at their residence and a numerical response was recorded. If there were children living in the household both the number of children and their ages were recorded.

6.3.2.5 Ethnicity
The respondents were asked their ethnic origin and this was recorded as:

NZ European = 1
NZ Maori = 2
Pacific Islander = 3
Asian = 4
Other = 5

6.3.2.6 Education
The respondents were then asked their highest level of formal education. The interviewers probed fully for the respondent's qualifications and educational attainment was recorded as:

3 years or less at secondary school = 1
4 years or more at secondary school = 2
Technical or trade certificate = 3
University qualification = 4

6.3.2.7 Occupation

The respondents were asked their present occupation and this was recorded. The occupational status of the subjects in both surveys was defined as unemployed, homemaker or caregiver, beneficiary or classified into nine levels based on the New Zealand Socio-economic index (NZSEI).

The NZSEI is an objective index of specific occupations within the labour force. The index was developed using a statistical relationship between education, occupation and income. The indices are based on data collected in the 1991 census (Davis, McLeod & Ransom, 1997).

6.3.2.9 Milk consumption

The respondents were asked about their daily milk consumption, either as a drink or added to cereals, tea and coffee. Responses were recorded as:

Less than ¼ litre per day = 1
Between ¼ to ½ litre per day = 2
More than ½ litre per day = 3
None at all = 4

6.4 Data Analysis

6.4.1 Data preparation

The answers to the questionnaire were recorded by the telephone interviewers and were entered into an Excel 97 spreadsheet. The spreadsheet was designed with 37 columns, one column to represent each question on the questionnaire. Each column was assigned an abbreviated name according to the variable in the questionnaire.

The 10 questions relating to demographics were checked and non-numeric answers were assigned a numeric code to be computer readable (for example male respondents were coded as 1).

The coded information was copied from the Excel spreadsheet into SPSS (Statistical Package for the Social Sciences) version 7.5 for statistical analysis. The data were checked for errors in data entry using the frequency command. This provided a means of checking the number of cases in each variable, the number of cases for which values were missing as well as the presence of beyond range variable values.

6.4.2 Frequencies

The SPSS FREQUENCIES program was used to produce the mean, median, mode and standard deviation for each variable.

6.4.3 Crosstabulations

The CROSSTAB program was used to compare the percentage agreement with the attitude statements within the gender, age, education, occupation, and ethnic and milk consumption groups.

A Pearson chi-square statistic was produced for each crosstabulation. It was used to assess the statistical significance of the bivariate associations at an alpha value of 0.05. Chi-square is a standardised measure of association between two variables based on observed (O) cell frequencies compared to expected (E) cell frequencies (Hair, Anderson & Tatham, 1998) where:

$$X^2 = \frac{\sum (O-E)^2}{E}$$

6.4.4 CHAID

Milk consumption was predicted using the statistical package. CHAID for Windows Release 6 is a programme part of the SPSS.

CHAID (Chi-squared Automatic Interaction Detector) performs segmentation modeling where a population is divided into two or more distinct groups based on categories of the "best" predictor of a dependent variable. It then splits each of these groups into smaller subgroups based on other predictor variables. This splitting continues until no more statistically significant predictors can be found at an alpha level of 0.05. CHAID displays the final subgroups in the form of an intuitive tree diagram.

CHAID is a useful technique for the detection and assessment of interaction effects. It provides advantages for marketing and public health researchers who are often concerned with choosing predictors from a large set of variables. For example, CHAID has been employed to establish the characteristics of people who were vulnerable to mental health problems in Singapore (Huang, Lin & Ngui, 1993). Of the sixteen predictors considered, five were found to play significant roles in identifying the various vulnerable groups. In Australia, a CHAID-generated flowchart proved useful in a pilot study to analyse the interrelationship between variables predictive of outcome in an urban trauma population. (Hill, Delaney & Roncal, 1997). The CHAID programme has also been used to evaluate the prognostic value of serum ferritin and other readily available clinical and laboratory parameters as predictors of bone marrow iron stores without marrow aspiration (Brink and van Schalkwyk, 1982). The predictions were statistically very highly significant, especially in the patients with iron deficiencies.

Traditional multivariate techniques may provide erroneous and misleading results for marketers (Magidson, 1988). An application of the CHAID technique was shown to result in substantial lift in response for an Amoco Oil Company promotion to its credit card file (Magidson, 1988).

In this thesis CHAID provided a useful technique to predict milk consumption by demographic characteristics and attitudes. It was also used to predict strategic attitude statements (determined by CHAID analysis) by demographic characteristics and other attitudes.

6.4.5 Exploratory factor analysis

Exploratory factor analysis is a technique for condensing many variables into a few underlying constructs. It provides a method of analysing the structure of the

interrelationships (Pearson correlations) among a number of variables by defining a set of common underlying dimensions known as factors.

Exploratory factor analysis is able to reveal which variables are most closely associated with each factor. Factor loadings range from –1.0 to 1.0 where zero is no association and 1 would indicate a perfect association. The sign of the association indicates whether the association is positive or negative. Two studies illustrate the utlility of this analytic method.

On the basis of factor analysis of the attributions of sweet foods, Prattala and Keinonen (1984) were able to identify four meaning dimensions. For example, the mean dimensions of soft drinks were labeled 'emotional meaning', 'social meaning', 'healthfulness' and 'personal use'. These meanings of the foods correlated with their reported frequency of use: subjects who associated positive attributes with a particular food also used that food more often than the others did.

In a study of gender and age differences in food cognition, Rappoport, Peters & Downey (1993) examined the pleasure, health and convenience ratings of 35 meals and snacks made by men and women. Separate factor analyses of the pleasure and health ratings revealed that men and women grouped foods differently on these criteria. The factor analysis of convenience ratings suggested that men and women perceive the meaning of convenience differently.

In this thesis the factor analysis of the attitude items failed to yield a small number of reliable factors (i.e. reduction to simple structure). Thus the use of multivariate analysis of factor scores was precluded (Appendix 6.3).

Study 2 Follow-up Survey

6.5 Sampling

Again the respondents were recruited from the database of Startel Teleperformance. This was the same database used in the baseline survey in October 1997. The sample consisted of 719 randomly selected respondents in the Auckland region.

6.6 The Procedure

The telephone survey was undertaken during October 1998. A similar procedure was used as in the baseline survey. In addition a videotape was made of all the TV advertising related to milk on air in the Auckland region between October 1997 and October 1998. The videotape was played at the briefing for telephone interviewers to provide background knowledge for questions related to the TV advertising of milk.

Interviews were conducted in the same manner as the baseline survey.

6.7 The Questionnaire

A copy of the follow up questionnaire is given in Appendix 6.4.

6.7.1 Attitudes to milk

The interviewer asked 28 questions in random order for all respondents about attitudes to milk. The questions were the same as those used in the baseline survey with an additional question to investigate respondents' perceptions of the iron content of milk. Responses were recorded for each of the 719 respondents in the sample.

6.7.2 Perceptions of advertising

The interviewers then asked six questions about advertising related to milk. The respondents were asked:

1. To recall any recent TV advertising for milk. The spontaneous responses were recorded by the interviewer as:

Michael Jones = 1
Anchor = 2
Rugby player/Football player = 3
Tararua = 4
The Bones ad /Dairy Goodness = 5
So Good/Sanitarium = 6
Can't recall = 7

2. To recall the brand being advertised. Responses were recorded as:

Anchor = 1
Tararua = 2
Dairy Goodness = 3
Sanitarium = 4
Can't recall/Don't know = 5

3 To recall any other advertising for milk. The order of recall was recorded numerically as above.

4. If respondents were able to recall the Michael Jones advertisement they were asked if they found the advertisement of interest to them personally. A yes or no response was recorded.

5. What the main message was in the advertisement from the following options:

Milk is healthy/good for you = 1
Milk gives you energy = 2
Milk is good for families = 3
Other = 4
Don't know = 5

6. "When you think about the milk you use, would you say you are using more or less than about a year ago?"

Responses were recorded as:

Much more = 1
A little more = 2
About the same = 3
A little less = 4
A lot less = 5

6.7.3 Demographics
The respondents were asked seven questions related to demographics. These were collected in a similar manner to the baseline survey.

Living in the household
The question related to people living in the household was simplified. In the baseline survey respondents were asked how many people lived in the household including the number and ages of children. In the follow up survey respondents were asked how many people lived in the household by age group. Responses were recorded as:

Preschool <5 years = 1
School age 5-12 years = 2
Teenagers 13-18 years = 3
Adult women 18+ years = 4
Adult men 18+ years = 5

6.8 Data Analysis

The data analysis was similar to the baseline survey with the addition of comparisons between the baseline and follow up surveys.

6.8.1 Frequencies
In the follow up survey frequency statistics were also used to determine the percentage spontaneous recall of milk brand advertising, prompted recall of milk brand advertising and percentage agreement for the main message delivered in the Michael Jones advertising

.

6.8.2 Crosstabulations
To determine if there were any differences in attitudes to milk between the baseline survey in October 1997 and the follow up survey in October 1998, data from the two surveys were merged and the CROSSTAB program was used to produce a chi-square measure of association.

This was repeated to identify any differences in responses amongst women, men, women 16-30 years, women 31-52 years, women over 53 years, men 16-30 years, men 31-52 years, men over 53 years.

In the follow up survey CROSSTAB analyses were used to compare the percentage spontaneous recall for TV advertising related to milk by gender, age group, ethnicity and recall of brand. Occupation and usage of milk one year ago was

compared with the percentage of respondents with personal interest in the Michael Jones advertising. CROSSTABS was also used to compare the percentage of milk used compared to one year ago by gender and age group.

Percentage agreement with attitude statements was compared by interest in the Michael Jones advertising, or no interest in the Michael Jones advertising and milk consumed on a daily basis, and, by interest or no interest in the Michael Jones advertising by gender.

In the follow up survey the CROSSTAB program was used to determine the percentage agreement with the statement 'milk is a good source of iron' by gender and age group.

6.8.3 CHAID

The CHAID programme was used to predict interest in the Michael Jones milk advertising using demographics and attitude/belief variables.

6.9 Reliability and Validity

6.9.1 Reliability

Reliability is an assessment of the extent to which a variable or set of variables is consistent in what it is intended to measure (Hair, Anderson & Tatham, 1998). If multiple measurements are taken, reliable measures will be highly consistent or similar in their values. In this thesis there was a high level of consistency between responses in the baseline and follow up surveys. The reliability was checked by correlation of the mean scores between the two surveys (Pearson correlation coefficient).

6.9.2 Validity

Validity is an expression of the degree to which a study is capable of measuring what it is intended to measure. **Internal validity** is the degree to which the results are correct for the particular group of people in the study (i.e. the respondents) or free from non-random error (Anastasi, 1986).

Bias or uncontrolled confounding can impair the internal validity within a study population. Bias occurs whenever the processes of selection cause the data to misrepresent the true relationship as it exists within the study population.

Interview bias and misclassification bias is sometimes referred to as observation or information bias (Hennekens and Buring, 1987). Interview bias occurs when systematic differences occur between subjects in the recording or interpreting of information from respondents. Interview bias can be minimised by conducting interviews according to a standardised protocol, as in the present study (Babbie, 1983).

Though randomisation rules out many threats to internal validity, it does not rule out all of them. Most result from the focused inequities that inevitably accompany

experimentation because some people receive one treatment and others receive different treatments or no treatment at all. The probability that an event might have occurred by chance alone is expressed as a p value and it may be termed significant when $p < 0.05$. In this study which employed many comparisons between groups a more conservative alpha level of 0.01 was used to avoid overdependence on spurious or chance differences.

Cook and Campbell (1963) have defined threats to internal validity. The threats that were relevant to the present study are summarised in Table 6.2.

Table 6.2 Possible threats to internal validity

Threat	Likely	Unlikely	No
History	✓		
Maturation		✓	
Testing		✓	
Instrumentation			✓
Statistical regression			✓
Selection	✓		
Interactions with selection			✓

'History' may be a threat when an observed effect might be due to an event which takes place between the pretest and the posttest, when this event is not the treatment of research interest.

Maturation can be a threat when an observed effect might be due to the respondent's growing older, wiser or more experienced between the pretest and posttest. This was not likely to be a threat in this study as different respondents were used in the baseline and follow up surveys.

Testing may be an effect due to the number of times particular responses are measured. Familiarity with a test can sometimes enhance performance. Again this was an unlikely threat as each respondent was given the questionnaire only once.

Instrumentation: when an effect might be due to a change in the measuring instrument between pretest and posttest. This did not occur in this study.

Statistical regression: when an effect might be due to respondents' being classified into experimental groups on the basis of pretest scores. High pretest scorers will score relatively lower at the posttest and low posttest scorers will score higher.

Selection is a threat when an effect may be due to the difference between the different kinds of people in one experimental group as opposed to another. In this study the respondents in each sample were remarkably similar. The only exception was a difference in the educational status of respondents in the two surveys.

Interactions with selection
Many of the previous threats to validity can interact with selection to produce forces that might appear as treatment effects. For example, selection-maturation

interactions result when experimental groups are maturing at different speeds. This effect was not pertinent to this study.

External validity is the extent to which the results of a study apply to people outside the study population (Cook and Campbell, 1963). It refers to the way in which the findings can be generalised to other populations. In the present study the results were compared with those from other attitude studies. For example, known sex differences in attitudes revealed in other surveys (e.g. to the fat content of milk) were similar to the results in the present study. These and other findings are referred to in the discussion. They support the validity of the study findings and suggest that the novel findings generated in the present study are valid findings.

Chapter 7

Results

Contents

PART 1: DEMOGRAPHIC CHARACTERISTICS

Parts 1 describes the demographic characteristics of the sample in the baseline and follow up surveys by age, sex, ethnicity, education and occupational status.

PART 2: MILK CONSUMPTION

Part 2 illustrates patterns of milk consumption by sex and age group, education and ethnicity in the two surveys. Demographic and attitudinal predictors of milk consumption are illustrated in hierarchical diagrams using CHAID.

PART 3: ATTITUDES AND BELIEFS ABOUT MILK

Part 3 provides a summary of positive and negative beliefs about milk and positive and negative nutritional beliefs about milk. Demographic differences in attitudes by sex, age group, education and ethnicity are provided in tables.

Predictors of key attitudes and prediction of sex differences in attitudes are given in hierarchical diagrams using CHAID.

PART 4: PERCEPTIONS TO MILK ADVERTISING

Part 4 provides results for perceptions of TV advertising of milk in the follow up survey. Findings for the recall of TV advertising, interest in Michael Jones and attitudes related to interest in the Michael Jones advertising is provided. Findings include change in usage of milk by sex and age group.

PART 5: CHANGES IN ATTITUDES AND BELIEFS

Part 5 gives results for the changes in attitudes and beliefs between the two surveys.

PART 1: DEMOGRAPHIC CHARACTERISTICS

7.1 Age and sex

There were 713 respondents in the baseline survey and 719 respondents in the follow up survey, equivalent to their proportions in the Auckland population. The ages ranged between 16 to 94 years.

Although a slightly different age group selection was used to describe the percentage of men and women in national population (1996 census), the percentages of men and women by age group in each of the samples were broadly similar.

The breakdowns for age and sex in the samples are shown in Tables 7.1-7.4.

Table 7.1 Age and sex breakdown for the samples

Age group (years)	Baseline survey				Follow up survey			
	Men	%	Women	%	Men	%	Women	%
16-20	40	12	47	13	41	12	48	13
21-35	96	27	104	29	96	27	104	29
36-50	84	24	82	23	85	24	82	23
51-64	85	24	84	23	81	23	78	22
65+	44	13	47	13	51	14	53	15
Total	349	100	364	100	354	100	365	100

Table 7.2 Age and sex of the New Zealand population

NZ population* Age group (years)	Men %	Women %
15-19	10	9
20-34	30	30
35-49	29	28
50-64	18	17
65+	13	16
Total = 2,786,221	100	100

*1996 Census (NZ Statistics)

Table 7.3 Sex breakdown of samples compared to the New Zealand population

Sex	Baseline survey	%	Follow up Survey	%	NZ population*	%
n	713		719		3,618,302	
Men	349	48.9	354	49.2	1,777,462	49.1
Women	364	51.1	365	50.7	1,840,840	50.8

*1996 Census (NZ Statistics)

Table 7.4 Age breakdown of sample in surveys

Age (years)	Baseline survey			Follow up survey		
	Total	Men	Women	Total	Men	Women
n	713	349	364	719	354	365
mean	42.65	43.26	42.05	42.99	43.65	42.35
SD	17.87	17.85	17.89	18.26	18.25	18.26

7.2 Ethnicity

Nearly two thirds (63%) of the sample in the baseline survey were NZ Europeans. There were slightly more European women (66%) than men (60%). Thirteen percent of the sample was Maori, 14% Pacific Islands and 10% Asian respondents in the sample. The percentages of Pacific Islands and Asian men were slightly higher than for women.

Compared to the national sample, European and Maori New Zealanders were under-represented and Pacific Islands and Asian people over-represented (Table 7.5a). Similar trends were observed in the follow up survey (Table 7.5b). The over representation of Pacific Islands and Asian people reflects their greater numbers in the Auckland region.

Table 7.5a Ethnicity of sample in baseline survey by sex

Ethnicity	Total	%	Men	%	Women	%
n	710		346		364	
European NZ	447	63	206	59.8	241	66.2
Maori NZ	91	12.8	47	13.5	44	12.1
Pacific Islands	99	13.9	53	15.2	46	12.6
Asian	73	10.3	40	11.5	33	9.1

Table 7.5b Ethnicity of sample in the follow up survey by sex

Ethnicity	Total	%	Men	%	Women	%
n	719		354		365	
European NZ	420	58.4	187	52.8	233	63.8
Maori NZ	102	14.2	60	16.9	42	11.5
Pacific Islands	123	17.1	70	19.8	53	14.5
Asian	64	8.9	33	9.3	31	8.5
Other	10	1.4	4	1.1	6	1.6

Table 7.6 Ethnicity of the New Zealand population

Ethnicity NZ population*	Total	%
n	3,302,775	
European NZ	2,496,552	75.6
Maori NZ	523,374	15.9
Pacific Islands	180,315	5.4
Asian	102,534	3.1

*1996 Census (NZ Statistics)

7.3 Education

In the baseline survey more than half of the sample (52.3%) had 3 years or less at secondary school and this was similar for both men and women. This is comparable to findings from the 1996 census in which 57% of the population aged 15years and over had attained school certificate or no qualification. In the sample, 17.6% had 4 years or more at secondary school comparable to 11.4% of the New Zealand population with sixth form certificate or a higher school qualification.

Nearly 15% of the sample had attained a technical or trade certificate and 15.2% a university qualification. In the 1996 census, 26% of the New Zealand population over 15 years had attained a post-school qualification and 5.5% a university qualification. In the sample there were more men (20%) than women (9%) with a technical or trade certificate and with a university education (17% of men compared to 14% of women).

Table 7.7a Educational attainment of sample in the baseline survey

Education	Total	%	Men	%	Women	%
n	612		326		286	
3y or less at secondary school	320	52.3	166	50.9	154	53.8
4y or more at secondary school	108	17.6	42	12.9	66	23.1
Technical or trade certificate	91	14.9	64	19.6	27	9.4
University qualification	93	15.2	54	16.6	39	13.6

Table 7.7b Educational attainment of sample in the follow up survey

Education	Total	%	Men	%	Women	%
n	679		353		326	
3y or less at secondary school	82	12.1	48	13.6	34	10.4
4y or more at secondary school	287	42.3	118	33.4	169	51.8
Technical or trade certificate	160	23.6	102	28.9	58	17.8
University qualification	150	22.1	85	24.1	65	19.9

In the follow up survey 12.1% of respondents had 3 years or less at secondary school, 42.3% had 4 years or more at secondary school and 45.7% had a higher qualification. Educational attainment in this sample was higher than for the sample in the baseline survey and for the 1996 New Zealand population Census.

In the follow up survey nearly a quarter (23.4%) of the sample had attained a technical or trade certificate compared to only 15% in the baseline survey. One in five (22.1%) of respondents had a university qualification compared to 15.2% of respondents in the baseline survey. There were more men (28.9%) than women (17.8%) with a technical or trade certificate, and more men had a university education (24.1% of men compared to 19.9% of women).

7.4 Occupational Status

In the baseline survey (Table 7.8a) there were:

- 8.5% of subjects were unemployed, compared to 5.1% of the national population over 15 years (NZ Statistics, 1997).
- 6.6% were homemakers or caregivers
- 10.4% were students
- more men (34.1%) were in the higher occupational indices determined by NZSEI 1-3 compared to women (27%)
- more women (37.1%) were in NZSEI 4-6 compared to men (21.9%)
- more men (23%) were in NZSEI 7-9 compared to women (6.2%).

The distribution of occupational status of subjects in the follow up survey was similar to that in the baseline survey (Table 7.8b).

Table 7.8a Occupational Status of sample in the baseline survey

Occupational Status	Total	%	Men	%	Women	%
n	589		282		307	
Unemployed	50	8.5	29	10.3	21	6.8
Homemaker, caregiver	39	6.6	2	0.7	37	12.1
Student	61	10.4	28	9.9	33	10.7
NZSEI 1 **Higher status**	2	0.3	2	0.7	0	0
NZSEI 2	115	19.5	67	23.8	48	15.6
NZSEI 3	62	10.5	27	9.6	35	11.4
NZSEI 4	72	12.2	22	7.8	50	16.3
NZSEI 5	92	15.6	32	11.3	60	19.5
NZSEI 6	12	2	8	2.8	4	1.3
NZSEI 7	41	7	33	11.7	8	2.6
NZSEI 8	28	4.8	22	7.8	6	2.0
NZSEI 9 **Lower status**	15	2.5	10	3.5	5	1.6

Table 7.8b Occupational status of sample in the follow up survey

Occupational Status	Total	%	Men	%	Women	%
n	651		309		342	
Unemployed	71	10.9	24	7.8	47	13.7
Homemaker, caregiver	44	6.8	0	0	44	12.9
Student	84	12.9	38	12.3	46	13.5
NZSEI 1 **Higher status**	12	1.8	10	3.2	2	0.6
NZSEI 2	119	18.3	65	21.0	54	15.8
NZSEI 3	68	10.4	35	11.3	33	9.6
NZSEI 4	74	11.4	24	7.8	50	14.6
NZSEI 5	91	14.0	39	12.6	52	15.2
NZSEI 6	5	0.8	4	1.3	1	0.3
NZSEI 7	41	6.3	38	12.3	3	0.9
NZSEI 8	16	2.5	14	4.5	2	0.6
NZSEI 9 **Lower status**	26	4.0	18	5.8	8	2.3

PART 2: MILK CONSUMPTION

Key points

- Overall two thirds of the respondents drank a glass or more each day.

- Men tended to drink more than women.

- Younger people tended either not to consume or were heavy consumers.

- Non-Europeans tended to be the highest consumers.

- There were complex interactions between the demographic categories.

7.5 Patterns of milk consumption

Similar distributions of milk consumption were seen in the baseline and follow up surveys (Tables 7.9a and 7.9b).

Table 7.9a Reported daily milk consumption by total sample and by sex in baseline survey

Daily milk consumption	Total	%	Men	%	Women	%
n	713		349		364	
Less than 250 ml	202	28.3	89	25.5	113	31.2
250-500ml	280	39.3	138	39.5	142	39
More than 500 ml	185	25.9	106	30.4	79	21.7
None	46	6.5	16	4.6	30	8.2

Table 7.9b Reported daily milk consumption by total sample and by sex in follow up survey

Daily milk consumption	Total	%	Men	%	Women	%
n	719		354		365	
Less than 250 ml	205	28.5	99	28	106	29
250-500ml	304	42.3	146	41.2	158	43.3
More than 500 ml	166	23.1	93	26.3	73	20
None	44	6.1	16	4.5	28	7.7

7.6 Daily milk consumption by age group

In both surveys more people under the age of 30 years consumed no milk or more than two glasses a day, more people over 53 years consumed less than a glass a day, and consumption of between one and two glasses of milk per day increased across the age groups (Tables 7.10a, 7.10b).

Table 7.10a Reported daily milk consumption by age group in baseline survey

Daily milk consumption by age group	16-30 years	31-52 years	53-94 years	*X^2	P value
n	234	239	240	69.855	0.001
Less than 250 ml	27.4%	26.4%	30.8%		
250-500ml	24.4%	38.5%	54.6%		
More than 500 ml	38.5%	28%	11.7%		
None	9.4%	7.1%	2.9%		

*df=6

Table 7.10b Reported daily milk consumption by age group in follow up survey

Daily milk consumption by age group	16-30 years	31-52 years	53-94 years	*X^2	P value
n	234	240	245	38.566	0.001
Less than 250 ml	28.2%	27.1%	30.2%		
250-500ml	31.2%	42.1%	53.1%		
More than 500 ml	31.2%	25.4%	13.1%		
None	9.4%	5.4%	3.7%		

*df=6

7.6.1 Daily milk consumption among male age groups

In both surveys, the men who consumed more than two glasses a day were in the younger age group. Men over 53 years were more likely than the other age groups to consume less than a glass or between one to two glasses a day. The men who consumed no milk at all were mostly aged 31 to 52 years (Tables 7.11a and 7.11b).

Table 7.11a Reported daily milk consumption among male age groups in the baseline survey

Daily milk consumption	16-30 years	31-52 years	53-94 years
n	111	121	117
Less than 250 ml	16.2%	19%	41%
250-500ml	31.5%	38%	48.7%
More than 500 ml	49.5%	32.2%	10.3%
None	2.7%	10.7%	0%

Table 7.11b Reported daily milk consumption among male age groups in the follow up survey

Daily milk consumption	16-30 years	31-52 years	53-94 years	*X^2	P value
n	122	120	122	38.326	0.001
Less than 250 ml	20.5%	21.7%	41.0%		
250-500ml	36.6%	40.0%	46.7%		
More than 500 ml	39.3%	30.0%	10.7%		
None	3.6%	8.3%	1.6%		

*df=6

7.6.2 Daily milk consumption among female age groups

In both surveys more women under 30 years consumed no milk at all or less than a glass a day. More women over the age of 53 years consumed between one and two glasses a day. Consumption of more than two glasses a day decreased across the age groups (Tables 7.12a, 7.12b).

Table 7.12a Reported daily milk consumption among female age groups in the baseline survey

Daily milk consumption	16-30 years	31-52 years	53-94 years
N	123	118	123
Less than 250 ml	38.2%	33.9%	21.1%
250-500ml	17.9%	39%	60.2%
More than 500 ml	28.5%	23.7%	13%
None	15.4%	3.4%	5.7%

Table 7.12b Reported daily milk consumption among female age groups in the follow up survey

Daily milk consumption	16-30 years	31-52 years	53-94 years	*X^2	P value
N	122	120	123	36.484	0.001
Less than 250 ml	35.2%	32.5%	19.5%		
250-500ml	26.2%	44.2%	59.3%		
More than 500 ml	23.8%	20.8%	15.4%		
None	14.8%	2.5%	5.7%		

*df=6

7.7 Daily milk consumption by education

In both surveys, non-consumption of milk increased with higher education.

In the baseline survey, more people with 3 years or less at secondary school consumed between one to two glasses a day. The highest milk consumers were those with 4 years or more at secondary school and those with a technical or trade certificate.

Table 7.13a Daily milk consumption by education in baseline survey

Daily milk consumption	3y or less at secondary school	4y or more at secondary school	Technical or trade certificate	University Qual.	$*X^2$	P value
N=612	320	108	91	93	40.189	0.001
Less than 250 ml	30%	25%	24.2%	28%		
250-500ml	45.3%	33.3%	26.4%	34.4%		
More than 500 ml	20.9%	38%	35.2%	24.75		
None	3.8%	3.7%	14.3%	12.9%		

*df=9

Table 7.13b Daily milk consumption by education in follow up survey

Daily milk consumption	3y or less at secondary school	4y or more at secondary school	Technical or trade certificate	University Qual.	$*X^2$	P value
n=679	82	287	160	150	21.375	0.011
Less than 250 ml	31.7%	32.1%	25.6%	22.7%		
250-500ml	50.0%	42.2%	41.3%	39.3%		
More than 500 ml	14.6%	23.0%	24.4%	28.0%		
None	3.7%	2.8%	8.8%	10.0%		

*df=9

In the follow up survey consumption of less than a glass day was higher among those with a secondary school education. Consumption of between one and two glasses a day decreased with educational attainment and consumption of more than two glasses a day increased with educational attainment.

7.8 Daily milk consumption by ethnicity

In both surveys there were significantly more European New Zealanders who consumed no milk at all compared to other ethnic groups. Compared to other ethnic groups there were fewer Asian people who consumed between one to two glasses of milk per day.

Table 7.14a Daily milk consumption by ethnicity in the baseline survey

Daily milk consumption by ethnicity	NZ European	NZ Maori	Pacific Islands	Asian	*X²	P value
n=	447	91	99	73	20.851	0.013
Less than 250 ml	29.3%	25.3%	23.2%	32.9%		
250-500ml	41.2%	38.5%	39.4%	28.8%		
More than 500 ml	21.3%	34.1%	33.3%	34.2%		
None	8.3%	2.2%	4.0%	4.1%		

*df=9

Table 7.14b Daily milk consumption by ethnicity in the follow up survey

Daily milk consumption by ethnicity	NZ European	NZ Maori	Pacific Islands	Asian	*X²	P value
n=709	420	102	123	64	19.051	0.025
Less than 250 ml	27.9%	33.3%	25.2%	26.6%		
250-500ml	42.9%	44.1%	44.7%	31.3%		
More than 500 ml	21.0%	20.6%	27.6%	35.9%		
None	8.3%	2.0%	2.4%	6.3%		

*df=9

7.9 Demographic predictors of milk consumption

Predictors of the demographic characteristics of milk consumption, derived from CHAID (Chi-squared Automatic Interaction Detector) analysis in the baseline survey are shown in Figure 7.1. The demographic predictors of milk consumption in the follow up survey were similar but not as extensive and are shown in Appendix 7.1.

Figure 7.1 is a tree diagram based on an analysis of the demographic variables that best predict milk consumption (the dependent variable). The second level of the tree represents the most statistically significant predictor of milk consumption, which was sex. More women (39%) than men (30%) had low levels of consumption. Medium levels of consumption (between 250 to 500ml) were similar in men and women and men (30%) had higher levels of consumption (>500ml) than women (22%).

At the third level of the tree diagram, you can see that for men, age was the best predictor of milk consumption. Younger men 16 to 30 years of age consumed greater volumes of milk (>500ml) than older men. At the next level ethnicity was the best predictor of consumption among younger men; non-European men (Maori, Pacific Island and Asian) consumed higher volumes of milk than NZ Europeans (63% and 35% respectively).

For women, education was the best predictor of milk consumption. Women with lower educational attainment (secondary schooling only) consumed smaller volumes of milk than women with a university qualification or a technical certificate (55% and 36% respectively).

Figure 7.1 Demographic predictors of milk consumption in baseline survey
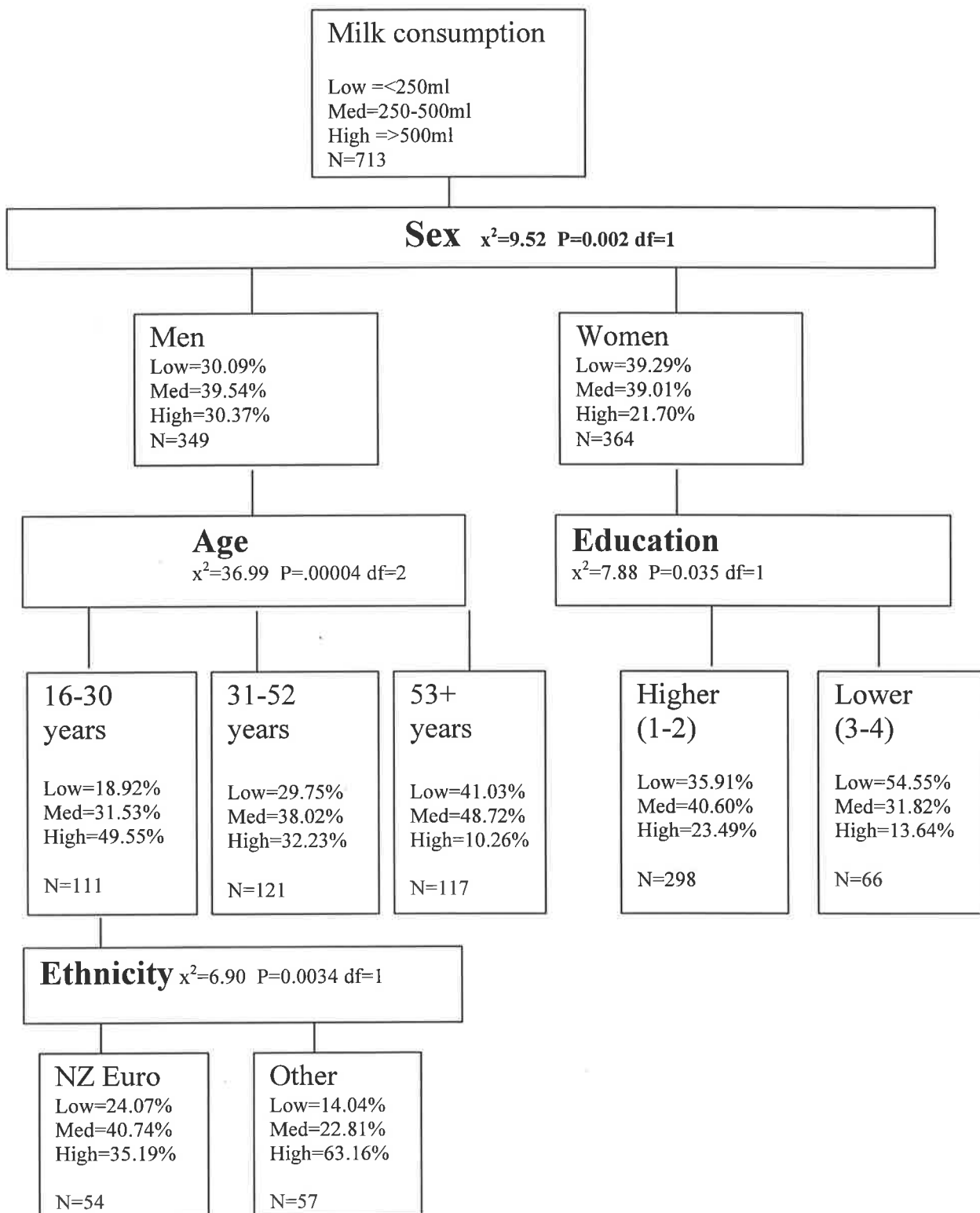
7.10 Attitudinal predictors of milk consumption

The attitudinal predictors of milk consumption in the baseline survey, derived from the CHAID analysis are shown in Figure 7.2. They were broadly similar to those in the follow up survey, which are shown in Appendix 7.2.

The strongest predictor in both surveys was 'milk is expensive compared to fizzy drinks'. In the baseline survey those who agreed (or were unsure) consumed smaller amounts of milk (less than 250ml) than those who disagreed (45% and 29% respectively).

The attitude 'adults over 65 need more milk than younger adults' was the best predictor of consumption among those who disagreed that 'milk is expensive compared to fizzy drinks'. Those who agreed or were unsure that adults over 65 need more milk consumed significantly lower amounts of milk than those who disagreed (32% and 15% respectively).

'Milk is good value for money' was the best predictor among those who agreed or were unsure that 'adults over 65 need more milk than younger adults'. Those who disagreed that 'milk is good value for money' consumed significantly less milk than those who agreed or were unsure (48% and 29% respectively).

Figure 7.2 Attitude predictors of milk consumption in baseline survey

Milk consumption

Low =<250ml
Med=250-500ml
High =>500ml
N=713

'Milk is expensive compared to fizzy drinks'
x^2=14.67 P=0.00026 df=1

Agree / Not sure

Low=44.83%
Med=33.72%
High=21.46%
N=261

Disagree

Low=28.98%
Med=42.48%
High=28.54%
N=452

'adults over 65 need more milk than younger adults'
x^2=18.33 P=0.00004 df=1

Agree / Not sure

Low=32.41%
Med=43.21%
High=24.38%

N=361

Disagree

Low=15.38%
Med=39.56%
High=45.05%

N=91

'milk is good value for money' x^2=10.86 P=0.002 df=1

Agree / Not sure

Low=29.24%
Med=43.85%
High=26.91%

N=301

Disagree

Low=48.33%
Med=40.00%
High=11.67%

N=60

PART 3: ATTITUDES AND BELIEFS ABOUT MILK

As outlined in Chapter 3, there are various points of view about milk constituents amongst consumers. In this section I broadly categorise the attitude items into positive and negative beliefs affecting milk consumption and nutrition or health. These are useful generalisations to organise the data and to provide for ease of presentation of these complicated results.

Key points

- Women had more positive beliefs about the taste, health, nutrition and price of milk. Men were more of the view that milk is for older people, is refreshing and can be used by lactose intolerant people. They also felt more obliged to drink it although they believed it was expensive relative to soft drinks. Men had concerns about cholesterol and women tended to be fat phobic.

- Young people had more positive attitudes to childhood liking of milk but were the least positive about its value for money. Middle aged respondents had more 'family' related concerns. They were more likely to believe that milk provides energy and goodness and is better than taking calcium supplements. They also had more concerns about cholesterol and lactose intolerance. Respondents over 53 years were more concerned about allergies and the wide range of milks available. Although they were more of the opinion that milk is important for older people they were the least positive about the taste of milk.

- Respondents in the highest occupational group had more concerns about milk and cholesterol.

- NZ Europeans and Maori had more concerns about allergies and bone growth and were more inclined to agree that milk is healthier than soft drinks. Maori respondents felt more obliged to drink milk than other groups. Pacific Islanders were more of the opinion that milk is refreshing and were less inclined to agree that women need more milk than men.

7.11 Positive beliefs about milk

The respondents' agreement with the attitude and belief statements is summarised in the next four tables. They have been grouped into positive beliefs, negative beliefs, nutritional beliefs and beliefs about fat, cholesterol and dieting.

In both surveys about 80% of respondents agreed that 'milk is good added to cereals and drinks' and that 'milk is better for you than fizzy drinks'. The majority of consumers (>73%) agreed that milk tastes good and about half (>52%) agreed that 'milk is refreshing'. There was about 70% agreement in both surveys that 'milk is good value for money' and 'I used to like milk as a child' (70%).

About 22% of respondents agreed that 'people with lactose intolerance can drink small amounts of milk'; about 37% of respondents didn't know; and over 38% disagreed with this statement.

Thirty eight percent of respondents agreed that 'adults over 65 need more milk' and over 54% agreed that 'women need more milk than men'. Over 65% agreed that 'milk should be the main part of a toddler's diet'.

Table 7.15. Positive beliefs about milk. Percentage agreement with attitude statements in the baseline and follow up surveys.

Attitude	AA	A	?	D	DD
Milk tastes good	31.7	41.4	10.7	13.3	2.9
	35.1	*39.0*	*10.2*	*12.3*	*3.5*
Milk is refreshing	16.8	35.3	11.1	27.6	9.1
	21.7	*36.0*	*11.5*	*21.7*	*9.0*
Milk is good added to cereals and drinks	36.9	42.8	8.3	10.2	1.8
	40.1	*42.8*	*7.8*	*7.4*	*1.9*
Milk is good value for money	23	44.6	13.5	10.7	8.1
	25.0	*44.5*	*11.7*	*11.7*	*7.1*
Milk is better for you than fizzy drinks	37.3	45	12.1	5	.6
	38.3	*42.1*	*13.6*	*4.3*	*1.7*
People with lactose intolerance can drink small amounts of milk	5	17	36.3	21.9	19.8
	6.4	*16.6*	*38.7*	*19.5*	*18.9*
I used to like milk as a child	27.9	42.4	15.1	10.2	4.3
	31.0	*39.4*	*14.3*	*10.3*	*5.0*
Adults over 65 need more milk than young adults	17.5	23.1	36.7	17.3	5.3
	16.4	*22.0*	*36.6*	*18.6*	*6.4*
Women need more milk than men	22	36.7	25.1	13.5	2.5
	21.7	*32.3*	*29.1*	*13.1*	*3.8*
Milk should be the main part of a toddler's diet	34.9	35.3	18.5	9.8	1.4
	32.0	*33.8*	*20.6*	*9.6*	*4.2*

Note: The percentage of responses from the follow up survey is given in italics.
AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

7.12 Negative beliefs about milk

About a third of respondents in both surveys agreed that 'fruit juice is better for you than milk', a third didn't know and the remainder disagreed. In both surveys about 25% agreed with the statement that 'there are too many types of milk available'. A further 25% responded 'don't know' and half disagreed.

More than 16% of respondents in the baseline survey and 24% in the follow up survey agreed that 'milk is expensive compared to fizzy drinks'.

In both surveys more than 35% of respondents agreed "that 'milk causes allergies in a lot of children' and over 22% agreed that 'I only drink milk because I feel I should'. More than 62% agreed that 'milk is more important for children than adults'.

Table 7.16 Negative beliefs about milk. Percentage agreement with attitude statements in the baseline and follow up surveys.

Attitude	AA	A	?	D	DD
Milk is expensive compared to fizzy drinks	3.6	12.5	20.5	48.8	14.6
	7.4	*16.7*	*17.2*	*44.8*	*13.9*
Fruit juice is better for you than milk	11.8	25.8	27.5	25.7	9.3
	10.4	*21.0*	*30.6*	*26.6*	*11.3*
There are too many types of milk available	5.9	17.8	28.5	33.5	14.3
	9.0	*17.9*	*25.2*	*32.7*	*15.2*
Milk causes allergies in lot of children	5.3	31.7	52	10.5	.4
	7.5	*27.7*	*50.8*	*10.4*	*3.6*
I only drink milk because I feel I should	6.3	17.8	11.4	43.6	20.9
	6.8	*15.7*	*13.9*	*41.9*	*21.7*
Milk is more important for children than adults	27.9	42.4	15.1	10.2	4.3
	31.5	*30.8*	*17.5*	*18.4*	*1.8*

Note: The percentage of responses from the follow up survey is given in italics.
AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

7.13 Positive nutritional beliefs about milk

Fifty five percent and 60% of respondents agreed that 'milk provides energy' in the baseline and follow up surveys respectively. Most (90%) of respondents in both surveys agreed that 'milk is a good source of calcium' and similarly 91% agreed that 'milk is important for bone growth'.

In both surveys more than 61% of respondents agreed that 'drinking milk is better than taking calcium supplements' and 77% agreed that 'milk has a lot of goodness'. In the follow up survey almost half the respondents agreed that 'milk is a good source of iron' (this item was not included in the baseline survey).

In both surveys only a third of respondents agreed that 'drinking low fat milk is ok for adults with high blood cholesterol' and about 25% of respondents agreed 'it is important to drink milk when you're on a weight reducing diet'. Thirty seven percent agreed that 'you should only drink a low fat milk when you're on a weight reducing diet'.

Table 7.17 Positive nutritional beliefs about milk. Percentage agreement with attitude statements in the baseline and follow up surveys.

Attitude	AA	A	?	D	DD
Milk provides energy	15.1	39.7	32.7	10.9	1.5
	22.4	*37.7*	*27.7*	*10.2*	*2.1*
Milk is a good source of calcium	51.5	39.3	6.5	1.4	1.3
	51.9	*38.0*	*6.4*	*1.3*	*2.4*
Milk is important for bone growth	52.7	38.8	4.8	3.2	0.4
	54.4	*37.1*	*5.1*	*2.4*	*1.0*
Drinking milk is better than taking calcium supplements	23.6	37.6	25.9	10.8	2.1
	29.5	*36.9*	*22.7*	*8.4*	*2.5*
Milk has a lot of goodness such as protein, vitamins and minerals	23.4	54.3	15.8	6.3	.1
	28.1	*49.5*	*15.2*	*4.5*	*2.8*
Milk is a good source of iron	*11.1*	*38.1*	*33.8*	*13.5*	*3.5*
Drinking a low fat milk is ok for Adults with high blood cholesterol	7.4	22.7	48.9	15	5.8
	8.2	*26.3*	*49.0*	*9.2*	*7.4*
It is important to drink milk when you're on a weight reducing diet	4.9	20.3	44.9	23.8	5.9
	7.0	*19.6*	*44.1*	*20.6*	*8.6*
You should only drink a low-fat milk when you're on a weight reducing diet	5.8	32.0	43.5	16.1	2.7
	9.9	*27.8*	*42.7*	*15.4*	*4.2*

Note: The percentage of responses from the follow up survey is given in italics.
AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

7.13.1 Beliefs about iron in milk (follow up survey only)

Half of the sample (49%) agreed that 'milk is a good source of iron'. Women (50.7%) agreed more than the men (47.2%).

Men aged over 53 years (54.9%) and women 31 to 52 years (53.3%) agreed more than the other age groups. Men aged 16 to 30 years agreed the least (39.3%). They were more uncertain than the other age groups.

Table 7.18. Percentage agreement with the statement: 'milk is a good source of iron' in the follow up survey. Comparison by sex and age groups.

	AA	A	?	D	DD
Total sample	11.1	38.1	33.8	13.5	3.5
Total women	11.5	39.2	33.2	13.2	3.0
Women aged 16 to 30 years	8.2	38.5	35.2	14.8	3.3
Women aged 31 to 52 years	17.5	35.8	34.2	10.0	2.5
Women aged 53 years and over	8.9	43.1	30.1	14.6	3.3
Total men	10.7	37.0	34.5	13.8	4.0
Men aged 16 to 30 years	10.7	28.6	45.5	8.9	6.3
Men aged 31 to 52 years	11.7	36.7	30.8	19.2	1.7
Men aged 53 years and over	9.8	45.1	27.9	13.1	4.1

AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

7.14 Negative nutritional beliefs about milk

In both surveys 28% of respondents agreed that 'all milk is high in fat', 53% agreed that 'Blue Top milk is high in fat' and more than 27% agreed that 'milk can cause high blood cholesterol'.

Table 7.19. Fat, cholesterol and diet beliefs about milk. Percentage agreement with attitude statements in the baseline and follow up surveys.

Attitude	AA	A	?	D	DD
All milk is high in fat	1.8	26.6	18.7	44.7	7.9
	4.6	*23.0*	*21.6*	*41.3*	*9.5*
Regular Milk (Blue Top) is high in fat	14.7	38.8	24	20.9	1.4
	15.3	*37.5*	*24.8*	*18.3*	*3.6*
Milk can cause high blood cholesterol	7.4	22.7	48.9	15	5.8
	6.3	*20.8*	*49.4*	*15.3*	*8.2*

Note: The percentage of responses from the follow up survey is given in italics.
AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

7.15 Demographic differences in attitudes

The significant demographic differences in attitudes by sex, age group, education and ethnicity in both the baseline and follow up surveys are shown in the following tables at or beyond an alpha level of 0.01.

7.15.1 Differences by sex

Positive beliefs about milk

In the baseline survey, women generally had more positive beliefs about milk than men, except for beliefs about refreshment, lactose intolerance and needs of the over 65 year olds. Results were similar in the follow up survey (Tables 7.20a and 7.20b).

- 91% of women compared to 73% of men agreed 'milk is better for you than fizzy drinks'
- 59% of men compared to 46% of women agreed that 'milk is refreshing'
- 33% of men compared to 11% of women agreed that 'people with lactose intolerance can drink small amounts of milk'.

Positive nutritional beliefs about milk

In the baseline survey women had more positive nutritional beliefs than men did except that men were more concerned about low fat milk for cholesterol.

- 36% of men compared to 11% of women agreed that 'drinking a low fat milk is OK for adults with high blood cholesterol'.

Negative beliefs about milk

In the baseline survey more men broadly had negative beliefs about milk than women. More men also had negative beliefs about the cost of milk in the follow up survey.

- 30% of men compared to 18% of women agreed that 'I only drink milk because I should'
- 22% of men compared to 11% of women agreed that 'milk is expensive compared to fizzy drinks'

Negative nutritional beliefs about milk

In both surveys women tended to have concerns about fat, and more men were concerned about cholesterol (Tables 7.20a and 7.20b).

Table 7.20a Percentage agreement with attitude statements in the baseline survey. Comparison by sex

Attitude	% men agree n=349	% women agree n=364	Pearson Chi-Square *	P Value
Milk is a good source of calcium	87.4 (9.5)	94.2 (0.8)	9.959	0.007
Milk can cause high blood cholesterol	31.5 (53.3)	28.8 (45.1)	13.108	0.001
Milk is expensive compared to fizzy drinks	21.5 (14.3)	11.0 (26.4)	24.876	0.001
Milk provides energy	51.0 (32.7)	58.5 (32.7)	9.952	0.007
Milk is better for you than fizzy drinks	73.1 (19.5)	91.2 (4.9)	42.474	0.001
All milk is high in fat	25.5 (25.8)	31.5 (11.9)	22.724	0.001
People with lactose intolerance can drink small amounts of milk	33.2 (39.0)	11.3 (33.8)	71.917	0.001
Drinking a low fat milk is ok for adults with high blood cholesterol	36.4 (51.0)	29.1 (48.1)	13.585	0.001
You should only drink a low fat milk when you're on a weight reducing diet	35.8 (49.0)	39.6 (38.2)	10.185	0.006
I only drink milk because I feel I should	30.4 (11.5)	18.1 (11.3)	15.345	0.001
It is important to drink milk when you're on a weight reducing diet	29.8 (45.8)	21.2 (44.0)	12.038	0.002
Milk is good added to cereals and drinks	80.2 (4.9)	79.1 (8.3)	14.164	0.001
Adults over 65 need more milk than young adults	44.7 (38.4)	36.8 (35.2)	12.981	0.002
There are too many types of milk available	24.4 (33.5)	23.1 (23.6)	10.907	0.004
Milk is refreshing	58.5 (5.4)	46.2 (16.5)	24.839	0.001
Milk is good value for money	63.3 (9.5)	72.0 (13.5)	35.959	0.001
Women need more milk than men	58.2 (31.5)	59.3 (19.2)	24.461	0.001

Note: Percentage of Responses as "don't know" is given in brackets.
*df=2

Table 7.20b Percentage of agreement with attitude statements in the follow up survey. Comparison by sex

Attitude	% men agree n=354	% women agree n=365	Pearson Chi-Square *	P Value
Milk is a good source of calcium	85.6 (9.3)	94.2 (3.6)	14.882	0.001
Milk can cause high blood cholesterol	30.6 (51.0)	23.6 (47.9)	11.368	0.003
Milk is expensive compared to fizzy drinks	29.1 (13.6)	19.2 (20.8)	13.059	0.001
Milk is better for you than fizzy drinks	72.5 (2)	87.9 (1.4)	27.626	0.001
All milk is high in fat	26.6 (26.6)	28.7 (16.8)	10.233	0.006
People with lactose intolerance can drink small amounts of milk	29.7 (42.1)	16.4 (35.3)	34.479	0.001
Milk is refreshing	63.6 (7.6)	52.1 (15.3)	14.227	0.001
Milk is good value for money	65.5 (10.20	73.4 (13.2)	14.282	0.001
Women need more milk than men	55.1 (32.5)	53.0 (25.8)	10.983	0.004

Note: Percentage of Responses as "don't know" is given in brackets.
*df=2

7.15.2 Differences by age-group

Positive beliefs about milk

In the baseline survey younger respondents (16 to 30 years) were more positive about childhood liking of milk but were the least positive about milk for toddlers and its value.
The middle age group (31 to 52 years) was more of the view that milk is important for women and fewer thought lactose intolerance was a problem.
The older age group (over 53 years) were more of the opinion that adults over 65 need the most milk and they liked the taste of milk the least. Results were broadly similar in the follow up survey (Tables 7.21a and 7.21b).

- 54% of the older, 43% of the middle and 25% of the younger age groups agreed that 'adults over 65 need more milk than younger adults'.

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Positive nutritional beliefs about milk

In the baseline survey more of the middle age group had generally positive beliefs about nutrition. The findings were similar in the follow up survey.

- 66% of the middle age group compared to 44% of the older and 55% of the younger age groups agreed that 'milk provides energy'

Negative beliefs about milk

In the baseline survey more respondents in the older age group had negative beliefs about allergies and the wide range of milk available. Similar beliefs about allergies were found in the follow up survey.

- 46% of the older age group, 34% of the middle age group and 31% of the younger age groups agreed that 'milk can cause allergies in a lot of children'
- 30% of the older age group compared to 18% of the middle and 24% of the younger age groups agreed that 'there are too many types of milk available'

Negative nutritional beliefs about milk

In the baseline survey those in the middle age group had more nutritional concerns about milk. Concerns about cholesterol in the middle age group were also found in the follow up survey.

- 39% of the middle age group compared to 23% of the older and 28% of the younger age groups agreed that 'milk can cause high blood cholesterol'
- 42% of the middle age group compared to 31% of the older and 26% of the younger age groups agreed that 'drinking a low fat milk is OK for adults with high blood cholesterol'
- 41% of those in the younger and middle age groups compared to 31% of the older age group agreed that 'you should only drink a low fat milk when you're on a weight reducing diet'.

Table 7.21a. Percentage agreement with attitude statements in the baseline survey. Comparison by age-group

Attitude	% agree 16-30 y n=234	% agree 31-52 y n=239	% agree over 53 y n=240	Pearson Chi- Square *	P Value
Milk causes allergies in lot of children	30.8 (50.0)	33.9 (57.3)	46.3 (48.8)	34.048	0.001
Milk is a good source of calcium	85.5 (9.8)	90.0 (6.7)	96.7 (3.3)	19.704	0.001
Drinking milk is better than taking calcium supplements	63.7 (24.4)	68.6 (18.0)	51.3 (35.4)	20.860	0.001
I used to like milk as a child	80.8 (6.4)	68.6 (10.9)	61.7 (27.9)	55.890	0.001
Milk can cause high blood cholesterol	28.2 (54.3)	39.3 (42.3)	22.9 (50.8)	20.142	0.001
Milk provides energy	55.1 (30.8)	65.7 (21.80	43.8 (45.4)	32.434	0.001
Milk is better for you than fizzy drinks	82.5 (7.7)	82.5 (10.9)	82.1 (17.5)	29.332	0.001
Milk has a lot of goodness such as protein, vitamins and minerals	73.9 (18.4)	87.4 (8.80	71.7 (20.4)	20.128	0.001
People with lactose intolerance can drink small amounts of milk	22.6 (45.7)	19.7 (30.5)	23.8 (32.9)	19.243	0.001
Drinking a low fat milk is ok for adults with high blood cholesterol	25.6 (55.1)	41.4 (45.6)	30.8 (47.9)	16.741	0.002
You should only drink a low-fat milk when you're on a weight reducing diet	41.5 (41.5)	40.6 (36.4)	31.3 (52.5)	14.963	0.005
Adults over 65 need more milk than young adults	25.2 (44.9)	42.7 (38.5)	53.8 (27.1)	42.881	0.001
There are too many types of milk available	23.9 (24.4)	17.6 (26.4)	29.6 (34.6)	23.557	0.001
Milk tastes good	77.4 (6.0)	76.2 (7.5)	65.8 (18.3)	22.923	0.001
Milk should be the main part of a toddler's diet	60.7 (23.9)	71.1 (20.5)	78.8 (11.3)	22.270	0.001
Milk is good value for money	61.1 (23.5)	71.5 (11.3)	70.4 (5.8)	35.941	0.001
Women need more milk than men	57.7 (31.2)	61.6 (30.1)	57.5 (14.6)	49.267	0.001

Note: Percentage of Responses as "don't know" is given in brackets.
*df =4

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Table 7.21b. Percentage agreement with attitude statements in the follow up survey. Comparison by age-group

Attitude	% agree 16-30 y n=234	% agree 31-52 y n=240	% agree over 53 y n=245	Pearson Chi-Square *	P Value
Milk causes allergies in lot of children	30.3 (49.6)	30.8 (56.7)	44.1 (46.1)	20.750	0.001
Drinking milk is better than taking calcium supplements	67.1 (22.6)	73.6 (16.3)	58.8 (29.0)	13.249	0.010
I used to like milk as a child	77.4 (6.4)	70 (13.3)	64.1 (22.9)	27.079	0.001
Milk can cause high blood cholesterol	26.1 (52.1)	35.1 (44.8)	20.0 (51.4)	16.134	0.003
Milk is expensive compared to fizzy drinks	32.5 (14.1)	23.3 (15.8)	16.7 (21.6)	18.418	0.001
Milk provides energy	58.5 (28.2)	70.4 (18.3)	51.4 (36.3)	22.014	0.001
Milk is better for you than fizzy drinks	76.1 (12.0)	82.1 (12.5)	82.8 (16.4)	27.844	0.001
Milk has a lot of goodness such as protein, vitamins and minerals	74.4 (16.2)	86.7 (10.0)	71.8 (19.2)	18.521	0.001
Drinking a low fat milk is ok for Adults with high blood cholesterol	25.6 (56.4)	44.6 (44.2)	33.1 (46.5)	23.174	0.001
I only drink milk because I feel I should	21.4 (18.4)	17.1 (13.8)	29.0 (9.8)	15.964	0.003
Adults over 65 need more milk than young adults	26.1 (44.4)	41.7 (38.3)	46.9 (27.3)	28.787	0.001
There are too many types of milk available	30.8 (18.4)	22.1 (24.2)	28.2 (32.7)	19.375	0.001
Milk tastes good	77.8 (4.7)	79.2 (8.8)	65.6 (16.8)	24.633	0.001
Milk should be the main part of a toddler's diet	55.6 (28.6)	66.7 (20.8)	74.7 (12.7)	22.778	0.001
Milk is good value for money	62.8 (17.5)	75.4 (10.8)	70.2 (6.9)	19.922	0.001
Women need more milk than men	48.5 (36.5)	56.3 (32.1)	57.1 (19.2)	26.406	0.001

Note: Percentage of Responses as "don't know" is given in brackets.
*df=4

7.15.3 Differences by education

In the baseline survey those without a university education were more concerned about bone growth and those with a technical or trade certificate felt more obliged to drink milk.

In the follow up survey non tertiary educated people agreed with the mistaken belief that 'milk is a good source of iron' and more highly educated people were concerned about drinking a low fat milk if you have a cholesterol problem.

Table 7.22a Percentage agreement with attitude statements in the baseline survey. Comparison by education

Attitude	% agree <3y sec school n=320	% agree >4y sec school n=108	% agree technical or trade cert n=91	% agree university qualification n=93	Pearson Chi-Square *	P Value
Milk is important for bone growth	93.8 (4.1)	94.4 (4.6)	90.1 (8.8)	86.0 (5.4)	17.774	0.007
I only drink milk because I think I should	24.7 (10.9)	26.9 (10.2)	40.7 (7.7)	14.0 (15.1)	18.265	0.006

Note: Percentage of Responses as "don't know" is given in brackets.
*df=6

Table 7.22b. Percentage agreement with attitude statements in the follow up survey. Comparison by education

Attitude	% agree <3y sec school n=82	% agree >4y sec school n=287	% agree technical or trade cert n=160	% agree university qualification n=150	Pearson Chi-Square *	P Value
Milk is a good source of iron	62.2 (29.3)	46.3 (30.7)	53.8 (34.4)	41.3 (41.3)	21.441	0.002
Drinking a low fat milk is OK for adults with high blood cholesterol	37.8 (52.4)	27.2 (51.6)	40.0 (47.5)	41.3 (46.0)	18.285	0.006

Note: Percentage of Responses as "don't know" is given in brackets.
*df=6

7.15.4 Differences by occupation

The trend for educated people to agree with the view that cholesterol is dangerous was confirmed by the finding that more people in the highest occupational group held this view.

Table 7.23. Percentage agreement with attitude statements in the follow up survey. Comparison by occupation

Attitude	% agree NZSEI 1-3 n=199	% agree NZSEI 4-6 n=170	% agree NZSEI 7-9 n=83	Pearson Chi-Square *	P Value
Milk can cause high blood cholesterol	33.8 (40.4)	23.5 (53.5)	24.1 (61.4)	13.651	0.008

Note: Percentage of Responses as "don't know" is given in brackets.
*df=4

7.15.5 Differences by ethnicity

NZ European and Maori respondents were more concerned about allergies (as already evidenced among people over 53 years) and bone growth (also important for the non tertiary educated) than Pacific Islands and Asian people. As with women respondents NZ European and Maori agreed that 'milk is better for you than fizzy drinks' and 'women need more milk than men'.

The Maori respondents agreed more that 'I only drink milk because I feel I should'. This obligation was predominantly a male belief and strongest among those with a trade or technical certificate.

As already seen among men, refreshment was found to be more important for Pacific Island respondents.

Table 7.24a. Percentage agreement with attitude statements in the baseline survey. Comparison by ethnicity

Attitude	% agree NZ European n=447	% agree NZ Maori n=91	% agree Pacific Islands n=99	% agree Asian n=73	Pearson Chi-Square *	P Value
Milk causes allergies in a lot of children	37.8 (52.6)	44.0 (48.4)	32.3 (59.6)	30.1 (43.8)	22.735	0.001

Note: Percentage of Responses as "don't know" is given in brackets.
*df=6

Table 7.24b. Percentage agreement with attitude statements in the follow up survey. Comparison by ethnicity

Attitude	% agree NZ European n=420	% agree NZ Maori n=102	% agree Pacific Islander n=122	% agree Asian n=64	Pearson Chi-Square *	P Value
Milk is important for bone growth	93.1 (4.5)	95.1 (2.0)	85.4 (10.6)	85.9 (4.7)	18.491	0.005
Milk is better for you than fizzy drinks	84.7 (10.0)	81.4 (16.7)	70.7 (22.0)	73.4 (14.1)	22.135	0.001
I only drink milk because I feel I should	21.0 (11.0)	28.4 (14.7)	24.4 (24.4)	20.3 (9.4)	21.373	0.002
Milk is refreshing	53.8 (14.3)	52.9 (7.8)	72.4 (6.5)	56.3 (10.9)	18.906	0.004
Women need more milk than men	58.8 (24.0)	53.9 (32.4)	40.2 (43.4)	53.1 (29.7)	19.360	0.004

Note: Percentage of Responses as "don't know" is given in brackets.
*df=6

7.16 Predictors of attitudes and beliefs about milk

Demographic predictors for the attitudes: 'people with lactose intolerance can drink small amounts of milk', 'milk causes allergies in a lot of children', 'I only drink milk because I feel I should', and 'milk can cause high blood cholesterol' are shown in Figures 7.3-7.6. These results are from the baseline survey. Findings were broadly similar in the follow up survey, which are shown in Appendix 7.1-7.4.

7.16.1 Prediction of 'people with lactose intolerance can drink small amounts of milk'

Only 22% of respondents agreed that 'people with lactose intolerance can drink small amounts of milk'. The strongest demographic predictor was sex. Thirty three percent of the men and 11% of the women agreed (Figure 7.3). Age was the strongest predictor for men. Agreement was significantly higher in men under 30 years (35%) than in men 31 to 52 years (27%) and men over 53 years (17%).

Figure 7.3 Demographic predictors of 'people with lactose intolerance can drink small amounts of milk' in the baseline survey.

'people with lactose intolerance can drink small amounts of milk'

A=Agree
?=Don't know
D=Disagree   N=713

Sex

x^2=74.03 P=7.7e-18 df=1

Men n=349

A=33.24%
?=38.97%
D=27.79%

Women n=364

A=11.26%
?=33.79%
D=54.95%

Age

x^2=14.90 P=.00058 df=2

16-30 years

A=35.14%
? =47.75%
D=17.12%

N=111

31-52 years

A=27.27%
? =28.93%
D=41.03%

N=121

Over 53 years

A=17.12%
? =43.80%
D=21.37%

N=117

7.16.2 Prediction of 'milk causes allergies in a lot of children'

More than 35% of respondents agreed that 'milk causes allergies in a lot of children'. The findings showed that age (53 years and over) was the strongest predictor for agreement with this statement (Figure 7.4). Agreement increased across the age groups.

Figure 7.4 Demographic predictors of 'milk causes allergies in a lot of children' in the baseline survey.

'milk causes allergies in a lot of children'

A=Agree
?=Don't know
D=Disagree   N=713

Age

x^2=25.94 P=2.3 e-6 df=1

16-30 years	31-52 years	Over 53 years
A=30.77%	A=33.89%	A=46.25%
? =50.00%	? =57.32%	? =48.75%
D=19.23%	D=8.79%	D=5.00%
N=234	N=239	N=240
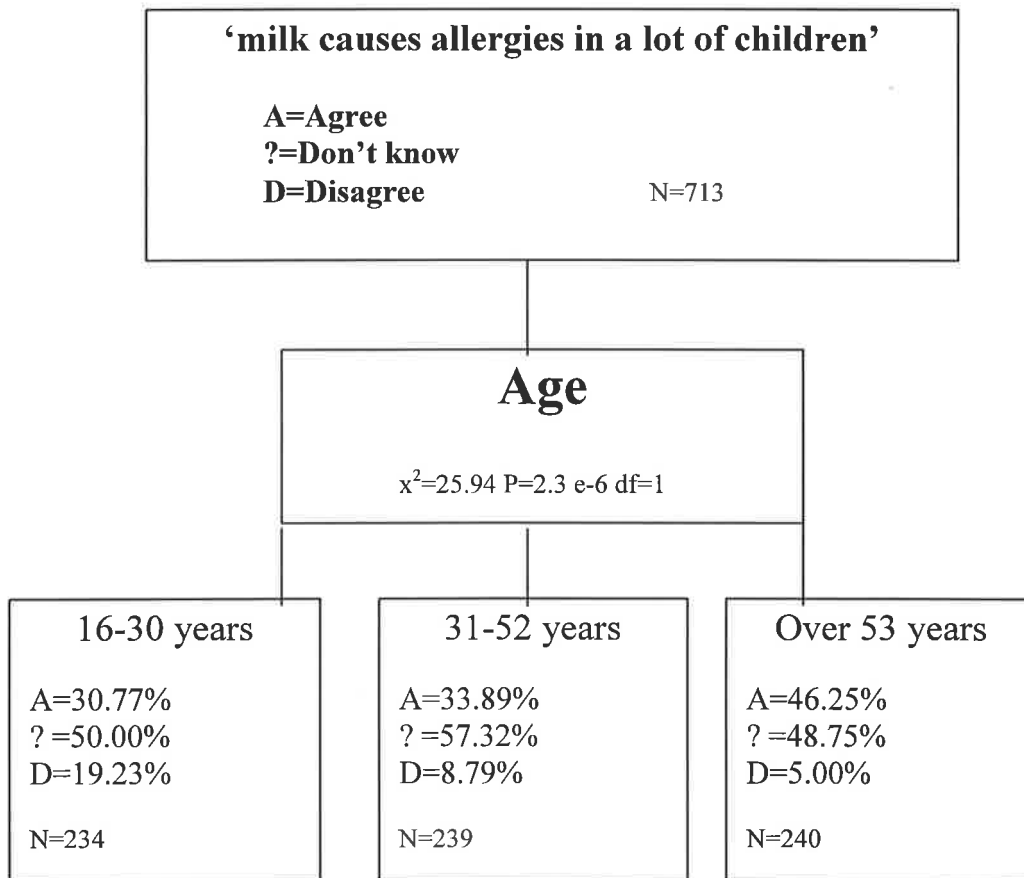
7.16.3 Prediction of 'I only drink milk because I feel I should'

Over 24% of respondents agreed that 'I only drink milk because I feel I should'. The best predictor for agreement was sex (Figure 7.5). There were significantly more men (30%) than women (18%) who agreed. Age was the strongest predictor for both men and women. Men over 53 years (49%) felt more obliged to drink milk than younger men. Conversely women under 53 years (22%) felt more obliged to drink milk than women over 53 years (10%). Age and sex were also the main predictors of this attitude in the follow up survey (Appendix 7.3).

Figure 7.5 Demographic predictors of 'I only drink milk because I feel I should' in the baseline survey.

'I only drink milk because I feel I should'
A=Agree
?=Don't know
D=Disagree   N=713

Sex
x^2=15.08 P=0.0001 df=1

Men n=349

A=30.37%
?=11.46%
D=58.17%

Women n=364

A=18.13%
?=11.26%
D=70.60%

Age
x^2=25.77 P=7.7 e-7 df=1

Age
x^2=8.90 P=0.0057 df=1

16-52 years

A=21.12%
? =12.50%
D=66.38%

N=232

Over 53 years
A=48.72%
? =9.40%
D=41.88%

N=117

16-52 years

A=22.41%
? =11.20%
D=66.39%

N=241

Over 53 years
A=9.76%
? =11.38%
D=78.86%

N=123
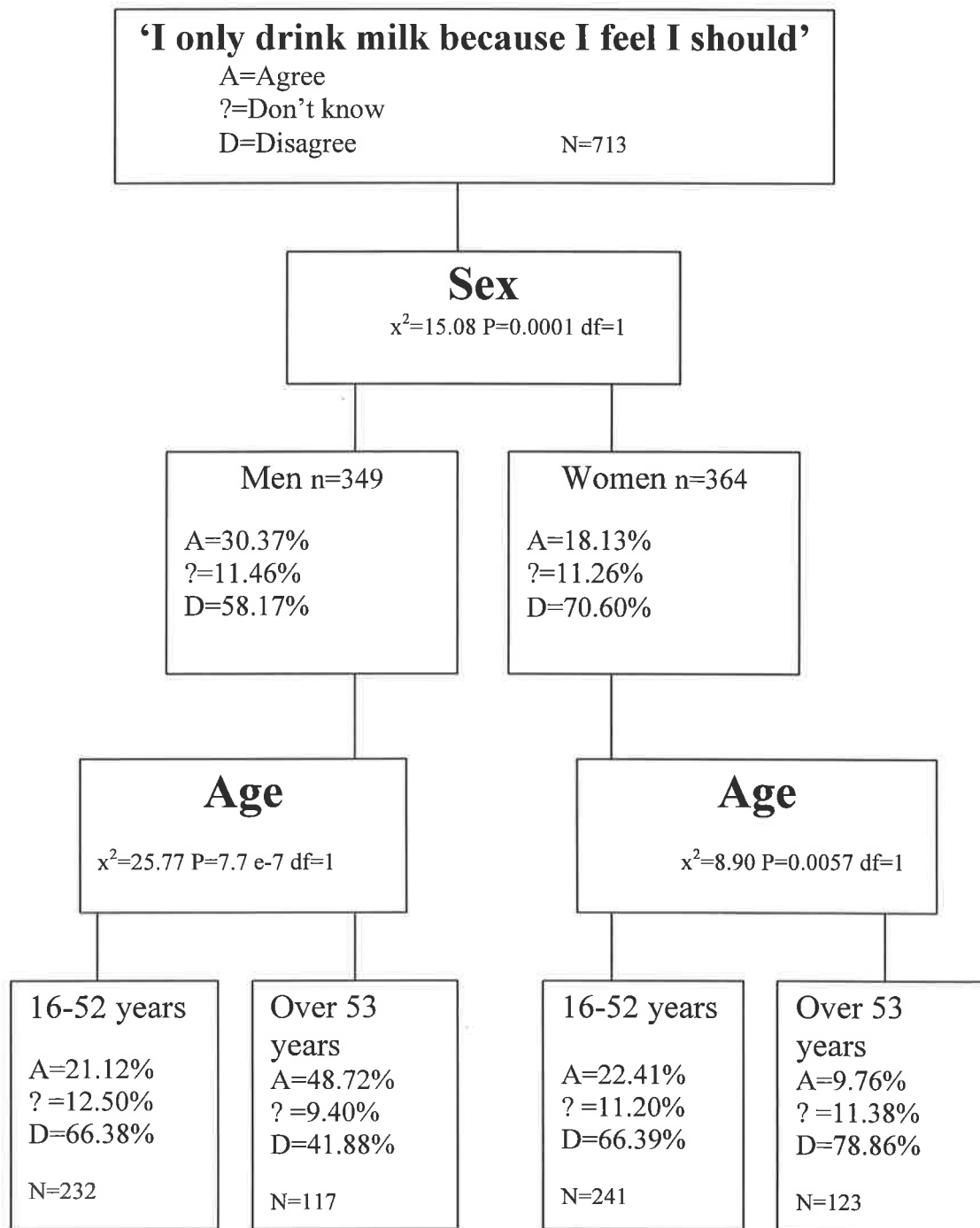
7.16.4 Prediction of 'milk can cause high blood cholesterol'

The demographic predictors of 'milk can cause high blood cholesterol' in the baseline survey are shown in Figure 7.6. Similar findings were found in the follow up survey (Appendix 7.4).

The strongest demographic predictor in both surveys was age. Middle age respondents (31 to 52 years) agreed significantly more than the other age groups that 'milk can cause high blood cholesterol'.

Figure 7.6 Demographic predictors of 'milk can cause high blood cholesterol' in baseline survey

'milk can cause high blood cholesterol'
A=Agree
?=Don't know
D=Disagree N=718

Age
$x^2=11.59$ P=0.003 df=2

16-30 years	31-53 years	54+ years
A=26.07%	A=35.15%	A=20.00%
?=6.84%	? =7.11%	? =10.61%
D=67.09%	D=57.74%	D=69.39%
N=234	N=239	N=245
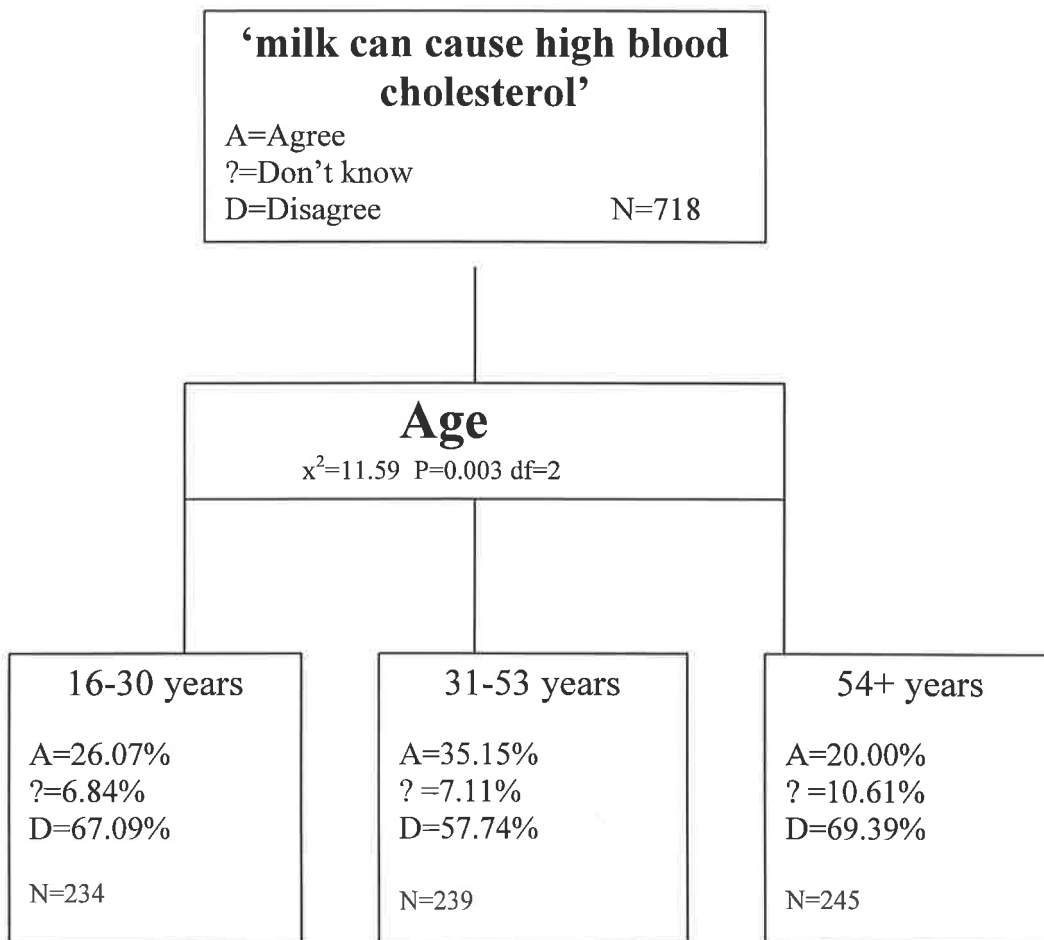
7.16.5 Prediction of 'all milk is high in fat'

The attitude predictors of 'all milk is high in fat' in the baseline survey are shown in Figure 7.7. The predictors were similar in the follow up survey (Appendix 7.5).

The strongest attitude predictor in both surveys was 'fruit juice is better for you than milk'. The findings showed that 33% of those who agreed that 'all milk is high in fat' or were not sure also agreed that 'fruit juice is better for you than milk'. Only 21% of those who disagreed that 'all milk is high in fat' agreed that fruit juice is better for you.

The best predictor of those who agreed with the statement 'fruit juice is better for you than milk' or were not sure was 'I only drink milk because I feel I should'. Forty one percent of respondents agreed that they felt obliged to drink milk.

Of those who disagreed that 'fruit juice is better for you than milk' the best predictor was 'milk is expensive compared to fizzy drinks'. Thirty three percent of respondents agreed or were unsure.

For those respondents who disagreed that 'milk is expensive compared to fizzy drinks' the best predictor was respondents who disagreed that 'women need more milk than men'.

Figure 7.7 Attitude predictors of 'all milk is high in fat" in baseline survey

'**All milk is high in fat**'
A=Agree
?=Don't know
D=Disagree
        N=711

'**fruit juice is better for you than milk**' x^2=14.80 P=0.00024 df=1

Agree / Not sure

A=32.83%
?=19.22%
D=47.95%
N=463

Disagree

A=20.56%
?–17.74%
D=61.69%
N=248

'**I only drink milk because I feel I should**' x^2=7.45 p=0.013 df=1

'**milk is expensive compared to fizzy drinks**' x^2=10.43 p=0.0025 df=1

Agree

A=41.03%
?=22.22%
D=36.75%

N=117

Not sure / Disagree

A=30.06%
?=18.21%
D=51.73%

N=346

Agree / Not sure

A=32.89%
?=18.42%
D=48.68%

N=76

Disagree

A=15.12%
?=17.44%
D=67.44%

N=172

'**women need more milk than men**' x^2=6.55 p=0.021 df=1

Agree

A=9.89%
?=14.29%
D=75.82%

N=91

Not sure / Disagree

A=20.99%
?=20.99%
D=58.02%

N=81

7.16.6 Attitudinal predictors of sex differences

Figure 7.8 shows a summary of the most predictive sex differences in attitudes in the baseline survey. Similar findings were found in the follow up survey (Appendix 7.6).

The findings show that 'people with lactose intolerance can drink small amounts of milk' is the attitude that shows the greatest significant difference in agreement by sex. Most of the men agreed with this statement (74%) but most of the women (67%) disagreed with it.

The best attitude predictor of those who agreed (74% men) that 'people with lactose intolerance can drink small amounts of milk' is 'drinking milk is better than taking calcium supplements'. More men than women agreed with this statement.

The best predictor of those who responded 'don't know' to 'people with lactose intolerance can drink small amounts of milk' was 'milk is better for you than fizzy drinks'. Fifty six percent of women agreed compared to 44% of men. 'It's important to drink milk on a weight reducing diet' was the best predictor of those who agreed (56% women).

Of those who disagreed that 'people with lactose intolerance can drink small amounts of milk' (67% women), the best predictor was 'women need more milk than men'. Sixty eight percent of women agreed compared to only 32% of men.

Figure 7.8 Attitudinal predictors of sex differences in attitudes in the baseline survey

Sex
M= men n=349
W= women n=364
N=713

'people with lactose intolerance can drink small amounts of milk' x^2=74.14 P=7.9e-17 df=2

Agree
Men=73.89%
Women=26.11%
N=157

Not sure
Men=52.51%
Women=47.49%
N=259

Disagree
Men=32.66%
Women=67.34%
N=297

'drinking milk is better than taking calcium supplements' x^2=14.67 p=0.00025 df=1

'milk is better for you than fizzy drinks' x^2=29.35 p=1.2e-7 df=1

'women need more milk than men' x^2=21.59 p=2.0e-5 df=2

Agree
M=63.04%
W=36.96%
N=92

Not sure / Disagree
M=89.23%
W=10.77%
N=65

Agree
M=44.44%
W=55.56%
N=207

Not sure / Disagree
M=84.62%
W=15.38%
N=52

Agree
M=31.84%
W=68.16%   N=179

Not sure
M=55.56%
W=44.44%   N=54

Disagree
M=15.63%
W=84.38%   N=64

'it's important to drink milk on a weight reducing diet' x^2=6.67 p=0.019 df=1

Agree / Not sure
M=49.67%
W=50.33%
N=153

Disagree
M=29.63%
W=70.37%
N=54

PART 4: PERCEPTIONS OF MILK ADVERTISING

Key points

- Recall for TV advertising of milk over the study period was the highest for the advertisement featuring rugby player Michael Jones. The recall was highest amongst men, those under 30 years, and Maori and Pacific Islanders. The highest brand recall for TV advertising was for Anchor (featuring Michael Jones).

- Interest in the Michael Jones advertising was significantly higher in men and amongst those with lower occupational status. Non-European women had more interest in the advertising than European women did. Respondents who found the advertising of personal interest reported using more milk than a year earlier.

- Half (49%) of the respondents who recalled the Michael Jones advertising agreed that the main message in the advertisement was that 'milk is healthy/good for you'.

- Heavy milk consumers who liked the advertising were more of the view that lactose intolerant people can drink milk and they liked milk as children. Light to moderate milk drinkers perceived milk to be good value for money but expensive compared to soft drinks. Men who were Michael Jones supporters agreed more than women that milk is good value for money.

- A third of the respondents (more men and those under 53 years) claimed that they were using more milk than a year earlier. However, more women than men reported using less milk. Respondents who used less milk than a year earlier and who liked the advertising were more of the view that milk is the main part of a toddler's diet. Men supported this view more than women.

7.17 Recall of TV advertising of milk

Approximately twenty percent (19.7%) of respondents were able to spontaneously recall TV advertising for the rugby player Michael Jones, 15.6% for Anchor, 1.9% for a rugby player and 1.1% for Tararua.

Half of the respondents (49.8%) were not able to recall any advertising and 7.6% recalled advertising for the Dairy Advisory Bureau advertisement "The bone woman".

Figure 7.9 Percentage spontaneous recall for any recent TV advertising related to milk.
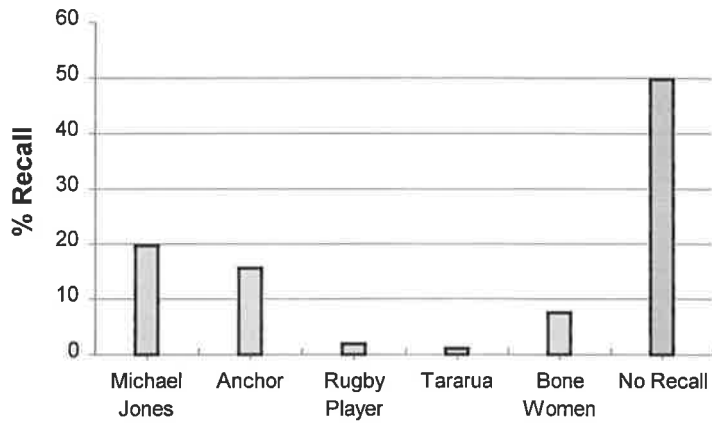
Significantly more men (21.5%) than women (17.8%) were able to recall advertising for Michael Jones. However 3.8% of women spontaneously recalled advertising for a rugby player who might have been related to either the Anchor or Tararua advertising.

Figure 7.10 Percentage spontaneous recall for any recent TV advertising related to milk. Comparison by sex (X^2=18.016, p=0. 006, df=6).
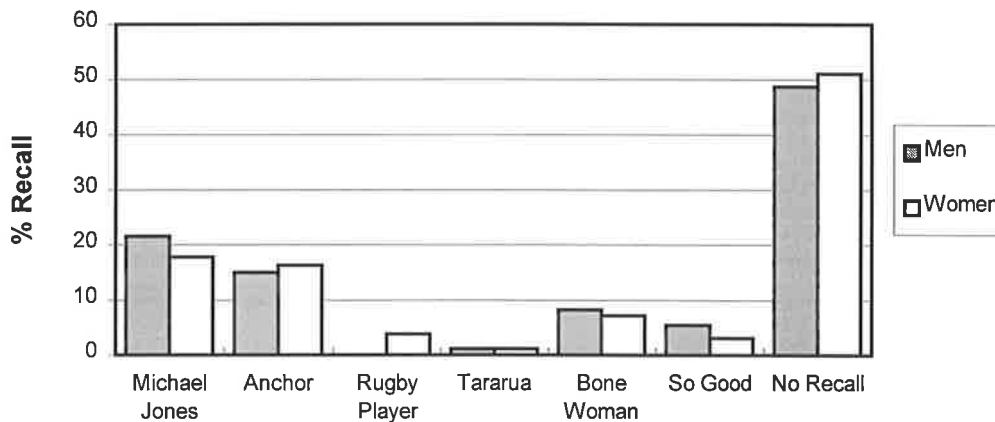
Among the age groups, the highest recall for recent TV advertising related to Michael Jones was among those aged 16 to 30 years (23.1%) and those aged 31 to 52 years (21.7%). The recall for the Michael Jones advertisement was significantly lower in those over 53 years (14.7%). 'No recall' for milk advertising was higher in those over 53 years (58.4%) compared to other age groups (47.5% for those aged 31 to 52 years and 43.2% for those aged 16 to 30 years).

Figure 7.11 Percentage spontaneous recall for any recent TV advertising related to milk. Comparison by age group (X^2=25.408, p=0. 013, df=12).
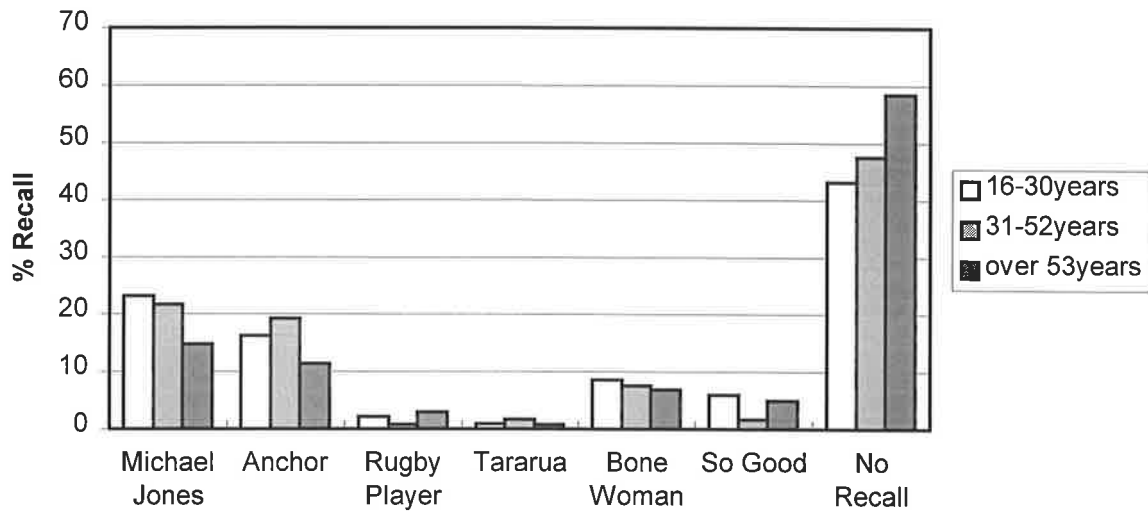
There was significantly less recall of the advertisement for Michael Jones amongst NZ Europeans (16.7%) compared to non-Europeans (26.5% for Maori, 22% for Pacific Islands and 26.6% for Asian people). Recall of Anchor advertising was highest amongst Pacific Islands people (22.8%). There were significantly more NZ Europeans (54.8%) and Maori (49%) who had no recall of milk advertising compared to Pacific Islands and Asian people (38.2% and 42.2% respectively).

Figure 7.12 Percentage spontaneous recall for any recent TV advertising related to milk. Comparison by ethnicity. (X^2=33.465, p=0. 015, df=18).
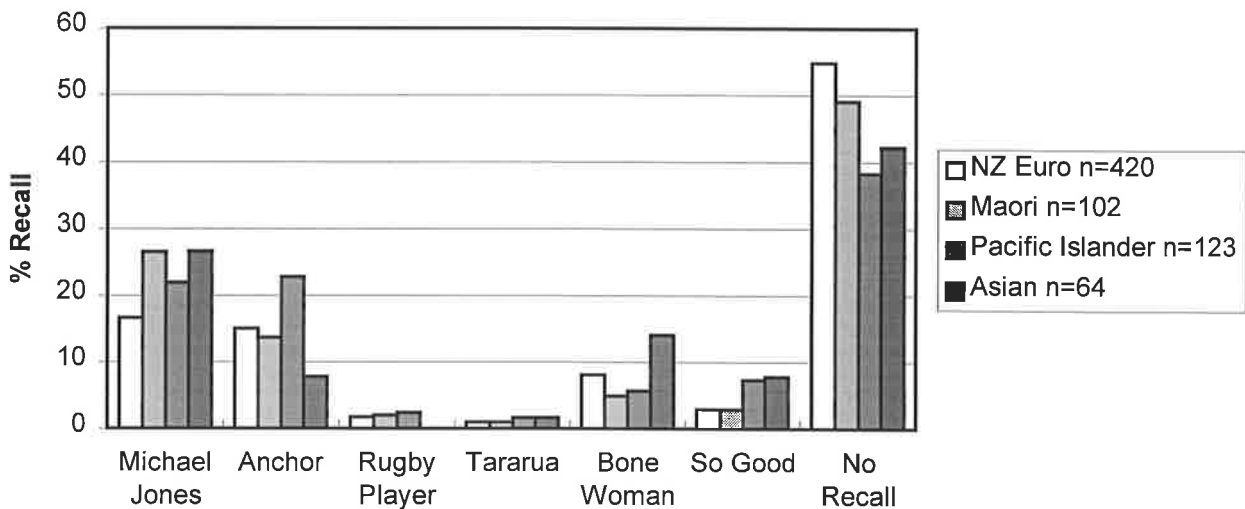
Of the 719 respondents surveyed, only 100 (14%) spontaneously recalled a brand for TV advertising related to milk. The majority of the brand recall was for Anchor (13% of total sample).

Of those who were able to recall TV advertising of milk, 44.4% could not recall the brand being advertised, 52.2% recalled the Anchor brand, 2.2% recalled So Good and 0.6% recalled Tararua or Dairy Goodness.

Figure 7.13 Percentage recall of brand being advertised.
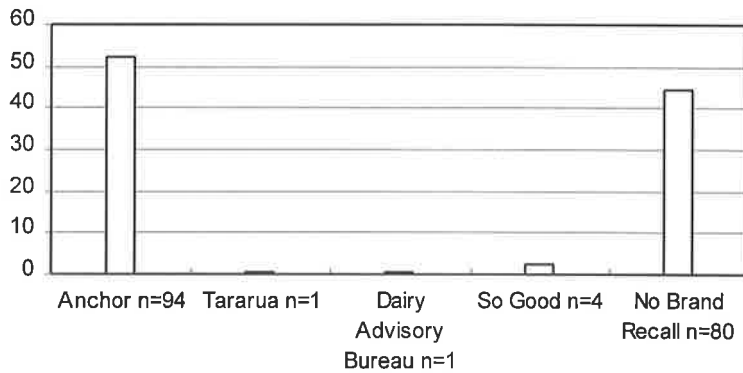
Eighty three percent of respondents were able to recall the Anchor brand for advertising related to Michael Jones, related to 'Anchor' advertising (12.3%) and related to a rugby player (4.3%).

The 'Dairy Goodness' brand was recalled correctly for advertising of 'The bone woman' but was incorrect for advertising of the Tararua brand.

Figure 7.14. Percentage recall of brand for TV advertisement for milk. (X^2=241.096, p=0. 001, df=20)
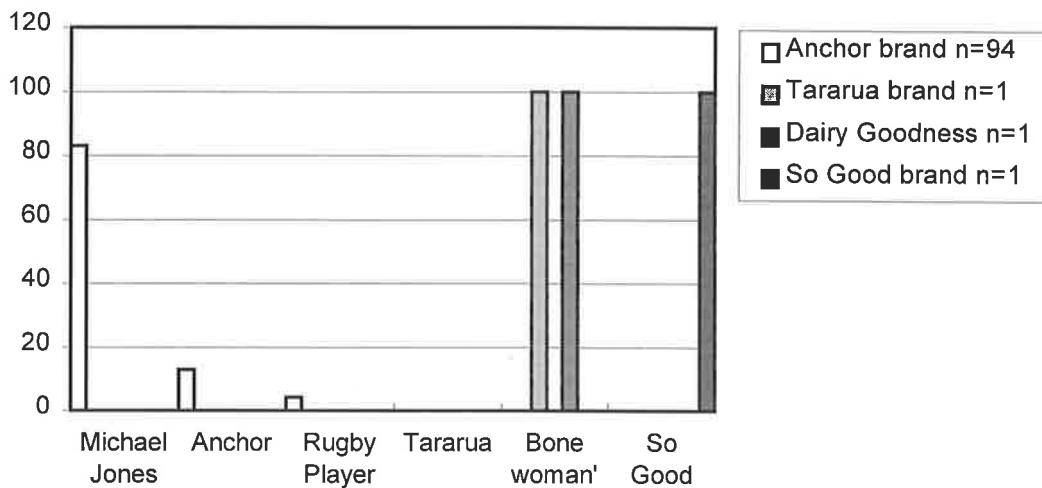
The Anchor brand was the number one brand to be recalled by 76.5% of respondents. Prompted recall for the Tararua brand was second (47.2%) and the Dairy Goodness (Dairy Advisory Bureau advertising) was third (46.6%).

Figure 7.15 Percentage order of prompted brand recall for Anchor, Tararua and Dairy Goodness.
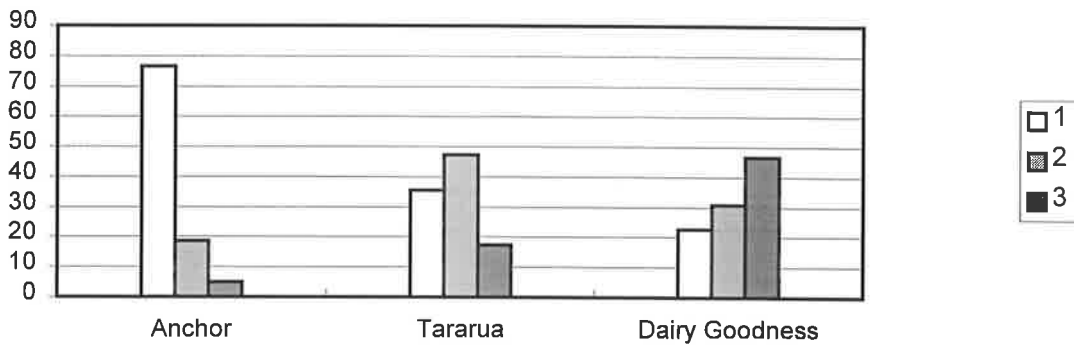
7.18 Interest in the Michael Jones TV advertising

7.18.1 Demographic predictors

Figure 7.16 shows that sex was the strongest demographic predictor of interest in the Michael Jones advertising. There were significantly more men (74%) than women (54%) who had personal interest in the advertising.

Ethnicity was the best predictor of interest in the advertising among women. There were significantly more Maori, Pacific Islands and Asian women (69%) with interest in the advertising compared to European women (40%). There was no difference in response to personal interest amongst the women when ethnicity was recoded to exclude Asian respondents, except that the probability value was slightly higher (p=0.0083)

Figure 7.16 Demographic predictors of interest in the Michael Jones advertising

Personal interest in the advertising with Michael Jones   Yes/No
N=259

Sex
x^2=11.14 P=0.00084 df=1

Men

Yes=73.53%
No=26.47%

N=136

Women

Yes=53.66%
No=46.34%

N=123

Ethnicity
x^2=10.52 P=0.0047 df=1

NZ Euro

Yes=40.00%
N0=60.00%

N=65

Other

Yes=68.97%
No=31.03%

N=58
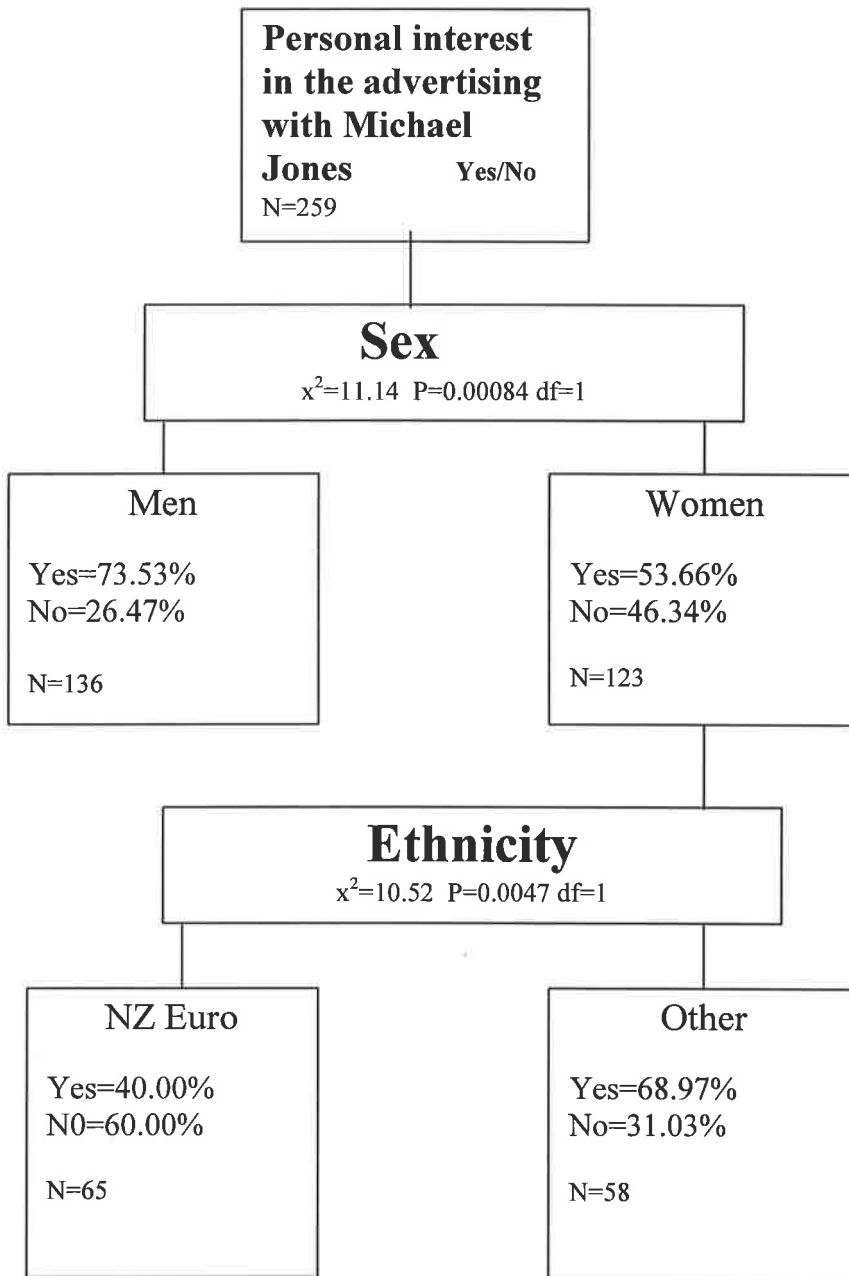
7.18.2 Interest in Michael Jones by occupation and milk usage

Of the respondents who recalled the TV advertising of Michael Jones, 64% found the advertisement of interest to them personally. The interest was higher among those of lower occupational status, NZSEI 7-9, (84.4% compared to 61.8% for NZSEI 4-6 and 40.8% for NZSEI 1-3).

Absence of interest in the Michael Jones advertising was higher in the highest occupational group, NZSEI 1-3, (40.8%) compared to the lower occupational groups.

Figure 7.17. Percentage of respondents finding advertising with Michael Jones of personal interest or of no interest. Comparison by occupation (x^2=6.605 P= 0.037 df=2).
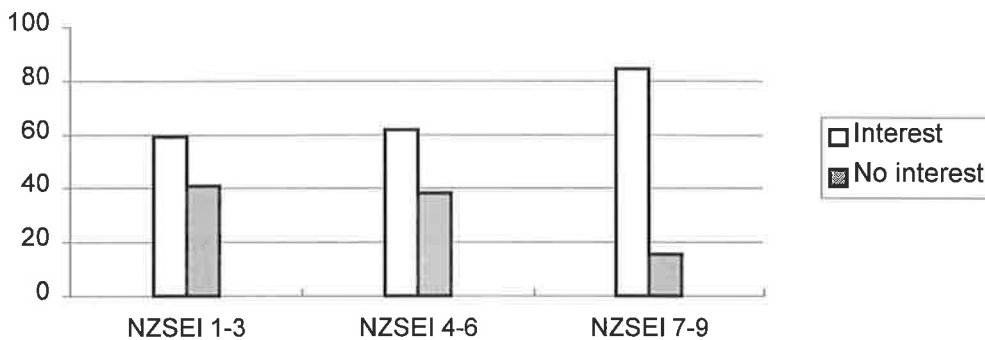
Respondents who found the Michael Jones advertising of personal interest used more milk than a year earlier (70%), compared to those who did not find the advertising of personal interest (30.3%).

Figure 7.18 Percentage of respondents finding advertising with Michael Jones of personal interest or of no interest. Comparison by change in usage of milk from one year (x^2=6.019 P=0.049 df=2).
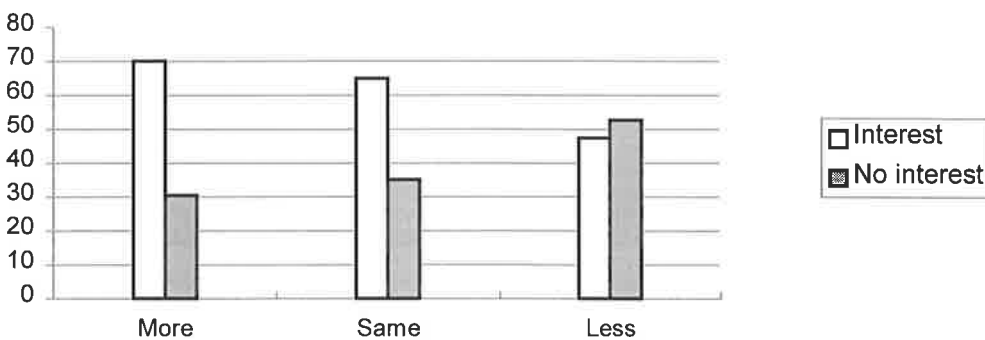
7.18.3 Main message of the Michael Jones advertising

Nearly half of the respondents (48.7%) who were able to recall the Michael Jones advertising agreed that the main message in the advertisement was that 'milk is healthy or good for you'. However, over a third (36.5%) agreed that the main message was 'milk is good for families'.

Table 7.25. Percentage agreement for the Main Message in the Michael Jones advertising.

Main Message	% agreement
Milk is healthy/good for you	48.7
Milk gives you energy	12.5
Milk is good for families	36.5
Don't know	2.3

7.18.4 Attitudes related to interest in Michael Jones

More respondents who found the Michael Jones advertising of personal interest agreed that people with lactose intolerance can drink milk and that low fat milk is acceptable for people with high cholesterol.

More of those with no interest in the Michael Jones advertising agreed that milk is better for you than fizzy drinks, is more important for children, is a good source of iron and is good on cereals and in drinks.

Table 7.26. Percentage agreement with attitude statements. Comparison with interest or no interest, in the Michael Jones advertising.

Attitude	% agree Interest	% agree No interest	Pearson Chi-Square *	P Value
Milk is better for you than fizzy drinks	69.1 (23.0)	81.7 (9.7)	7.148	0.028
Milk is more important for children than adults	58.4 (25.9)	63.4 (11.8)	8.503	0.014
Milk is a good source of iron	47.0 (38.6)	50.5 (24.7)	7.013	0.030
People with lactose intolerance can drink small amounts of milk	24.1 (44.6)	14.0 (40.9)	6.316	0.043
Drinking a low fat milk is ok for adults with high blood cholesterol	33.7 (53.6)	30.1 (44.1)	7.258	0.027
Milk is good added to cereals and drinks	78.9 (11.4)	91.4 (2.2)	8.178	0.017

Note: Percentage of responses as 'don't know" is given in brackets. *df=2

7.18.5 Attitudes related to interest in Michael Jones and daily milk consumption

Respondents, who found the Michael Jones advertising of personal interest, and who drank the most milk (> ½ L per day), agreed most with 'I used to like milk as a child', and 'people with lactose intolerance can drink small amounts of milk'.

Milk drinkers agreed more than non-milk drinkers that 'milk is a good source of iron', that 'milk is good added to cereals', 'milk is refreshing' and 'milk is good value for money'. Non-milk drinkers were more uncertain about these statements.

Non-milk drinkers agreed the least that 'milk is expensive compared to fizzy drinks'.

Table 7.27. Percentage agreement with attitude statements. Comparison with interest in the Michael Jones advertising and daily milk consumption.

Attitude	% agree <1/4 L per day	% agree ¼ to ½ L per day	% agree > ½L per day	% agree none at all	Pearson Chi-Square *	P Value
I used to like milk as a child	68.8 (16.7)	68.8 (18.2)	72.4 (24.1)	16.7 (33.3)	19.526	0.003
Milk is expensive compared to fizzy drinks	45.8 (6.3)	37.7 (13.0)	27.6 (10.3)	8.3 (66.7)	32.176	0.001
All milk is high in fat	27.1 (43.8)	18.2 (31.2)	41.4 (20.7)	41.7 (16.7)	13.013	0.043
Milk is a good source of iron	50.0 (41.7)	50.6 (40.3)	44.8 (27.6)	16.7 (41.7)	16.184	0.013
People with lactose intolerance can drink small amounts of milk	20.8 (47.9)	22.1 (49.2)	41.4 (34.5)	8.3 (25.0)	12.832	0.046
Milk is good added to cereals and drinks	85.4 (4.2)	83.1 (10.4)	72.4 (13.8)	41.7 (41.7)	16.661	0.011
Milk is refreshing	58.3 (4.2)	74.0 (7.8)	58.6 (10.3)	33.3 (25.0)	13.598	0.034
Milk is good value for money	75.0 (4.2)	72.7 (9.1)	58.6 (27.6)	33.3 (58.3)	28.708	0.001

Note: Percentage of Responses as "don't know" is given in brackets.
*df=6

7.18.6 Attitudes related to interest in Michael Jones and usage of milk

More respondents with interest in the Michael Jones advertising, and who used more milk compared to a year earlier agreed that 'drinking milk is better than taking calcium supplements' and 'milk tastes good'. Those using less milk agreed that 'milk should be the main part of a toddlers diet'.

Table 7.28 Percentage agreement with attitude statements. Comparison with interest in the Michael Jones advertising and by usage of milk compared to one year earlier.

Attitude	Use more milk	Use same	Use less milk	Pearson Chi-Square *	P Value
Drinking milk is better than taking calcium supplements	82.5 (9.5)	65.9 (24.7)	66.7 (11.1)	9.625	0.047
Milk tastes good	82.5 (11.1)	78.6 (4.8)	61.1 (22.2)	9.512	0.050
Milk should be the main part of a toddler's diet	38.1 (41.3)	60.0 (20.0)	77.8 (22.2)	15.139	0.004

Note: Percentage of Responses as "don't know" is given in brackets.
*df=4

7.18.7 Attitudes related to interest in Michael Jones by sex

More women than men with interest in the Michael Jones advertising agreed that 'milk is better than taking calcium supplements'. More men than women agreed that 'I used to like milk as a child' and that 'milk is good value for money'.

Table 7.29 Percentage agreement with attitude statements. Comparison with interest in the Michael Jones advertising, by sex.

Attitude	Men with interest	Women with interest	Pearson Chi-Square *	P Value
Drinking milk is better than taking calcium supplements	65.0 (22.0)	83.3 (10.6)	6.673	0.036
I used to like milk as a child	71.0 (20.0)	57.6 (19.7)	6.275	0.043
Milk is good value for money	69.0 (8.0)	66.7 (24.2)	11.690	0.003

Note: Percentage of Responses as "don't know" is given in brackets.
*df=2

7.18.8 Usage of milk one year after the TV advertising

One third of the 719 respondents in the follow up survey claimed they were using more milk than about a year ago, 47% claimed they were using about the same and 20% claimed they were using less milk.

Table 7.30 Percentage usage of milk, compared to one year earlier

	Much more	A little more	Same	A little less	A lot less
% Usage	9.0	23.6	47.0	12.9	7.4

7.18.9 Usage of milk by sex

More men (35.3%) than women (30.1%) claimed to be using more milk. In contrast, more women (24.7%) than men (15.9%) reported using less milk. 10.7% of the women who used less milk claimed they used 'a lot' less compared to their male peers.

Figure 7.19 Percentage usage of milk, compared to one year ago. Comparison by sex (x^2=13.673 P=0.008 df=4).
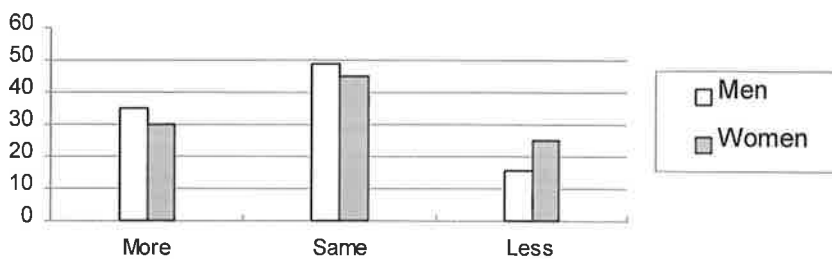
7.18.10 Usage of milk by age group

Over a third of young and middle aged people indicated they were using more milk compared to only 16.3% of those over 53 years.

Figure 7.20. Percentage usage of milk, compared to one year ago. Comparison by age group (x^2=62.260 P=0.0001 df=8).

170
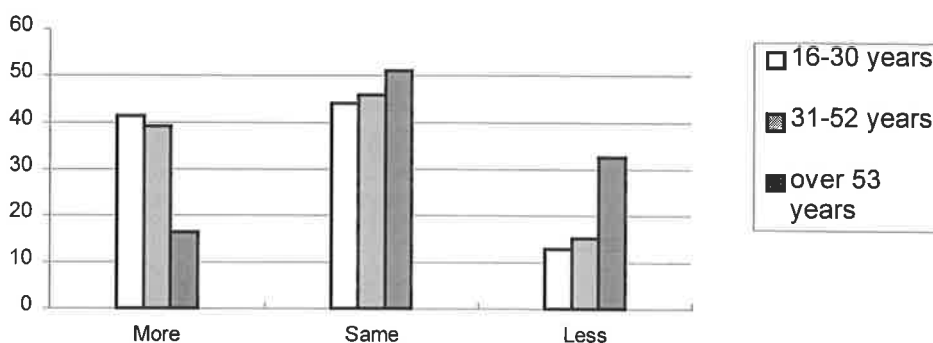
PART 5: CHANGES IN ATTITUDES AND BELIEFS

Key points

There were apparent changes in attitudes (beliefs) in the follow up survey (compared to the baseline survey) reflecting positive perceptions about the goodness and energy milk provides, concerns about fat, cholesterol, allergies and the cost of milk as well as the view that milk is not just for children. This was evidenced by more people who:

- Agreed that 'milk provides energy'
- Agreed that 'milk has a lot of goodness'
- Agreed that 'drinking a low fat milk is OK for adults with high blood cholesterol'
- Agreed that 'milk is expensive compared to fizzy drinks'
- Strongly agreed that 'milk causes allergies in a lot of children'
- Strongly agreed that 'all milk is high in fat'
- Disagreed that 'milk is more important for children than adults'

The apparent change amongst women was that more women:

- Agreed that 'milk provides energy'

More older women (over 53 years):

- Strongly agreed that 'all milk is high in fat'
- Strongly agreed that 'you should only drink a low fat milk when you're on a weight reducing diet'.

7.19 Changes in positive beliefs about milk

The significant changes in agreement to the attitude and belief statements between the baseline survey in October 1997 and the follow up survey in October 1998 are shown in the following tables at an alpha level of 0.01or beyond. Total responses for agreement to attitudes and beliefs between the two surveys are shown in Appendix 7.7.

In the follow up survey (compared to the baseline survey) more people:

- Agreed that 'milk provides energy' (60 vs 55%)
- Strongly agreed that 'milk has a lot of goodness' (28 vs 23%)
- Agreed that 'drinking a low fat milk is OK for adults with high cholesterol' (35 vs 30%)

Table 7.31 Changes in percentage agreement to positive attitude statements

Attitude	AA	A	?	D	DD	X^2	P value
Milk provides energy	15.1	39.7	32.7	10.9	1.5	14.134	0.007
	22.4	*37.7*	*27.7*	*10.2*	*2.1*		
Milk has a lot of goodness such as protein, vitamins and minerals	23.4	54.3	15.8	6.3	.1	24.046	0.001
	28.1	*49.5*	*15.2*	*4.5*	*2.8*		
Drinking a low fat milk is ok for adults with high blood cholesterol	7.4	22.7	48.9	15	5.8	13.491	0.009
	8.2	*26.3*	*49.0*	*9.2*	*7.4*		

Note: The percentage of responses from the follow up survey is given in italics.
AA = Strongly agree, A = Agree, ? = Don't know, D =Disagree, DD =Strongly disagree

7.20 Changes in negative beliefs about milk

In the follow up survey (compared to the baseline survey) more people:

- Agreed that 'milk is expensive compared to fizzy drinks' (24 vs 16%)
- Strongly agreed that 'milk causes allergies in a lot of children' (7.5 vs 5.3%)
- Disagreed that 'milk is more important for children than adults' (18 vs 10%)
- Strongly agreed that 'all milk is high in fat' (4.6 vs 1.8%)

Table 7.32 Changes in percentage agreement to negative attitude statements.

Attitude	AA	A	?	D	DD	X^2	P value
Milk is expensive compared to fizzy drinks	3.6	12.5	20.5	48.8	14.6	16.681	0.002
	7.4	*16.7*	*17.2*	*44.8*	*13.9*		
All milk is high in fat	1.8	26.6	18.7	44.7	7.9	14.133	0.007
	4.6	*23.0*	*21.6*	*41.3*	*9.5*		
Milk causes allergies in lot of children	5.3	31.7	52	10.5	.4	22.763	0.001
	7.5	*27.7*	*50.8*	*10.4*	*3.6*		
Milk is more important for children than adults	27.9	42.4	15.1	10.2	4.3	13.507	0.009
	31.5	*30.8*	*17.5*	*18.4*	*1.8*		

Note: The percentage of responses from the follow up survey is given in italics.
AA = Strongly agree, A = Agree, ? = Don't know, D =Disagree, DD =Strongly disagree

7.21 Changes in beliefs about milk among women

The apparent changes in beliefs among women related to nutritional concerns about energy and goodness (as already evidenced among those in the middle age group), allergies (where those over 53 years were shown to be strong predictors) and uncertainty about the milk needs of children. In the follow up survey (compared to the baseline survey) more women:

- Agreed that 'milk provides energy' (64 vs 58%)
- Strongly agreed that 'milk has a lot of goodness' (35 vs 30%)
- Strongly agreed that 'milk causes allergies in a lot of children' (10 vs 6.6%)
- Were uncertain (?) that 'milk is more important for children than adults' (18 vs 13%)

There were no significant changes in nutrition beliefs between the two surveys among the men.

Table 7.33 Changes in percentage agreement with attitude statements among women.

Attitude	AA	A	?	D	DD	X^2	P value
Milk provides energy	13.2	45.3	32.7	7.7	1.1	16.785	0.002
	24.7	*39.2*	*26.8*	*7.7*	*1.6*		
Milk has a lot of goodness such as protein, vitamins and minerals	29.9	51.6	13.5	4.5	0.3	12.628	0.013
	35.3	*46.0*	*13.4*	*2.5*	*2.7*		
Milk causes allergies in lot of children	6.6	29.9	55.2	7.7	0.5	12.015	0.017
	10.1	*25.2*	*52.3*	*9.0*	*3.3*		
Milk is more important for children than adults	32.0	33.1	13.8	21.2	0	12.021	0.017
	35.2	*26.4*	*18.1*	*18.7*	*1.6*		

Note: The percentage of responses from the follow up survey is given in italics.
AA = Strongly agree, A = Agree, ? = Don't know, D =Disagree, DD =Strongly disagree

7.22 Changes in beliefs about milk among women over 53 years

There were apparent changes in beliefs of older women. In the follow up survey (compared to the baseline survey) more women over 53 years:

- Strongly agreed that 'all milk is high in fat' (4 vs 0%)
- Strongly agreed that 'you should only drink a low fat milk when you're on a weight reducing diet' (11 vs 1%)

Table 7.34 Changes in percentage agreement with attitude statements among women over 53 years

Attitude	AA	A	?	D	DD	X²	P value
All milk is high in fat	0	25.2	11.4	63.4	0	13.353	0.010
	4.1	*19.5*	*13.0*	*57.7*	*5.7*		
You should only drink a low-fat milk	0.8	31.7	48.0	16.3	3.3	14.180	0.007
when you're on a weight reducing diet	*11.4*	*25.2*	*43.9*	*13.0*	*6.5*		

Note: The percentage of responses from the follow up survey is given in italics.
AA = Strongly agree, A = Agree, ? = Don't know, D =Disagree, DD =Strongly disagree

7.23 Evidence for reliability

To check the overall reliability of the data the mean scores for the attitude items in the baseline and follow up surveys were correlated.

The Pearson correlation coefficient was r = 0.937 (p = 0.0001).

Table 7.35 Means scores for attitude statements in the baseline and follow up surveys

	Baseline survey	Follow up survey
Milk tastes good	2.14	2.10
Milk is refreshing	2.77	2.60
There are too many types of milk available	3.33	2.60
Milk is good added to cereals and drinks	1.97	1.88
I used to like milk as a child	2.21	2.19
Milk is expensive compared to fizzy drinks	3.58	3.41
Milk is good value for money	2.36	2.31
Milk causes allergies in lot of children	2.69	2.75
Milk is important for bone growth	1.60	1.58
Milk can cause high blood cholesterol	2.89	2.98
Milk is better for you than fizzy drinks	1.87	1.89
Fruit juice is better for you than milk	2.95	3.07
Drinking milk is better than taking calcium supplements	2.30	2.17
I only drink milk because I feel I should	3.55	3.56
Milk is a good source of calcium	1.62	1.64
Milk has a lot of goodness such as protein, vitamins and minerals	2.06	2.04
People with lactose intolerance can drink small amounts of milk	3.34	3.28
Milk provides energy	2.44	2.38
All milk is high in fat	3.30	3.28
Drinking low fat milk is ok for adults with high blood cholesterol	2.86	2.81
It's important to drink milk on a weight reducing diet	3.05	3.04
You should only drink a low-fat milk on a weight reducing diet	2.78	2.76
Regular Milk (Blue Top) is high in fat	2.55	2.58
Adults over 65 need more milk than young adults	2.70	2.77
Women need more milk than men	2.38	2.45
Milk should be the main part of a toddler's diet	2.07	2.20
Milk is more important for children than adults	1.64	2.28

Chapter 8

General Practitioner Survey

In this chapter I will review the role that general practitioners (GPs) have as health and nutrition information providers and the studies that have been undertaken to estimate the image of milk and milk products among GPs and other health professionals. I will then outline the methods and results of the survey that was undertaken in this thesis to investigate GPs' views about milk and their opinions about the suitability of milk for different age groups. A discussion of the survey findings and the implications of these findings in terms of declining milk consumption will follow.

8.1 Introduction

General Practitioners (GPs) are perceived as the best source of health information, the most credible source, and after the media, the source that is most often used by consumers (Worsley, 1989; Hiddink, Hautvast & van Woerkum, 1997). It is believed that GPs should play a decisive role as nutrition educators as they may increase the nutrition knowledge of their patients and modify their attitudes and beliefs to food and nutrition (Hiddink et al, 1997).

It is generally considered that GPs do not give enough nutrition information to their patients and their nutrition knowledge is often poor (Serra-Majem, Calvo & Male, 1999). The degree of dietary counseling GPs provide depends on their interest in the role of diet on health, their perception of their task and their beliefs about the ability and willingness of patients to change their dietary habits (Hiddink, Hautvast, van Woerkum, 1995).

In New Zealand, nutrition education for medical students has until recently been very limited (Mann, 1999). Prior to 1996, the teaching of nutrition in one of New Zealand's two medical schools was confined to one half-day during the Biochemistry course and to 12 lectures scattered throughout the Pathology course. As a result many GPs do not have the appropriate expertise to provide sound nutrition information to their patients.

The nutrition information needs of a random sample of 1000 New Zealand GPs were examined in a postal survey in 1988 (Worsley and Worsley, 1991). Three short questionnaires were administered, one to each third of the sample. A response rate of 78% was attained. Of 252 GPs who completed the questionnaire about nutrition issues 74% strongly believed that over-consumption of fat, salt, sugar and or energy were the major problems in the New Zealand diet (Worsley and Worsley, 1991). Their main recommendation to patients was to eat less fat (39% of GPs).

In New Zealand, coronary heart disease (CHD) is the leading cause of death. Public health authorities place much emphasis on risk factor reduction (e.g. lowering total and saturated fat intake). The distribution of saturated fat intake from different food groups shows milk and milk products are one of the main contributors.

In their survey of the nutrition information and resource needs of 251 New Zealand GPs, Worsley and Worsley (1990) found that among six sources of nutrition information for patients the most often used were from the National Heart Foundation (55%) and the Health Department (17%). In contrast, less than 4% of the GP respondents often used nutrition pamphlets from the Dairy Advisory Bureau or the food industry. Although 89% of GPs wanted more patient information materials on topics such as calcium, the findings suggest that nutrition resources from industry appear to be regarded as suspect or biased.

In 1991, the Dairy Advisory Bureau commissioned research to determine the food and health attitudes of and advice given by health professionals. Special emphasis was placed on CHD and on the way in which health professionals viewed milk and milk products as contributors to health and disease (Colmar Brunton, 1991).

Telephone interviews were conducted with 150 respondents in each of four areas (Auckland, Wellington, Christchurch and Dunedin). The health professionals were from a range of disciplines involved in nutrition communication including general practitioners, nutritionists, health teachers, dietitians and practice nurses.

The survey revealed a number of negative health attributes associated with dairy products. These included: the fat content (49% of responses), high cholesterol (29%), high saturated fat (26%), cause of allergy/asthma (15%) and high energy content (12%). Only 3% of the sample perceived no negative health attributes.

When they were asked which part of the diet would be most likely to contribute to heart disease, 17% mentioned dairy products specifically. When further prompted, 5% answered milk, 9% butter and 8% cheese.

These findings highlight that New Zealand health professionals have particular concerns about the health attributes of dairy products including milk, which may be communicated to consumers.

In Denmark, like most Western countries, the main nutrition related health problems, obesity, CHD and cancer, also result in a call for a reduction in dietary fat. In 1991, the Danish Dairy Board initiated a strategy for nutrition communications directed at health opinion formers to counteract the influence of negative messages about milk fat. They wished to communicate the positive features of low fat milk products (Hølund, 1999).

In 1997 an evaluation study was undertaken. The purpose of this study was to identify the perceptions of milk products among influencers and to elucidate their attitudes to the Danish Dairy Board in undertaking nutrition communications. A further aim was to disclose barriers for future collaboration between the milk industry and health opinion formers. Twenty health influencers were interviewed about these issues.

Most influencers considered milk products to be important for health because they play a significant role in the Danish diet. Milk products were believed to be problematic because they are perceived as major contributors to the prevalence of coronary heart disease in Denmark. These findings, led to recommendations for the

milk industry to produce and market more tasty, low fat dairy products. The dairy industry was encouraged to undertake product-related communication with a holistic perspective. Its nutrition communication activities would, in future, be conducted in collaboration with authorities and other interested parties (Hølund, 1999).

Most GPs are busy, fulltime professionals who are hampered by lack of time and knowledge. In 1996 there were 14.7 million GP consultations in New Zealand which represents more than four consultations per person (Ministry of Health, Health Expenditure Trends in New Zealand, 1980-1996). There is anecdotal evidence to suggest that GPs recommend patients with elevated blood cholesterol levels to remove milk and dairy products from their diet. Therefore, it was important that New Zealand GPs' attitudes and beliefs about milk be explored as part of this thesis. Since studies in food cognition have shown significant sex and age differences in attitudes and beliefs in the general population it was expected GPs' attitudes may also differ by sex, age or years of experience.

Aim 4	**To investigate general practitioners' attitudes to milk**
Hypothesis 24	GPs will have limited nutrition knowledge about milk since New Zealand medical students had little training in nutrition prior to 1996 (Mann, 1999).
Hypothesis 25	Women GPs will have different dietary beliefs about milk than their male colleagues because they may share the female populations' concerns about weight control (Tuorila & Pangborn, 1998).

8.2 Methodology

8.2.1 Sampling

The subjects were recruited from the New Zealand Medical Association's database of general practitioners. There were a total of 1560 general practitioners registered on the database.

The subjects selected from this sampling frame were all general practitioners residing between Taupo and Wellsford in the upper half of the North Island. This included a total of 653 general practitioners, which represents 41.85% of the national sampling frame.

General practitioners were selected from this geographic region. This region represented the target market for milk advertising in which consumer attitudes to milk were investigated.

8.2.2 Ethical approval

The ethics protocol conformed to the policy of the University of Adelaide for conduct of surveys. For details of this policy refer to Appendix 6

8.2.3 The Procedure

A mail survey was sent out to the sample of 653 general practitioners during October 1997 (Appendix 8.1). The survey was conducted using Dillman's recommendations for mail surveys (Dillman, 1978). The initial mail out of the questionnaire was followed after two weeks with a reminder letter to non-respondents (Appendix 8.2). If, after four weeks, there was no response, a further reminder letter and a replacement questionnaire was sent (Appendix 8.3).

A letter outlining the purpose of the study accompanied each questionnaire and a stamped addressed envelope. The letter was sent out under the auspices of the New Zealand Nutrition Foundation. The letter was written and signed by the Medical and Scientific Director of the New Zealand Nutrition Foundation who had a long association with the College of General Practitioners. This was done because general practitioners receive many mail surveys and are generally unwilling to respond to them because of time constraints. The New Zealand Nutrition Foundation letterhead and envelope was more likely to attract the attention of general practitioners and to stimulate their responses.

The letter outlined the problem of New Zealanders' inadequate calcium intake. It then sought the help of the general practitioners to ascertain their views about the relationship between milk consumption and health. It stated that a questionnaire was enclosed that had been designed by a postgraduate nutrition student and it requested that it be completed and returned in the stamped addressed envelope as soon as possible.

Information about the GP's age, sex and duration of general practice was sought. Details of the content of the questionnaire are given below.

The reminder letters sent to non-responders after two and four weeks were also written on New Zealand Nutrition Foundation letterhead and were signed by the Medical and Scientific Director. The letters reminded doctors about the questionnaire that had been sent to them and thanked those who had already completed and returned it. The letters urged those doctors who had not completed the questionnaire to do so. In the event the questionnaire had been mislaid, doctors were asked to call the office of the New Zealand Nutrition Foundation for a replacement questionnaire. The second reminder letter included a replacement copy of the questionnaire.

From the sample obtained from the New Zealand Medical Association database, each general practitioner was assigned a code number. The code number was stamped onto each questionnaire as a method of identification. The code numbers were entered onto an Excel 1997 spreadsheet along with numerical responses for each of the 46 questions answered.

8.2.4 The questionnaire

The first 25 questions related to attitudes about milk, and the following 9 questions concerned doctors' opinions about age group requirements for milk. For each of these questions the general practitioners were asked to circle one of five responses where:

1= strongly agree
2= mildly agree
3=neither agree or disagree
4=mildly disagree
5=strongly disagree

The next five questions asked general practitioners if in their experience, various age groups of people drank about the right amount of milk. They were asked to circle one of three responses where:

1=not enough
2=about right
3=in excess of their needs

The final three questions asked the general practitioners to record their sex; (1=male, 2=female); their number of years of experience in general practice; and their present age in years. In cases where a response was not provided, the column for that data variable was left blank.

8.2.5 Data analysis

The completed coded data from the 332 questionnaires was copied from the Excel spreadsheet to a SPSS file for statistical analysis.
The data were checked for errors in data entry using the frequency command. This provided a means of checking the number of cases in each variable, the number of

cases for which the data were missing and mispunches by examining values beyond those defined as "legal" for each variable. Examination of one in ten of the records directly with the questionnaires showed the data entry was extremely accurate.

Frequency statistics were also used to produce the mean, median, mode and standard deviation for each variable.

Cross tabulations were used to compare agreement with the attitude statements in the questionnaire by age group of the general practitioners, by sex, and by years of experience in general practice.

CHAID (Chi-squared Automatic Interaction Detector) was used to predict sex and age group differences in attitudes, the importance of age group requirements for milk by sex and appropriate milk consumption across age groups by sex and age group.

8.3 Results

8.3.1 Summary

Women general practitioners (GPs) were more of the view that people on slimming diets need to drink milk and that milk provides satiety. They agreed more than their male colleagues that:

- Milk is important for adults on weight reducing diets
- Milk is filling

Younger GPs were more informed about the role of milk avoidance in lactose intolerance and were more knowledgeable about the difference between reduced and low fat milk. They were also more aware that milk is not just for children. Younger GPs agreed:

- Most: that milk can be consumed by lactose intolerant people in small amounts
- Least: that Lite Blue milk (1.5% fat) is ok for overweight adults; Milk is more important for children than adults

GPs with more years of experience were less knowledgeable about the role of milk in lactose intolerance and more of the opinion that milk is for children. They agreed:

- Least: that milk can be tolerated by lactose intolerant people in small amounts
- Most: that milk is more important for children than adults

8.3.2 Responses to the questionnaire

Three hundred and thirty two general practitioners responded to the questionnaire (50.8%) and 283 (43.3%) did not respond. For another 38 (5.8%) the reasons for their non-participation are known: 11 refused, 9 had gone overseas, 10 had retired, 3 had deceased, 4 with the wrong address and 1 declined because he was not a registered general practitioner. Thus the overall response rate was 54%.

8.3.3 Age, sex and years of experience of the sample

The GPs' mean age was 51 years (SD=11.8) and the median age was 48 years. They ranged in age from 24 years to 85 years. 229 (71.8%) of the respondents were men.

The GPs had a mean of 21.5 years experience (SD=11.28), ranging from one to fifty two years. There were 81 GPs with 1-12 years, 74 with 13-19 years, 76 with 20-29 years and 85 with 30-52 years of experience.

8.3.3 General practitioners' views about milk

8.3.3.1 Positive beliefs about milk

The majority of GPs (88%) agreed that 'milk is available in a range to suit everyone's needs' and 66% agreed that 'milk is better than taking calcium supplements'.

Most (82%) agreed that 'milk is a refreshing drink for children' and 63% agreed that 'milk is refreshing for adults'. About 75% of GPs agreed that milk is good value for money, tastes good and is filling.

Table 8.1 Positive beliefs about milk. Percentage agreement with attitude statements

Attitude	AA	A	?	D	DD
Milk is available as a range to suit everyone's needs	52	36	7	2	2
Milk is better than calcium supplements	38	29	18	11	3
Milk is a refreshing drink for children	46	36	11	4	2
Milk is a refreshing drink for adults	32	30	23	11	3
Milk is good value for money	49	32	15	2	2
Milk tastes good	38	35	15	6	5
Milk is filling	37	38	18	5	1

AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

8.3.3.2 Positive nutritional beliefs about milk

More than 86% of the GPs agreed that milk is a good source of calcium, protein and energy. About a quarter agreed that milk is a good source of zinc and vitamin B_{12}. Ninety three percent agreed milk is important for bone health in children and 71% agreed it was important for bone health in adults.

Table 8.2 Positive nutritional beliefs about milk. Percentage agreement with attitude statements

Attitude	AA	A	?	D	DD
Milk is a good source of energy for children	59	27	9	3	2
Milk is a good source of protein	62	24	8	3	1
Milk is a good source of zinc	10	16	52	8	5
Milk is a good source of vitamin B_{12}	9	19	39	16	8
Milk is a good source of calcium	84	11	1	2	2
Milk is important for bone growth in children and teenager	69	24	3	2	2
Milk is important for adults to maintain strong bones	33	37	18	9	2

AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

8.3.3.3 Beliefs about dieting and cholesterol

Only 38% of the GPs agreed that milk is important for adults on a diet. Two thirds agreed that Blue Top milk (regular fat) is OK for adults without weight or cholesterol problems and that Lite Blue milk (reduced fat) is OK for overweight adults. More than 85% agreed skim (Green Top) milk was OK for overweight adults and for adults with high blood cholesterol.

Table 8.3 Diet and cholesterol beliefs about milk. Percentage agreement with attitude statements

Attitude	AA	A	?	D	DD
Milk is important for adults on weight reducing diets	12	27	36	15	9
Milk such as regular Blue Top is OK for adults without weight or cholesterol problems	26	39	13	16	6
Milk such as Lite Blue Top is OK for overweight adults	19	44	18	13	6
Milk such as Green Top is OK for overweight adults	50	39	6	3	1
Milk such as Green Top is OK for adults with elevated blood cholesterol	49	36	9	3	2

AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

8.3.3.4 GPs beliefs about the dietary importance of milk

The majority of the GPs (85%) agreed that milk should be the main part of a toddler's diet and 74% agreed that milk is more important for children than adults. Twenty eight percent agreed that milk is not essential for adults.

Most (80%) agreed milk can cause lactose intolerance but only 45% agreed that lactose intolerant people could consume milk in small amounts.

Table 8.4 Dietary importance of milk and disadvantages. Percentage agreement with attitude statements

Attitude	AA	A	?	D	DD
Milk should be a major part of a toddler's diet	64	21	8	3	3
Milk is more important for children than adults	43	31	13	10	3
Milk is not essential for adults	11	17	21	27	24
Milk can cause allergies in a few children	35	50	9	4	2
Milk can cause symptoms of lactose intolerance in a few adults	29	52	10	5	2
Milk can be consumed by lactose intolerant people in small amounts	10	35	26	18	8

AA=Strongly agree, A=Agree, ? =Don't know, D=Disagree, DD=Strongly disagree

8.3.3.5 Differences in GPs' beliefs between age groups

Younger GPs (24 to 44 years) agreed more that 'milk can be consumed by lactose intolerant people in small amounts'. Agreement declined with advancing age.

Middle aged GPs (45 to 55 years) agreed the most that 'milk such as Lite Blue is OK for overweight adults' and that 'milk is a good source of zinc'.

GPs over 56 years agreed more that 'milk is more important for children than adults'.

Table 8.5 Percentage agreement with attitude statements amongst general practitioners. Comparison by age group

Attitude	% agree 24-44 y n=105	% agree 45-55 y n=100	% agree 56-85 y n=105	Pearson Chi-Square *	P Value
Milk is a good source of zinc	20.4 (67.3)	34.4 (56.7)	29.8 (48.9)	11.673	.020
Milk is more important for children than adults	64.8 (18.1)	80.0 (11.0)	81.9 (7.6)	10.516	.033
Milk can be consumed by lactose intolerant people in small amounts	59.0 (20.0)	49.0 (27.0)	35.4 (30.3)	11.975	.018
Milk such as Lite Blue is OK for overweight adults	57.1 (13.3)	69.0 (21.0)	61.3 (20.8)	13.618	.009

Note: Percentage as 'don't know' is given in brackets
* df-= 4

8.3.3.6 Sex differences in GPs' beliefs

More women GPs agreed (than their male colleagues) that milk is important for adults on slimming diets and that "milk is filling". In both cases the male GPs expressed more uncertainty than the women.

Table 8.6 Percentage agreement with attitude statements amongst general practitioners. Comparison by sex

Attitude	% men who agree n=223	% women who agree n=89	Pearson Chi-Square *	P Value
Milk is important for adults on weight reducing diets	34.5 (38.6)	50.6 (31.5)	7.142	.028
Milk is filling	69.7 (22.4)	88.9 (8.9)	12.770	.002

Note: Percentage as 'don't know' is given in brackets
* df-= 2

8.3.3.7 Length of practice differences in GPs' beliefs

GPs with less than 20 years' experience agreed most that 'milk can be consumed by lactose intolerant people in small amounts'. Agreement declined with increasing years of experience.

Those with 13 to 19 years' experience agreed the most that 'milk is a good source of vitamin B_{12}'. GPs with 20 to 29 years' experience agreed more that 'milk is important for children than adults'.

Table 8.7 Percentage agreement with attitude statements amongst general practitioners. Comparison by years of experience in general practice

Attitude	% agree 1-12 y as GP n=81	% agree 13-19 y as GP n=74	% agree 20-29 y as GP n=76	% agree 30-52 y as GP n=85	Pearson Chi-Square *	P Value
Milk is a good source of vitamin B $_{12}$	20.8 (51.9)	39.7 (44.4)	33.8 (32.4)	26.3 (43.4)	12.567	.050
Milk is more important for children than adults	64.2 (19.8)	68.9 (13.5)	89.3 (5.3)	78.6 (10.7)	16.288	.012
Milk can be consumed by lactose intolerant people in small amounts	59.3 (17.3)	59.5 (25.7)	41.3 (30.7)	29.5 (28.2)	24.797	.000

Note: Percentage as 'don't know' is given in brackets
* df-= 6

8.3.3.8 Attitude predictions of GP's sex, age and experience

Sex

Figure 8.1 shows the attitudes that most discriminated the sex of the GPs. The main significant difference in agreement by sex was to the attitude that 'milk is filling'. Of those who agreed two thirds were men and one third were women whereas of those who disagreed or didn't know most were men (88%) compared to only 13% women.

The best attitude predictor for GPs who agreed that 'milk is filling' was "I think that milk is important for people on weight reducing diets'. Of those who thought milk was important on a diet 56% were men, whilst those who disagreed or didn't know 74% were men.

Figure 8.1 Prediction of sex differences in attitudes
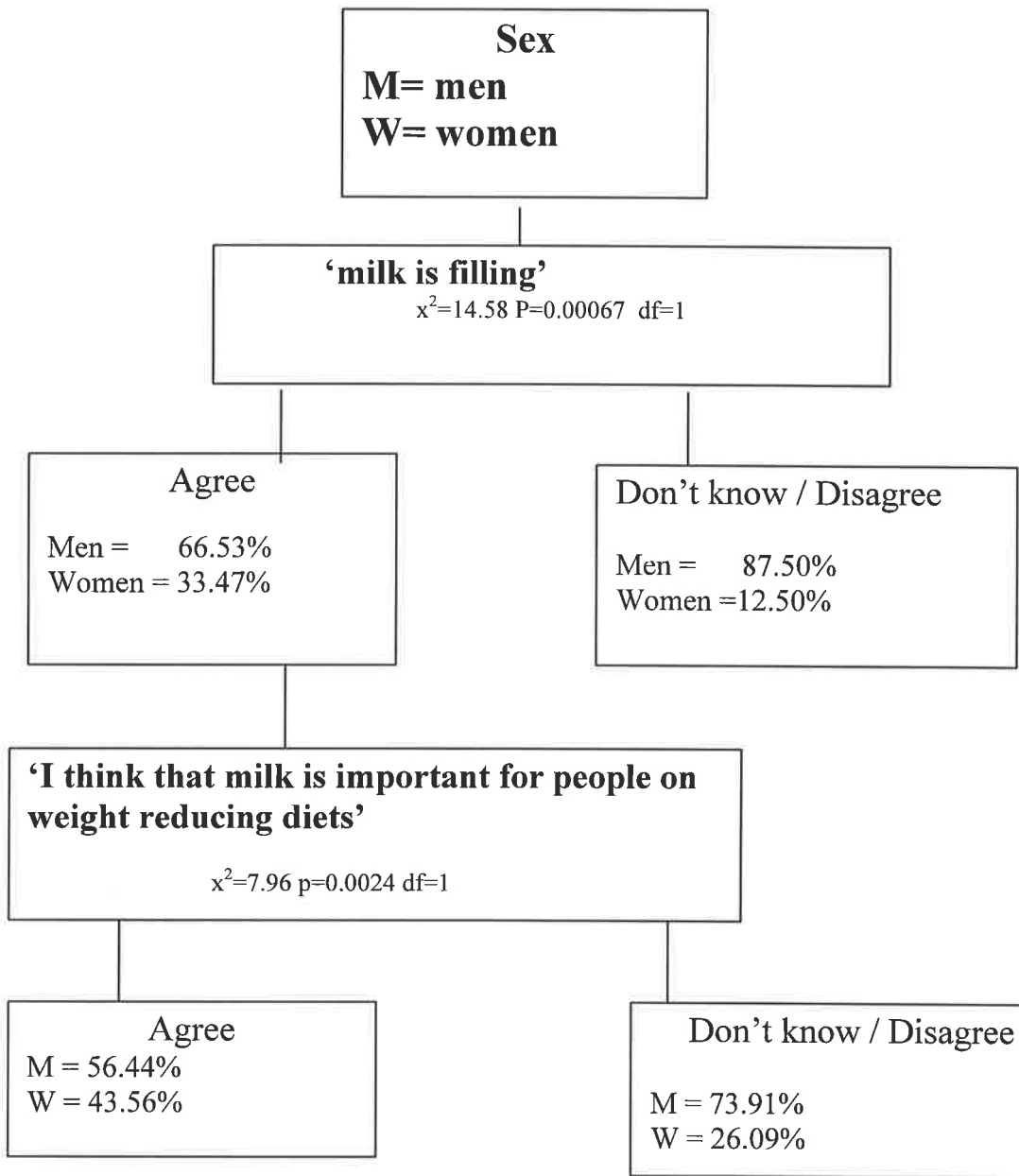
Age

The best attitude predictor of age group differences was 'milk can be consumed by lactose intolerant people in small amounts' (Figure 8.2). The younger age group agreed most (42%) and agreement declined with advancing age.

Figure 8.2 Prediction of age group differences in attitudes
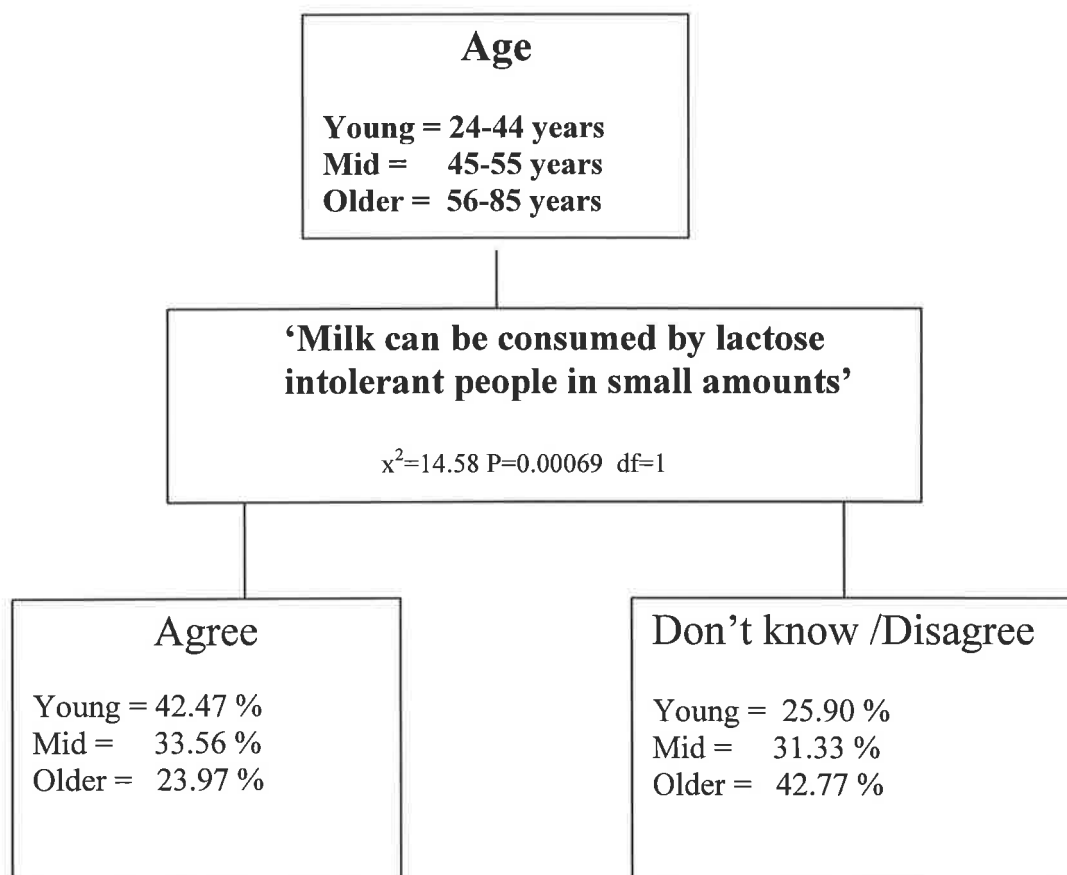
GP experience

Similarly, the statement 'milk can be consumed by lactose intolerant people in small amounts' was the best attitude predictor of GP experience (Figure 8.3). GPs with the least experience (1-12 years) agreed most (33%) and agreement declined with advancing years of experience.

Figure 8.3 Prediction of GP experience differences in attitudes

GP experience
1-12   years
13-19 years
20-29 years
30-52 years

'Milk can be consumed by lactose intolerant people in small amounts'

x^2=22.25 P=1.2e-5 df=1

Agree

1-12 y   =32.88 %
13-19 y =30.14 %
20-29 y =21.23 %
30-52 y =15.75 %

Don't know /Disagree

1-12 y   = 19.41 %
13-19 y = 17.65 %
20-29 y = 26.47 %
30-52 y = 36.47 %
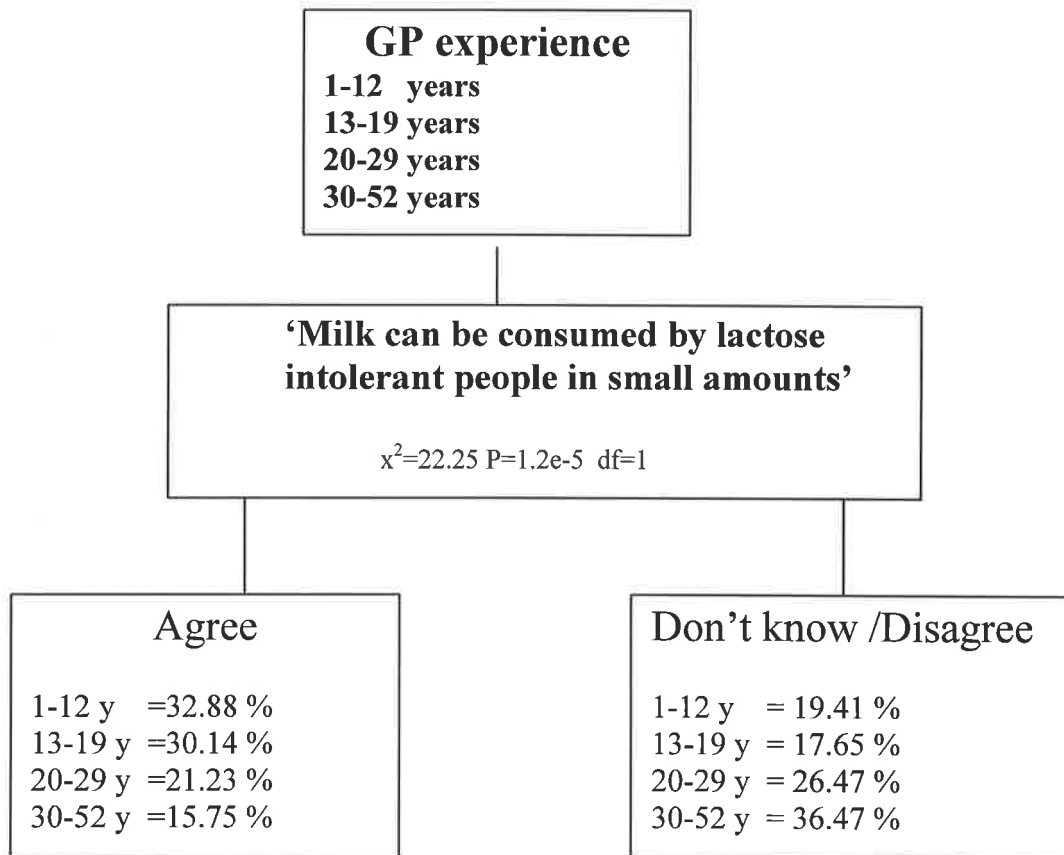
8.4 General Practitioner's views about the importance of milk for different age groups

Over 83% of GPs ranked childhood, the teenage years and during pregnancy and lactation as the most important stages for drinking milk. Over 73% thought that milk is important for women. In contrast only 58% considered milk to be important for men aged 19 to 64 years and 36% thought it was important for men over 65.

Table 8.8 General Practitioner's responses to importance of milk for different age groups. Percentage agreement with importance of milk.

Age Group	Not Important	Somewhat Important	Important	Very Important	Extremely Important
Pre-school children (under 5 years)	7.8	.2	9.3	23.2	52.4
School age children (5-11years)	6.9	.3	13.3	35.8	34.3
Teenage girls (12-18 years)	6.6	.3	16	35.2	31.9
Teenage boys (12-18 years)	6.3	.3	22.9	36.7	21.7
Adult men (19-64 years)	10.2	8.6	43.1	12	3
Adult women (19-64 years)	6.9	6.6	30.4	29.5	13.6
Pregnant and lactating women	6.6	.6	10.2	29.8	43.1
Men over 65 years	19.3	4	17.5	12.7	6
Women over 65 years	7.5	5.1	21.1	31.3	22

8.5 General Practitioners' views about suitability of milk intake for different age groups

Approximately half of the GPs indicated that women over 65 years, women aged 19 to 64 years, pregnant and lactating women, teenage boys and girls do not drink enough milk.

Table 8.9 GPs opinions about the adequacy of the milk intakes of different age groups*

Age Group	Not Enough % Agree	About Right % Agree	In Excess of Their Needs % Agree
Pre-school children (under 5 years)	22	62.7	5.1
School age children (5-11years)	36.4	48.8	4.2
Teenage girls (12-18 years)	45.5	38.3	4.5
Teenage boys (12-18years)	66.6	19.9	2.4
Adult men (19-64 years)	31	50	7.2
Adult women (19-64 years)	56.3	28.9	3.6
Pregnant and lactating women	47.3	38.3	3.3
Men over 65 years	36.1	47	4.5
Women over 65 years	59.3	25.3	4.2

* "In your experience do these people drink about the right amount of milk?"

8.6 Discussion

The aim of the survey was to investigate general practitioners' (GPs) attitudes to milk. This is important because GPs hold consultations with a large proportion of the New Zealand population and GPs' opinions may influence consumer attitudes and beliefs. GPs often have a stable clientele of patients. As gatekeepers of specialised medical services, doctors get to know their patients and their families and have more occasions for talking about food and nutrition.

The survey contained 25 questions related to attitudes about nutrition and health as well as questions about usage and sensory aspects of milk. Some of the items in the questionnaire were similar to those in the consumer surveys. GPs are also milk consumers and their attitudes and beliefs about milk are likely to be influenced by consumer advertising. Their attitudes may also influence their professional recommendations about patient age group requirements for milk and whether various age groups drink the right amount of milk.

The survey findings showed that GPs have positive beliefs about the taste, refreshment, value and range of milks available. These beliefs were broadly similar to those of the general population described in Chapter 7 although more GPs (80%) than general consumers (68%) believed milk is good value for money. GPs probably believe more in the nutritional benefits of milk and therefore appreciate its good value.

Most (95%) of GPs believed that milk is a good source of calcium. This was the same finding as among women in the consumer surveys. It indicates that New Zealanders do understand that milk is a good source of this mineral. It also suggests that consistent advertising messages on packaging and in the media may have reinforced this knowledge.

Two-thirds of the GPs agreed milk is better than calcium supplements and 14% disagreed. This result is a little surprising given the extensive advertising and promotion of calcium supplements by the pharmaceutical industry. It suggests that there is an opportunity to promote the benefits of milk compared to calcium supplements. GPs may not be aware that calcium fortified milks provide a rich source of calcium in a relatively small volume or that the calcium in milk is well absorbed. In addition, it may not be appreciated that milk provides other nutrients such as phosphorus, magnesium and vitamin D that have benefits for bone health.

The majority of GPs (86%) believed that milk is a good source of protein and energy. Only 9% were uncertain about these nutrients, which indicates a lack of nutrition knowledge. Among consumers 60% believed milk is a good source of energy. Therefore more GPs than consumers perceived milk to be a good source of energy.

Only a quarter of GPs agreed that milk is a good source of zinc and vitamin B_{12} and over 40% were uncertain. Younger GPs were less knowledgeable. Twenty percent agreed milk is a good source of zinc and 68% didn't know. GPs with more experience may have acquired this knowledge over time. These results are not

surprising. It was hypothesised that GPs would have limited nutrition knowledge about milk since GPs had little nutrition education in their medical training (hypothesis 24).

Milk was believed to be 'filling' (or satiating) by three-quarters of the GP sample and more women (89%) GPs than men (70%). This suggests that GPs might view milk as a food rather than a beverage. It is also consistent with the finding that 82% of GPs believed milk is a refreshing drink for children but only 57% believed it is refreshing for adults.

With regard to milk and bone health, GPs have different perceptions about adults and children. Whereas the majority (93%) believed milk is important for bone growth in children, only 70% considered that adults need milk to maintain strong bones. Overall, 74% of GPs believed milk was more important for children. This finding was similar among consumers. It is encouraging that this belief is less prevalent among GPs under 45 years (65%). However, it reinforces the notion that milk is seen as childish among many people. This may be an important factor in the decline in milk consumption.

Twenty eight percent of GPs considered that milk is not essential for adults at all. Given that milk provides at least 36% of the recommended daily intake of calcium for adult New Zealanders this is somewhat alarming. It suggests that not all GPs view milk as a food that is essential for health. This may reflect a lack of nutrition knowledge or a preference for alternative types of milk such as cheese or soy milk. It provides further evidence however that the benefits of milk must be more vigorously promoted to GPs by the milk industry.

When it comes to milk and dieting male and female GPs had significantly different perceptions as suggested in hypothesis 25. Male GPs were negative. Only 35% agreed that milk is needed on a weight reducing diet compared to half (51%) of the women. Overall only 65% of GPs agreed that regular milk is ok for adults without weight or cholesterol problems. This is a concern because again it suggests that GPs believe that consumers can do without milk. The findings support the anecdotal evidence that GPs counsel patients with high blood cholesterol levels or who need to lose weight, to omit milk from their diets.

It is difficult for GPs to overlook or escape the needs of overweight patients. Obesity and overweight are a growing problem among New Zealanders. In the introduction to this chapter several studies were reviewed that highlighted the view that GPs are concerned about fat in the diet and so is negatively perceived by the public. Worsley & Worsley (1991) showed that three quarters of GPs believed that over-consumption of fat is a major dietary problem. A further New Zealand survey (Colmar Brunton, 1991), found that the fat content of milk was viewed as a negative health attribute by half of the health professionals surveyed. Similarly in Denmark, health professionals deemed milk products to be problematic because of their supposed contribution to the prevalence of coronary heart disease (Hølund, 1999).

These results suggest that the milk industry needs to do more to promote the reduced and low fat variants of milk which have negligible amounts of fat and cholesterol and are very suitable for people on weight reducing and cholesterol

restricted diets. It is clear that GPs (especially men) do not have up to date knowledge of the benefits of low fat milk variants.

Milk allergy and intolerance is another potential problem for milk. Most (85%) of the GPs agreed that milk can cause allergies in a few children. Milk allergy rarely affects children over three years of age but if it is believed that milk allergy is a problem then milk drinking habits are unlikely to be encouraged. The problem is that children are likely to develop preferences for fruit juice and soft drinks. Indeed, 38% of consumers believed that fruit juice is better than milk. This is a concern, as young children in particular need a regular intake of milk to provide essential nutrients for growth. It is difficult to get these nutrients in other ways.

Twice as many GPs (45%) as the general population (22%) agreed that lactose intolerant people could consume milk in small amounts. This finding is nevertheless disappointing given that the statement is correct. CHAID analysis showed that GPs with the least experience agreed most and agreement declined with advancing years of experience. Therefore younger GPs may have a greater knowledge about lactose intolerance than their senior colleagues. It is possible that soymilk advertising, which suggests that lactose intolerance is a widespread problem, has influenced GPs and consumers. Indeed, 80% of GPs agreed milk could cause lactose intolerance symptoms in a few adults. Clearly, lactose intolerance is a further nutritional barrier to milk drinking. Therefore it is important that the milk industry takes action to eradicate misconceptions about allergies and lactose intolerance amongst both consumers and GPs.

GPs appropriately ranked childhood, the teenage years and during pregnancy and lactation as the most important stages for drinking milk. This reinforces their perception that milk is more important for children than adults. GPs had quite different perceptions about the importance of milk for men and women. Whereas 43% agreed milk was very or extremely important for women, only 15% thought so for men. Similarly, in the consumer surveys 59% agreed women need more milk than men. This perception might be related to previous milk advertising that highlighted the risk of osteoporosis in women. The problem is that men also get osteoporosis. Men do not however perceive low calcium intakes from milk to be a male issue.

When it comes to getting enough milk, about half the GPs indicated that women and teenagers don't drink enough. This is encouraging for the milk industry and health promotion alike, as GPs are likely to support greater consumption amongst these groups. Seven percent of GPs believe adult men drink milk in excess of their needs. Although this is the view of only a minority of GPs, it is of concern as it reinforces the mistaken belief that milk is for women.

8.7 Conclusion

GPs have mainly positive views of milk but also some negative views. There is a need for an effective communications programme as in Denmark to counter GP confusion.

The investigation of GPs' attitudes to milk in this survey has elicited a number of original findings that support the hypotheses relating to medical training and gender outlined earlier in this chapter (hypotheses 23 and 24).

I have shown that GPs' perceptions of concrete attributes (such as taste, refreshment, cost and types of milk available) mirror those of the general population.

GPs are knowledgeable about milk, calcium and bone growth but no different to consumers. When it comes to more obscure nutrients, GP knowledge is limited. In relation to fat, cholesterol, dieting and allergies milk is not well understood. These issues pose real threats to milk consumption.

There is a general view among GPs that milk is for women and children.

As in the general population, women GPs have different perceptions to their male colleagues. They have more pragmatic beliefs about the role of milk in weight control and are therefore more likely to support its consumption amongst dieters.

The results show that GPs' attitudes and beliefs are unlikely to facilitate the growth of milk consumption. If the situation is to be reversed the milk industry must act soon to improve GPs' knowledge about the role of milk in a healthy diet.

More nutrition communication for GPs is needed from the milk industry.

Chapter 9

Discussion

In this chapter I will discuss the key findings from the consumer surveys and how these findings relate to other studies reported in the literature. I will also discuss the implications these findings have for the milk industry and for public health nutrition.

Firstly, I will review the findings related to milk consumption and how consumption varies by gender, ethnicity and other demographic factors. I will then discuss the hierarchy of attitudes to milk, which predict milk consumption.

Secondly, I will discuss the key findings related to attitudes and beliefs about milk and their influence on consumption. I will discuss the important differences in attitudes for gender, age, ethnicity and occupational status. Perceptions towards milk related variables have not been examined before in an integrated study.

In the next section I will discuss the effects of advertising on milk attitudes. I will show that the advertising undertaken by the milk industry during the study period targeted mostly young Maori and Pacific Island men who are high milk consumers which is at least a questionable strategy for the milk industry. I will also discuss the apparent changes in attitudes to milk associated with the advertising.

There were minor limitations associated with the research methodology such as the sampling method, sample size, and questionnaire. They indicate potential difficulties to be avoided in future research in this area.

Finally, I will discuss the implications of these research findings for the milk industry and for public health nutrition. This will lead on to main conclusions drawn from the research.

9.1 Milk consumption

The results showed that at least one third of the respondents in both surveys consumed less than a glass of milk a day. Although it is likely that additional milk was consumed from other sources it is clear that the consumption of milk as a beverage was minimal.

This finding highlights problems for public health and for the milk industry. A glass of milk provides between 36% to 62% of the recommended calcium intake depending on the type of milk used. Unless alternative dairy products or high calcium foods were consumed this finding suggests that the calcium intakes amongst this third of the study population may be marginal. It also suggests that milk is an unpopular beverage choice for about one third of adult New Zealanders.

Sex was the strongest predictor of milk consumption. In general men drank more milk and indeed a higher percentage of women were non-consumers. These findings have not been observed before. Metcalfe et al (1998) however, found that 4% of

New Zealanders were non-consumers, but most of their sample was men (73%). This was similar to the finding for men in this study and provides some evidence for the external validity of the present study.

Ironically in terms of meeting daily calcium requirements, higher consumption of milk may be more important for women. The estimated lifetime risk of hip fracture at age 50 is considerably higher for New Zealand women (17.5%) than men (6%) (Elliot, 1996). The findings clearly suggest that milk promotion strategies need to focus more on the needs of women consumers.

Young people (16 to 30 years) tended either not to consume or were heavy consumers of milk. Non-consumption was higher among young women (15%) and heavy consumption (more than two glasses a day) was higher among young men (>40%). Age was the strongest predictor of milk consumption among men. Younger men consumed greater volumes of milk (more than two glasses a day) and heavy milk consumption declined with age. Milk consumption was highest among Maori and Pacific Islands people and ethnicity predicted milk consumption among young men. This was broadly similar to the findings of the National Nutrition Survey (Ministry of Health, 1999) which found that male Maori and Pacific Island participants consumed more milk than NZ Europeans. Again, this provides further evidence for the validity of the current study.

The findings clearly indicate that milk consumption is lowest among NZ Europeans and therefore promotional strategies to encourage greater milk consumption should target this group. This was not done in the advertising campaign related to this study (see below). Conversely milk appears to be popular amongst some young people especially Maori and Pacific Islands men. This may be because young people did not experience the school milk scheme and were not 'turned off' milk as a consequence.

Non-consumption of milk is a serious problem among some young women. Murphy et al (1994) have shown that there is a significant positive association between milk consumption up to age 25 and higher bone mass. It has been suggested that teenage girls reach adulthood with less than their peak bone mass because they fail to increase their calcium intake when their calcium needs are greatest (Eck & Hackett-Renner, 1992). Calcium intakes may be low amongst this age group because of the preoccupation that young women have with slimness coupled with the perception that high calcium foods are fattening (Moses et al, 1989).

9.2 Attitudes to milk

The first aim of this thesis was to investigate attitudes to milk. Recent attitude theories such as the Theory of Planned Behaviour (Ajzen, 1985) and its predecessor the Theory of Reasoned Action (Fishbein and Ajzen, 1980) offer a coherent framework within which to relate beliefs, attitudes and behaviour. As noted in Chapter 1 these attitude models have been widely used and have shown good predictive power for a variety of behaviours. They have also been successfully applied to predict the consumption of a variety of foods, for example milks varying

in fat content (Tuorila, 1987). Attitudinal factors may underlie declining levels of milk consumption.

The attitude items chosen for investigation in the consumer surveys were quite distinct. This was to ensure a broad coverage of the attitude domains related to milk. The attitude findings were complex. In general, attitudes were related to demographic characteristics of people and to milk consumption. Positive attitudes to milk tended to be held more by women. Concerns about milk related to the issues that affect people's lives.

Although the individual attitude items appear fragmented they each have important implications. Therefore, to provide an overall portrayal of the findings it is important that I deal with the attitude items individually.

9.2.1 Positive beliefs about milk

Overall, most people had positive views about milk but they were polarised by demographic differences in attitudes. As distinct from drinking milk as a beverage, there was almost universal agreement that milk is good added to cereals and drinks (such as tea and coffee). Positive nutritional beliefs about milk were mixed. Women tended to have greater knowledge about the calcium benefits of milk and were more of the view that milk is better for you than fizzy drinks. Men however, were less convinced about milk's nutritional benefits and were less inclined to agree that milk is good value for money.

Pacific Islands and Asian people were less aware about the role of milk in bone growth and a third did not hold the view that milk is better for you than soft drinks. On the other hand Pacific Islands people as well as men in general held the positive view that milk is refreshing.

Older people were the most pessimistic about milk. They were less likely to agree that milk provides nutritional goodness and a substantial proportion were not convinced that milk has a good taste. Nearly half of the older people appeared to favour taking calcium supplements instead of milk. Younger people had more positive views about milk but nevertheless it was not a popular choice for them. They had liked milk during their childhood but seemed to lack knowledge of milk's inherent benefits. As a result they agreed at the least that milk is good value and had the most positive attitudes to soft drinks.

Milk tastes good
Taste is an important determinant of food choice and in this study the majority of respondents (>73%) liked the taste of milk. This supports hypothesis 1 that most people would have positive attitudes towards milk's taste. As New Zealand is a dairy farming nation and milk and dairy products are dietary staples this is to be expected. Other investigators have shown that the taste perception of milk is related to its fat content (Tuorila, 1996; Pangborn et al, 1985; Raats and Shepherd, 1992). Regular fat milk dominates the New Zealand market and taste perceptions of various types of milk were not explored in the consumer surveys.

Older people (over 53 years) tended to have more negative attitudes about the taste of milk compared to younger people. This may reflect the negative influence of the school milk scheme. However for most consumers the taste of milk does not appear to be a reason for declining consumption.

Milk is refreshing
About half (>52%) of the respondents perceived milk to be refreshing, especially Pacific Islands men. It was hypothesised that Maori and Pacific Islands people were more likely to regard milk to be refreshing (hypothesis 17) and this was found to be case. The 1997 National Nutrition Survey (Ministry of Health, 1999) showed that Maori and Pacific Islands people were more frequent consumers of milk as a beverage. This observation was also made in this study. From qualitative research high milk consumers are more likely to regards milk as a refreshing drink than low milk consumers (E Brown, personal communication). This may be because high milk consumers perceive fewer barriers to its consumption.

However, overall, only half of the people surveyed agreed that milk is refreshing. This is a concern because milk must compete with other beverage choices that are promoted for refreshment and such drinks may be preferred in part because of their sensory qualities.

Milk added to cereals and drinks
The hypothesis that most people would have positive attitudes towards milk added to cereals and drinks (hypothesis 3) was supported by the findings. In both surveys about 80% of respondents agreed that *'milk is good added to cereals and drinks'*. This result is encouraging for the milk industry because cereals are New Zealanders most popular breakfast food (Consumer Link, 1998).

In the United States it has been shown that regular consumers of breakfast cereals had a greater nutrient intake at breakfast which was enhanced by the addition of milk (Carson, Siega-Riz & Popkin, 1999). For most 5 to 10 year olds and 30 to 59 year olds, regular consumption of breakfast cereals was associated with greater daily intake of calcium. Therefore increased consumption of milk and cereal for breakfast appears to be an effective way to improve nutrient intake.

Calcium and bone growth
The findings that most (90%) of the respondents understood that milk is a good source of calcium and is important for bone growth confirm the expectations listed in Chapter 3. Calcium is an important milk nutrient. These findings are very encouraging for the milk industry. They suggest that calcium, bone growth and milk are closely linked in the consumer's mind.

Awareness about calcium and bone growth was lowest amongst Pacific Islands and Asian people, which reflect a difference in perceptions amongst New Zealand immigrants. Women were more aware that milk is a good source of calcium than men which is not surprising since the literature shows that women have more concerns about nutrition (Steele, Dobson & Alexander, 1991; Rappoport, Peter & Downey, 1993).

The general awareness about calcium, bones and milk found in this study is similar to findings from the United States (Elbon et al, 1996). (This provides further evidence for the study's validity). The milk industry cannot afford to be complacent about communicating milk's calcium benefits to consumers. In a survey undertaken in New Zealand, only 13% of respondents were able to spontaneously recall milk as a factor that could prevent osteoporosis (CM Research, 1998). Therefore every effort needs to be made to keep the link between calcium, bones and milk "top of mind".

Calcium supplements

A considerable proportion of respondents in the baseline survey disagreed (13%) or was not sure (26%) that calcium supplements were unnecessary. This was particularly true of respondents over 53 years. These findings agree with earlier work, which found that 11% of consumers purchased calcium tablets (CM Research, 1998) and confirms the expectation listed in Chapter 3. The greater uncertainty of older people about calcium supplements suggests that they have been contemplating change. They may have reached a stage of readiness to change as proposed in the stage of change model (Lee, 1993).

The findings suggest that the milk industry must communicate the benefits of milk specifically to this age group. Since GP attitudes to calcium supplements are similar to those of consumers (see Chapter 8), it is important that communications about the benefits of drinking milk also be developed for GPs. Promotion of milk consumption by public health authorities may also help to reassure older people that milk is a useful and accessible source of calcium.

Milk goodness

Hypothesis 6 that women would have more positive attitudes regarding the goodness of milk (protein, vitamins and minerals) was not supported. Women were no more positive than men were. Women may be more aware of negative nutrients such as fat, and this may override their perceptions about milk's goodness.

Overall, three-quarters of the respondents believed milk provides goodness, which confirms the expectation, listed in Chapter 3. The more positive finding among middle aged consumers might reflect greater concerns about nutrient needs among families of growing children and less concern about negative nutrients.

Tuorila and Pangborn (1988) have shown that beliefs about the positive nutrient content of milk were directly related to its consumption. However, when asked to spontaneously recall the nutrients found in dairy products, CM Research (1998) found that only 17% of New Zealanders recalled protein and 22% recalled vitamins and minerals. To generate greater awareness of the presence of these nutrients in milk communications may need to be linked to their benefits. More effective communications may help to increase consumption.

Liked milk as a child

In both surveys about 70% of respondents agreed that '*I used to like milk as a child*' but agreement declined with advancing age. The finding that more young respondents (81%) used to like milk compared to middle aged (69%) and older (62%) respondents supports hypothesis 9 that people under 30 years who did not

experience the school milk scheme are more likely to have positive attitudes to childhood liking of milk. CM Research (1991) found that respondents over 30 years had been "turned off" milk by compulsory milk in New Zealand schools.

This finding suggests that younger people could be encouraged to consume more milk if it was more relevant to their lifestyles. The greater aspirational appeal of other beverages provides intense competition e.g. Coca-Cola. However milk provides more nutrients per millilitre than virtually any other beverages. Furthermore it is available in a low fat alternative and is a natural source of nutrition. Regrettably, these benefits are not widely known as shown by the present findings.

Milk and energy
In the baseline survey half of the respondents agreed that 'milk provides energy'. The recent growth in "energy drinks" in New Zealand suggests that beverages with 'energy' have positive connotations for people who seek an energy lift or get-up-and-go. In some cases "energy drinks" contain caffeine e.g. Red Bull. There was an expectation (Chapter 3) that there would be negative perceptions towards milk and energy because it is not promoted as an energy drink. However, energy may have different meanings for consumers. Amongst the weight conscious it may be associated with calories and viewed as a negative attribute. Qualitative research suggests that the energy in milk is viewed as sustained rather than instant energy (E Brown, personal communication).

Therefore the "sustained" energy provided in milk may be quite different in consumer's minds from the instant energy provided in energy drinks. It also suggests that milk is perceived more as a food than an energy drink. Two thirds of consumers in the middle age group had positive perceptions about milk and energy. This may be related to the perception that milk is an important source of energy for their children's growth and development. Worsley (1990) has shown that fathers' perceptions of health are influenced to some extent by their children's experiences. Further research is needed to explore consumer perceptions of 'energy' and develop appropriate advertising communications.

Value for money
Two-thirds of the respondents saw milk as good value for money. This suggests that the cost of milk is not a barrier to consumption. There was an expectation that people would view the value of milk unfavourably, especially compared to soft drinks, because it has steadily increased in price (Chapter 3). Perceptions were indeed less positive amongst younger people and men who agreed most that *'milk is expensive compared to fizzy drinks'*.

The lack of significant differences between the occupational groups about milk's value supports Wilson and Horwath's finding that occupational status was not a major determinant of milk product intake amongst New Zealand women. Nevertheless, amongst women deciding whether to increase their milk product intake, Wilson and Horwath (1996) found that the expense of milk was more important to women in lower socio-economic groups.

These results suggest that it is important that both the milk industry and health professionals are mindful that lack of income or high prices may restrict food choice and can be a barrier to the improvement of nutrition status in low-income families.

Milk and iron
Attitudes towards iron in milk were investigated in the follow up survey. Half (49%) of the respondents agreed that *'milk is a good source of iron'*. This false perception is probably due to the intense advertising by the meat industry.

CM Research (1998), found in an unprompted study that only 4% of respondents indicated that milk contained iron. The higher response in the current study may have been due to the use of prompted recognition because iron is a nutrient that is 'top of mind'. It is significant that younger men were less convinced about the presence of iron than other age groups. This may be because the meat advertising campaign was aimed more at women than young men. Apart from the CM Research study there have been no other investigations of this belief. Nevertheless the findings suggest that iron is perceived to be an important nutrient.

9.3.2 Negative beliefs about milk

Negative attitudes to milk were not widespread. However they may limit the potential to make milk an every day part of modern life. The narrow focus of the perceived nutritional benefits of milk appears to have inhibited milk's popular appeal. Fruit juice was perceived to have greater health value than milk by a third of the respondents. Similarly, more than a quarter of the male respondents, and Pacific Islands and Asian people were not persuaded that milk is better for you than soft drinks.

Nearly a third of all respondents were troubled about the fat and cholesterol content of milk. Women were more anxious about fat and men were troubled about the effect of milk drinking on cholesterol levels. Low fat milks were generally not well understood.

Concerns about perceived allergenic properties of milk among children were evident in over a third of the respondents. The unease was greatest amongst older people and NZ Maori. There was confusion about lactose intolerance and milk particularly amongst women.

Finally, older people had more negative attitudes towards the range of milks available and were more of the view that milk is for toddlers and people over 65. Many older men felt they were more or less obliged to drink milk.

In this study, respondents' attitudes to milk predicted their consumption. The strongest attitude predictor in both surveys was the statement *'milk is expensive compared to fizzy drinks'*. In the baseline survey those who agreed (or were unsure) consumed smaller amounts of milk than those who disagreed (45% and 29% respectively). This suggests that among low volume milk consumers cost may be a barrier. They may prefer soft drinks, which are less expensive.

Further evidence for the role of cost in milk avoidance is related to some of the attitudes of those respondents who disagreed that *'milk is expensive compared to fizzy drinks'*. Among this group agreement with the statement that *'adults over 65 need more milk than younger adults'* predicted low consumption. This suggests that low volume consumers might believe that milk is more important for older people. Among those who agreed (or were unsure) with this statement disagreement with the attitude *'milk is good value for money'* predicted low consumption. This again implies cost is a barrier. The cost of milk has been identified as a problem by other investigators (Elbon et al, 1996). It provides further evidence that the health benefits of milk are not realised.

Soft drinks
Hypothesis 11 that younger people would have more positive attitudes to soft drinks was supported (Table 7.21b). While the majority of consumers thought that milk was a superior product it is a concern that younger people, a quarter of men and most Pacific Islander and Asian immigrants did not share this view (Tables 7.20a, 7.21b, 7.24b). Soft drink consumption is growing rapidly in New Zealand and appears to be capturing several segments of the market.

Two thirds of the GPs surveyed in this study agreed that teenage boys don't drink enough milk. Their perception is probably correct. The 1997 National Nutrition survey showed that young men (53% aged 15 to 18 years; 54% aged 19 to 24 years) consume soft drinks at least three times a week (Ministry of Health, 1999). Soft drinks may displace milk nutrients such as calcium in the diets of children and adolescents (Harnack, Stang & Story, 1999). Furthermore young men perceive milk to be expensive compared to fizzy drinks.

Therefore it is important that the milk industry develop communications about the health benefits of milk to justify its higher price. Younger people and those from immigrant families may have less knowledge about the importance of milk or it may simply not be "cool" to drink. The development of enticing single serve packaging and interesting educational materials targeting children in schools may help to increase their knowledge and acceptance. Ideally the displacement of soft drinks by milk in schools might help to change milk-drinking habits. However a significant investment would be required to ensure that milk vending machines are available and that the product offering is an appealing beverage choice.

Fruit juice
A substantial proportion of respondents (one third) thought that fruit juice was *"better for you than milk'*. Fruit juice may be perceived to be better for health because it does not have negative nutritional attributes that can be barriers to consumption. For example, fruit juice does not contain fat or cholesterol and rarely causes allergies. The per capita consumption of fruit juices and drinks amongst New Zealanders is estimated to be 22 litres (AC Nielsen, 1998). This is less than a quarter of the per capita consumption of milk (94 litres). However, calcium fortified fruit juices have recently been introduced to the New Zealand market, which may increase overall consumption. In the United States soft drink consumption has displaced both milk and fruit juice (Harnack et al, 1999). As calcium fortified fruit juice is already widely available in America, this suggests that the "cool" image of

soft drinks may be a more powerful inducement to consumers than the health benefits of fruit juice and milk.

The perception that fruit juice is better for you than milk has important implications for the milk industry. The introduction of calcium fortified fruit juice means that milk can no longer claim "ownership" of calcium. Therefore to create a point of difference, the milk industry may need to convey messages about the wide array of nutrients provided in milk or focus on another unique advantage. Communication of more demanding and complex nutritional messages may involve more intensive and long term communication campaigns with consumers and health professionals. For the milk industry this would require a new paradigm in marketing communications.

Milk and fat

Hypothesis 7 that women would have more concerns about the fat content of milk than men was supported (Tables 7.20a, 7.20b). Gender differences in attitudes to the fat content of milk have been well documented in other studies (Tuorila, 1987; Shepherd & Stockley, 1985; Shepherd, 1988). In New Zealand, Wiseman (1994) showed that women were more likely to believe in the importance of dietary fat reduction than men were. In particular, more women (79%) than men (63%) believed that less whole milk should be consumed to reduce the risk of heart disease. Indeed, in the current study more than half of the respondents agreed that homogenised *'Blue Top milk is high in fat'*. There were no ethnic differences in the respondents' perceptions of the fat content of milk. Therefore hypothesis 16, that Europeans would be more likely to have negative attitudes towards the fat content of milk was not supported.

The strongest attitudinal predictor of *'all milk is high in fat'* in both surveys was agreement that *'fruit juice is better for you than milk'*. This suggests that milk is not considered to be as healthy as fruit juice because it is perceived to be high in fat. Amongst those who agreed that *'fruit juice is better for you than milk'* the best attitude predictor was *'I only drink milk because I feel I should'*. This implies that milk is perceived to have some health giving properties, as people still feel obliged to drink it.

These collective findings about the fat content of milk have not been reported in other studies although CM research (1998) showed that 31% of New Zealanders believed that dairy products contain too much fat. However perceptions about *milk* were not investigated. The current results strongly support Wiseman's finding that a quarter of New Zealanders thought that homogenised milk is high in fat. Consumers appear to lack awareness about reduced and low fat milk variants since they only have about 35% market share (AC Neilsen, 1997).

Consumers may be confused about the advertising of low fat milks when regular homogenised milk has already been promoted as low fat food. Low fat milks may need strong sub-branding so they are clearly identifiable and communications may need to illustrate the fat content of milk in comparison to that of other foods. For example, 'a glass of Supertrim has no more fat than an apple'. Promotions need to be relevant to modern lifestyles. Consumption of low fat milk may for instance be more appealing as a coffee latte than as a milk beverage. Further research is needed to identify preferred consumer usage of the different types of milk.

Milk and cholesterol

In both surveys more than 27% of respondents agreed that *'milk can cause high blood cholesterol'* and men agreed more than women. This finding supports the expectation that cholesterol would be perceived as a dominant negative nutrient linked to saturated fat intake (Chapter 3). The perception that milk is high in cholesterol was related to increasing age and high occupational status. This supports hypothesis 15 that people of higher occupational status would have negative attitudes to fat and cholesterol in milk. The literature has shown that higher occupational groups have food intakes that are more consistent with health promotion messages (Steele, Dobson & Alexander, 1991).

This focus of New Zealanders on cholesterol has been shown before. For example Worsley et al (1991) found that almost one in eight shoppers were aware of their cholesterol levels and Wiseman (1994) showed that avoidance of cholesterol was more important for women (86%) than men (79%). So the focus is being maintained over time. Beliefs about the cholesterol content of milk have not been examined in other studies. Again this is further evidence of the validity of the present findings.

In contrast to the consumers' perceptions, low fat milks contain negligible amounts of cholesterol. In the consumer surveys more men, middle aged and higher educated people thought this was the case (Tables 7.20a, 7.21a, 7.21b, 7.22b).

Hypothesis 4 that people were generally unaware that low fat milks have little or no effect on serum cholesterol concentrations was confirmed. In contrast to the present findings, Elbon et al (1996) showed that 77% of American respondents were aware that low fat dairy foods could be consumed on a low cholesterol diet. This indicates that public health and marketing efforts successfully communicated the facts about low fat milk and cholesterol. The American subjects were however participating in a community wellness programme and their nutrition knowledge scores predicted their consumption of lower fat milk.

Nevertheless, the lack of awareness that low fat milks are suitable for people with high cholesterol is a problem in New Zealand. Neither New Zealand health agencies nor the milk industry have communicated this message.

An additional factor, which may inhibit the consumption of low fat milk, may be that low fat milk is not well liked. Raats and Shepherd (1992) showed that low fat milks were perceived to be thin and watery. However, people can change their taste perceptions. Finnish consumers who changed from full fat milk to non-fat milk disliked it at first, but eventually adapted to the taste and preferred it (Tuorila, 1987).

The results of the present study confirm that cholesterol in milk is an issue that needs to be dealt with. Communications could combine the needs of both the milk industry and public health nutritionists by joint promotions. For example, promotions by the milk industry and the National Heart Foundation. The finding that cholesterol is more of an issue for higher occupational status, middle aged men provides evidence for targeting of specific communications to this group. This may provide a further opportunity to grow milk consumption.

Dieting and weight loss

The expectation that there would be negative perceptions about drinking milk whilst dieting because of its perceived high fat content of milk was supported (see Chapter 3). The findings suggest that potentially a third of women may avoid milk while dieting. This is an important public health issue. The 1997 National Nutrition Survey showed that mean body weight has increased in the New Zealand population in the last ten years from 71.3 kg to 74.5-kg (Ministry of Health, 1999) with an increase for women of 3.6 kg. It is well documented that many women are preoccupied about their weight in relation to their body shape and appearance (e.g. Rozin et al, 1988), especially teenage girls (e.g. Nowak and Crawford, 1998). Therefore, significant numbers of New Zealand women may be dieting because of concerns about their weight and so avoid milk.

Hypothesis 5 that there would be a lack of awareness about low fat milks and dieting was confirmed. The finding that women were more aware of the benefits of low fat milks when dieting is consistent with other work in this area (Tuorila and Pangborn, 1988; Tuorila et al, 1990; Alexander and Tepper, 1995). However, the present findings are novel in that they illustrate that there is a lack of awareness about the importance of milk for people trying to lose weight. There is a need to reverse this perception.

Milk allergies

Hypothesis 10 that people over 30 years with young families would perceive that milk causes a lot of allergies was not supported. CM Research (1991) had shown that the perceived incidence of allergies in children was high amongst families. However only a third of middle aged people agreed. This is very encouraging for the milk industry. The results suggest that myths about milk allergy are strongest amongst older people (Figure 7.4). The higher agreement seen amongst NZ Maori may be related to their higher incidence of respiratory infections (Pearce, Davis & Smith, 1984) and glue ear (amongst Maori children) (Giles and Asher, 1991). Although milk avoidance does not reduce the risk of these problems, there is anecdotal evidence that health workers promote milk free diets in an effort to avoid repeat occurrences.

It had previously been shown that 19% of New Zealanders believe allergies are related to eating dairy products (CM Research, 1998) but until now milk has not been directly implicated in consumer studies. It would be beneficial to provide health professionals and older people with up to date information about milk allergies. In addition, it may be helpful to develop culturally appropriate education materials for Maori in conjunction with Maori health workers.

Lactose intolerance

There was a widespread disagreement with the view that *'people with lactose intolerance can drink small amounts of milk'* especially among women (Figure 7.3). This supports the expectation listed in Chapter 3. This ignorance may be due in part to the activities of the soy industry, which has raised awareness about lactose intolerance in TV advertising and actively promotes soy 'milk', as an alternative to cow's milk (Sanitarium So Good advertising).

There are no other studies of perceptions of lactose intolerance amongst New Zealanders. Therefore it is important that credible communications are developed to dispel misconceptions and to encourage low volume consumption amongst lactose intolerant people.

Milk for women, children, toddlers and older people
Most of the respondents indicated that milk is mainly for toddlers and children as suggested in hypothesis 12. Milk was also perceived to be more important with advancing age of the respondents. This may be because older people are more concerned about avoiding osteoporosis. Similarly the perception that milk is more important for women may be related to women's greater needs for calcium. CM Research (1991) found that milk was perceived to be a child's drink because of its importance in infancy and early childhood, association with school milk and that by default, it was not an adult's drink. The adults indicated that milk was not a socially acceptable drink in adult company and they joked about the notion of offering friends a glass of milk when they visited.

This perception appears to be part of New Zealand culture. In contrast, in Finland adults commonly drink milk at mealtimes and in America adults choose milk from beverage choices offered on airlines. An understanding of consumer usage by age and gender would help to frame communications in ways that are more relevant to consumer lifestyles. For example, amongst adults over 50 years Elbon et al (1996) showed that 47% of participants believed that 'milk helps me to get to sleep'. This provides an opportunity to promote milk as a flavoured nightcap. The development of milk based drinks for special usage occasions may help to increase consumption as suggested by Grunert's food lifestyle model, which emphasises the importance of usage situations.

Obliged to drink milk
The finding that one in five respondents drank milk because they felt they should, suggests that certain benefits, probably nutritional, outweighed their weak preferences for it. Sex and age were the strongest predictors for this perceived obligation (Figure 7.5). These feelings were strongest in men over 53 years (49%).

This suggests that the inherent health giving properties of milk override its sensory qualities. With a greater emphasis on its health benefits and improvements to its taste, milk could be made more attractive to consumers. Further research is needed to identify usage opportunities to develop appealing milk based drinks.

The range of milks
Only a quarter of the respondents considered that there were too many types of milk available. Older people (30%) held this view more than younger people. This is not surprising, as the range of milks has only been extended in the last ten years (Table 2.1). This perception is in agreement with Rozin's work (Rozin, 1976)), which has demonstrated that food preferences are linked to familiarity. Consumers are reluctant to shift from their own milk type because of beliefs concerning sensory quality, nutritional and health value and suitability for various purposes (Tuorila, 1987).

Most New Zealanders (65%) consume regular homogenised milk. More men than women are likely to have conservative food tastes (Wilson, 1989) and may therefore be more reluctant to try a new milk type. Although women are concerned about health and nutrition and believe in the importance of dietary fat reduction to reduce the risk of heart disease (Wiseman, 1994), they tend to purchase foods that meet the preferences of their husbands and children (Murcott, 1995). It would therefore be helpful to explore the beliefs of family members in future research. Overall, amongst a small proportion (25%) of New Zealanders the power of conservatism and familiarity appear to be likely barriers to changing milk types.

All of the above findings suggest that there are opportunities to provide better communications about the nutritional benefits of milk and to create more usage opportunities. This will be discussed in the section below on implications for the milk industry and public health nutrition. In addition, milk consumption may be enhanced if measures are undertaken to improve the sensory quality of reduced and low fat milks. Milk based drinks, which provide consumer usage solutions may help to increase consumption.

9.3 Attitudes to TV advertising of milk

The second aim of this thesis was to investigate people's perceptions of a TV campaign, which promoted milk by featuring a Samoan rugby player, Michael Jones. The findings showed that the highest brand recall for television advertising over the study period was for Anchor (featuring rugby player Michael Jones) which supports hypothesis 18. This finding was expected as the target audience rating points (TARPS) for television advertising were significantly greater for Anchor (51%) compared to Tararua (15%), Dairy Goodness (20%) and So Good (14%). The brand recall for Anchor was highest amongst men, those under 30 years, and Maori and Pacific Islands people which supports hypotheses 19, 21 and 22.

Rugby is a sport that attracts enormous national interest. New Zealand has more rugby players per capita than any other country in the world. The first migrants brought rugby to New Zealand from their public schools in the United Kingdom. It spread rapidly in New Zealand schools where it became part of the Victorian ethic of producing 'well rounded pupils' (boys) (Kirk, 1999). It also spread rapidly in the provinces where it became the focus of community and social interaction. New Zealand Maori took to the game immediately (Kirk, 1999). It suited their physique and athleticism. Later migrants from the Pacific Islands of Samoa and Tonga provided another rich source of rugby playing talent. 'All Black' teams in recent years have been made up of players of European, Maori and Pacific Island heritage in about equal numbers.

As a result many schoolboys aspire to play for the New Zealand All Black rugby team and rugby coaching in schools is taken very earnestly. Michael Jones was one of New Zealand's most popular All Blacks. His Samoan identity was likely to have created strong support from Pacific Islands and Maori supporters. Therefore milk advertising that featured Michael Jones was likely to appeal mostly to young, Maori and Pacific Islands men. Ironically these groups are already the highest milk consumers.

The CHAID analysis showed that personal interest in the Michael Jones advertising was significantly higher in men and amongst those with lower occupational status. Hypothesis 20 that there would be lower interest amongst women because the rugby images portrayed in the advertising was supported. Among women, the advertising had more appeal among non-European women than Europeans.

Respondents who found the advertising of personal interest reported using more milk than a year earlier. However, the effectiveness of the Michael Jones advertising was diminished because it was of less personal interest to the target audience who were household shoppers and mostly women aged between 20 to 49 years of age. Moreover the advertising gained the highest interest among Maori and Pacific Islands men, who are high milk consumers. Donovan, Egger & Francas (1999) propose that for advertising to be effective it must be relevant to the target audience. By targeting existing high milk consumers the opportunity to change attitudes and increase milk consumption amongst low milk consumers (young women) was missed.

Prompted recall of the advertising was higher among the high milk drinking Maori and Polynesians. Thus by focusing on this small group the campaign missed the opportunity of raising interest in the much larger group of European women. However the principles of consumer market segmentation were not followed and the use of industry resources was not maximised. A creative strategy that had included a female role model and was consistent over time may have been more cost effective. Moreover the campaign was not continued and was therefore a wasted opportunity.

The Maori and Polynesian men who loved the rugby advertising had more positive views about milk. For example they were more of the view that lactose intolerant people could drink milk. Their beliefs typically reflected the views of high milk consumers who have a liking for milk. By contrast the European women who failed to be charmed by Michael Jones had quite different views. They responded more positively to statements that milk is better than fizzy drinks, is more important for children, is a good source of iron and is good on cereals. These beliefs represent women's views about milk. They indicate that women may rely on the more conventional views of milk (i.e. its importance for nourishment). The advertising failed to shift these views because the campaign was misdirected. By targeting high milk consumers whose consumption did not need to be increased and failing to change the views of low milk consumers the advertising was ineffective.

More women than men reported using less milk than a year earlier. The overall effect was that the advertising did not change milk consumption amongst any of the groups and probably turned women off milk.

9.4 Changes in attitudes to milk as a result of TV advertising

Aim 3, hypothesis 23 that there would be more positive perceptions towards the goodness of milk as a result of the advertising was supported. The campaign seems to have increased perceptions about the goodness and energy that milk provides. It also seems to have strengthened the belief that milk is not just for children (Tables 7.33, 7.34).

One of the advertising objectives was to demonstrate the health benefits of milk and focus on its low fat content. However, after the advertising more people strongly agreed that *'all milk is high in fat'* and *'milk causes allergies in a lot of children'*. Therefore the advertising appears to have strengthened negative perceptions to milk.

As previously discussed, perceptions about the fat content of milk and allergies are barriers to consumption. Whilst one of the Anchor commercials featured Supertrim milk with 'just 0.1% fat' the message had no influence on perceptions. Consumers may have been confused by one of the Dairy Goodness advertisements. The focus of this advertisement was that "people still won't believe that everyday milk has only 3.3% fat". This message is somewhat misleading as a glass of regular milk provides a nutritionally significant quantity of fat (8.25g) as people are advised to drink two to three glasses a day. However, it is unlikely that consumers have sufficient nutrition knowledge to understand the advertising. It would be more helpful to compare the fat content of milk with a food that is not perceived to be fattening e.g. an apple. By creating different messages about the fat content of milk industry resources were not used effectively.

More people agreed that *'milk is expensive compared to fizzy drinks'*. This finding was expected however due to the price increase in milk one month prior to the follow up survey. Indeed, soft drinks could be purchased from the supermarket for almost half the price of milk. As previously discussed the relative cost of soft drinks is a threat to milk consumption. Gaining greater consumer understanding about the nutritional benefits of milk compared to soft drinks may help to create more positive beliefs that milk is good value for money.

More women strongly agreed that *'milk provides energy'*. Milk is perceived to provide sustained energy (E Brown, personal communication) which is associated with nourishment. This may be viewed positively if milk is for children or negatively if energy is associated with calories. Indeed more women over 53 years in the follow up survey strongly agreed that *'all milk is high in fat'* and that *'you should only drink a low fat milk when you're on a weight reducing diet'*.

These findings indicate that concerns about the fat content of milk had increased over the study period for women over 53 years although they were less concerned about fat compared to women in general. Milk advertising may have increased their awareness of low fat milk for use in dieting. Elbon et al (1996) showed that consumption of low fat milk amongst women over 50 years was positively correlated with nutrition knowledge scores. Therefore promotion of the nutrition benefits of low fat milk may help to increase milk consumption amongst this age group.

9.5 Limitations of the research

Reliability and validity
The validity of the study findings was demonstrated by the similarity of some of the study findings with those of other studies. For example, the finding that milk consumption was highest among Maori and Pacific Islands people was broadly similar to the findings of the 1997 National Nutrition Survey (Ministry of Health, 1999). In addition, in the baseline survey the proportion of consumers who indicated a preference for taking calcium supplements rather than milk was similar to the findings of CM Research (1998).

To check the overall reliability of the data the mean scores for the attitude items in the baseline and follow up surveys were correlated (Table 7.35). The Pearson correlation coefficient (r = 0.937, p = 0.0001) indicated a strong measure of consistency between the two surveys. The survey results were substantially identical. This confirms reliability of the data. This suggests that the attitude data had high consistency (reliability) between the two measurement waves.

There were some limitations to the research design. The study lacked a control group. This is a potential flaw since attitudes and beliefs could be influenced by factors other than advertising. However, it would have been very difficult to select a community control group. Consumers who did not watch TV were likely to have had different lifestyles and therefore would have been dissimilar to the study group. To ensure that all possible causal factors in the experimental and control groups were identical except for exposure to TV would have entailed considerable time and financial resources. This was not a practical option. Similarly use of a comparison region in another part of New Zealand would have introduced further biases due to the unique conditions operating in the New Zealand regions and again would have been beyond the resources available.

The sampling frame for the consumer studies was the Auckland region telephone directory. Although the samples selected were based on gender and age of the New Zealand population statistics the attitudes and beliefs of consumers living in the Auckland region may not reflect those of consumers living in more remote regions of New Zealand. There was a slight over-representation of Pacific Islands and Asian people in both surveys, which reflects their greater numbers in the Auckland region.

Although the respondents were closely matched by gender and age in the baseline and follow surveys it would have been more reliable to measure changes in attitudes with the same respondents in each of the surveys. However, with consumer panels cost and logistic obstacles did not permit this.

There was an increase in milk price a month before the follow up study. This increased the overall perception in the follow up study that *'milk is expensive compared to fizzy drinks'*. There were no other apparent events that might have effected the respondents' perceptions.

A limitation of the questionnaire related to its estimation of "true" milk intake. Respondents were asked about their daily milk consumption and responses were recorded as parts of a litre (± 250ml). Respondents may have over- or

underestimated the amount of milk they consumed. However, although this was a crude measure of milk intake consumption by gender and ethnicity was similar to other studies (Ministry of Health, 1999).

Factor analysis showed that the attitudes were quite distinct, as there were only weak correlations between the attitude items. The selection of distinct items was deliberate. As the investigator wanted to ensure that as many as possible attitude domains regarding milk were included in hindsight, the lack of commonality between the attitude items suggests that they may have been spread too thinly across attitude domains.

In future studies it would be advantageous to include more items related to key attitude domains. For example, items related to weight control or cost concerns or health restraint issues. A set of common factors would have enabled multivariate analysis and therefore greater control of possible confounding by independent variables such as age, sex, and ethnicity.

There was a need to quantify the degree to which chance variability could account for the observed results. In this study which employed many comparisons between groups a more conservative alpha level of 0.01 was used to avoid over dependence on spurious or chance differences.

9.6 Implications

The findings from the studies undertaken in this thesis have shown the existence of a complex set of attitudes to milk, the relationships of these attitudes to milk consumption and, the apparent effects of milk advertising. These have important implications for the milk industry and for public health nutrition.

9.6.1 Implications for the milk industry

The results from both consumer surveys showed that at least one third of New Zealanders drink less than a glass of milk a day. Milk consumption was lowest amongst young European women and 8% of women did not drink milk at all. Declining milk consumption is a serious problem for the milk industry. It appears that milk is less relevant to people's current lifestyles and the nutritional benefits of milk are not well understood by many consumers.

There is evidence that the sensory quality of milk may need to be improved. About a quarter of people dislike the taste of milk and nearly a half of those surveyed do not find milk refreshing. Alternative products such as milk and juice blends, flavoured milk and milks for specific usage occasions (e.g. breakfast or as a nightcap) may provide an opportunity to promote higher consumption. Promotion of milk with a leading cereal brand might encourage increased breakfast usage.

The findings suggest that milk may be a suitable vehicle for iron fortification. This provides an opportunity for the milk industry to target specific consumer groups who want to increase their iron intake by food sources other than meat. For example, flavoured iron fortified milk may appeal to women.

'*Milk is expensive compared to fizzy drinks*' was the strongest attitude predictor of milk consumption. This suggests that there is an urgent need to take milk beyond the status of a commodity to that of a value-added product. Relative to other beverage choices, regular milk may be seen as mundane. Value added milks for children, teenagers and other groups might help to differentiate milk so consumers do not see it as being basically the same boring generic commodity. Such a shift in marketing strategy may also help to overcome the perception that milk is mainly for toddlers, children and women.

For a third of New Zealanders, milk is not considered to be good value for money. Rising milk costs may impact negatively on consumption and the health status of some New Zealanders. The findings of Elbon et al (1996) amongst older participants in the United States suggest that small containers are needed to increase the frequency of milk consumption in people with low milk intakes, particularly amongst those who live alone. Availability of milk with a low spoilage rate could also increase milk consumption in older consumers. Increased efforts may be needed to provide extended shelf life products especially single person households.

An important part of increasing milk consumption is to make it as easy to consume as other beverages. That suggests that milk needs the same prominent exposure as soft drinks. Therefore milk may need to be available in vending machines and restaurants. In order to compete in these areas milk also needs a longer shelf life than the present ten days.

There was succinct gender and age related differences in attitudes. Women generally had more positive nutritional beliefs about milk. They were more concerned about weight control and therefore their intake of fat from milk. This feminine interpretation of what is 'good for the body' supports findings from the literature, which suggest that women have different views of food in general (Rappoport et al, 1993; Rozin and Falloon, 1998; Worsley, 1987).

It was clear from the surveys that the benefits of low fat milks are not widely understood. The milk industry needs to provide clear messages to consumers that low fat milks are not 'fattening' and indeed have an important role in weight reducing diets.

Middle aged men of high occupational status were the group most concerned about milk and cholesterol. Targeted messages, which illustrate that low fat milks have negligible cholesterol levels but important nutritional benefits for men, especially in relation to maintenance of strong bones, may help to increase their consumption.

Young people had positive perceptions about liking milk as a child presumably because they escaped the school milk scheme. This suggests that young people could be coerced into drinking more milk if they knew how good it was for their body and their health. The successful targeting of energy drinks (e.g. 'Red Bull', 'V') amongst younger consumers suggests that a similar positioning may work for milk based drinks.

Older people had the most concerns about milk allergies and felt more obliged to drink milk than other groups. The findings suggests that older people recognise that

they need to drink more milk than young adults but they do not appear to enjoy milk as much as they could. Usage ideas, recipes as well as tips about the health benefits of milk may encourage greater consumption in this group. Providing milk facts about allergies on packs and leaflets may help to counteract their negative perceptions.

Overall the findings suggest that the milk industry must take action to address these barriers to milk consumption. Nutrition messages and advertising strategies are required that are relevant to modern consumers, especially young European women who are the primary household shoppers and low milk consumers.

This is an important consideration for the milk industry. As outlined in Chapter 2, the dairy industry in New Zealand has a masculine culture evidenced by a strong manufacturing focus. As such, economic performance and growth are key priorities. It is believed that in the postmodern economy the imageries of consumption drive production whereas under modernism, production was given a privileged status (Venkatesh, 1999). In the change from a production industry to an image production industry what is important is not the technical knowledge of producing goods but rather the shifting surface knowledge where the key success factors are speed, motion and instantaneity. For example, the Nike brand of sports shoes defines modern consumerism in a way that the basis of its marketing is not merely its economics but also a particular expression of the market.

Hofstede (1997) proposes that masculine and feminine cultures create different management hero types. Whereas the masculine manager is assertive, decisive and more of a lone decision maker looking for facts, the manager in a feminine culture is less visible, intuitive and accustomed to seeking a consensus. The more feminine management approach is more likely to identify shifts in social ideologies and capture these as opportunities within the organisation's marketing strategies.

The dairy industry culture tends to attract managers with "macho" attitudes and who assume 'top-down' styles of management. The overriding impression I have after four years in the industry is that the attitudes and beliefs of various managers do not match the views of modern consumers. For example, there is a view amongst certain managers that communication of nutrition messages would not add value to the milk business. The review of the literature in Chapter 3 suggests that such attitudes are contrary to consumers' views and lifestyles particularly those of household shoppers.

To date, the milk industry has been slow to adopt marketing practices, which identify with recent social changes. This was evidenced by the "macho" approaches to advertising that was generated by the major milk brand during the study period. By creating advertisements that were mostly liked by high milk consumers (young Maori and Pacific Islands men), the opportunity to encourage consumption amongst low milk consumers or young women was missed.

There are additional opportunities to develop milk-based drinks for specific usage occasions. To date, however, there has been a reluctance to use non-dairy ingredients to formulate such drinks because there is a view that this will not create more value for shareholders (the farmers). A further difficulty is the relatively low

proportion of funds available for milk advertising compared to other beverage industries. This means that there is less opportunity to target messages to consumers that are relevant to their needs and wants. For example, the provision of nutrition information, recipes and usage ideas.

On a more optimistic note, the current restructuring of the New Zealand dairy industry provides an opportunity for cultural change. Recently, New Zealand Dairy Foods, the marketers of Anchor milk were reconstituted as a separate company from the New Zealand Dairy Group. Whereas the key business focus had been maximising profits to the dairy farmers, the change in structure provides an opportunity to invest in long-term marketing strategies. This may provide more opportunity for dairy companies to compete with other beverage manufacturers and to grow milk consumption.

9.6.2 Implications for public health nutrition

Declining milk consumption is a potential public health problem because milk provides nutrients that are not readily accessible in other foods. The findings from the consumer surveys showed that 9.4% of young people (16 to 30 years) consumed no milk at all.

Young people, especially boys, appear to be more attracted to soft drinks and lack knowledge about the nutritional value of drinking milk. In America the consumption of soft drinks is more than two-fold higher than in New Zealand. The American Medical Association has expressed opposition to the sale of soft drinks in schools. Therefore it would be prudent to address the situation in New Zealand before soft drink consumption adversely impacts on nutritional status.

Young women may reject milk on the grounds it is fattening. This perception could be overcome by nutrition education. The milk industry needs to work with health agencies in New Zealand to ensure that the education sector provides positive nutrition messages about milk both within the school curriculum and in the school environment. The consumer surveys showed that younger people liked milk as children, which suggests that milk is unlikely to be rejected if it was made available in school vending machines. To help to improve nutrient intakes, the milk and cereal industry could work with schools to encourage children to eat cereal and milk for breakfast.

Amongst adults there is an apparent barrier to drinking milk because of inaccurate perceptions about its fat and cholesterol content. This provides an opportunity for the milk industry to collaborate with the weight loss industry and the National Heart Foundation to provide positive communications about the benefits of low fat milk.

As previously noted calcium deficits have serious implications for adolescents and adults alike. There is an opportunity here for the milk industry to form alliances with health organisations to promote the bone protecting properties of milk. For example, Osteoporosis New Zealand has been recently established to raise awareness and knowledge of osteoporosis. However, this organisation is partly funded by pharmaceutical companies who manufacture calcium supplements. This may be an area of conflict for the milk industry.

The conservative recommendation of the Ministry of Health to ensure that 75% of the population have calcium intakes greater than 600mg a day by the year 2000 does not appear to have been accompanied by any action. This is a difficulty for the milk industry, as it does not see that it has a major role in health promotion. Furthermore, various health agencies are reluctant to communicate branded milk messages. Milk companies are in the business of gaining increased market share for their branded products so this reluctance can inhibit progress.

The attitudinal barriers that appear to exist between the milk industry and health organisations in New Zealand have been overcome in Denmark. In 1991 the Danish Dairy Board initiated a strategy for nutrition communication which aimed to change the structural conditions for nutrition information, improve educational competence among opinion formers and improve consumers' competence to make healthier food choices (Helund, 1999).

The Board took the initiative in establishing an independent Nutrition Council funded by leading food trade organisations in Denmark and the Danish Medical Organisation. This initiative has given the Danish Dairy Board a lot of goodwill and productive contact with almost any nutrition scientist. Five years later the government took over and a permanent Nutrition Council was set up under the Ministry of Food, Agriculture and Fisheries, which can be seen as a seal of approval.

In addition, the Danish Dairy Board has run campaigns addressed at day care institutions for preschool children and school children as well as an osteoporosis prevention campaign and health promotion activities addressed at elderly people (Helund, 1999). All of these activities were performed in collaboration with opinion formers and representatives from the target groups. The media were also kept informed.

There is positive recognition from opinion formers that the Dairy Board takes on co-responsibility for public health in Denmark (Helund, 1999). The fact that the dairy industry has a formulated nutrition policy is considered fundamental for the opinion formers' incentive to collaborating or having a serious dialogue with the industry. This dialogue in combination with highly qualified nutritional staff of the industry is considered the main reason for the relatively peaceful media debate in Denmark concerning dairy foods and nutrition (Helund, 1999). This suggests that the high ethical standard of the industry has paved the way for collaboration with public health.

The possibility for a combined effort in nutrition communication by the milk industry and public health educators might be achieved by engaging the support of GPs. They are viewed as providers of the most credible source of health information and are well positioned to provide health information about milk to families. As noted in Chapter 8, GPs appear to lack nutrition knowledge about the range of nutrients in milk. Probably as a result of this, a third of GPs do not consider milk to be essential for adults. Further, a third of the GPs disagreed or were not sure that calcium supplements were unnecessary. These findings suggest that the milk industry needs to follow the lead of the Danish Dairy Board to improve the educational competence of opinion formers. GPs need encouragement to provide

positive milk messages to their patients and to recommend milk and not supplements.

The evaluation of young children for possible milk allergy is a common problem encountered by GPs. Unfortunately many GPs do not have the knowledge to make an accurate diagnosis and trial of a milk free diet may therefore be initiated. Accurate information on milk allergy and lactose intolerance is not widely available to consumers. This suggests that continuing education initiatives for GPs may be required to prevent unnecessary milk avoidance from these causes.

Teachers, practice nurses, Plunket nurses and community dietitians are also important influencers. Educational initiatives aimed at GPs need to be undertaken in collaboration with these health advisors in order to obtain a synergistic effect and to avoid confusion about nutrition messages.

Further initiatives similar to the Michael Jones 'Smart drink guide' but aimed at a range of social groups could be developed for GP and other clinics. However, many health professionals are reluctant to use branded industry materials and there is an overabundance of such resources available. The interest of the public's health status should take precedence. Public health is more likely to improve if the parties work together without prejudice. Industry-health alliances provide a positive way forward and can help to maximise the use of resources.

Specialist groups, such as paediatricians, may also be able to provide a supporting role. The American Academy of Pediatrics has recently issued a position statement to provide advice about the nutritional needs of calcium for children and teenagers (Committee on Nutrition, 1999). To emphasise the important of calcium nutrition, they suggest that pediatricians consider asking questions about dietary calcium intake including:

- What do you drink, either white or chocolate milk, with your meals?
- Do you drink milk with meals, snacks or cereal or any other time of the day?

Similar initiatives could be undertaken in New Zealand by the Paediatric Society, Royal College of General Practitioners or by the Plunket society. This would help to create greater awareness of milk drinking habits in young children and provide credibility to the milk messages delivered by industry.

In summary there is an urgent need to arrest declining milk consumption particularly amongst children and teenagers. The milk industry alone cannot be held accountable for this problem. Public health initiatives are needed to encourage greater milk consumption and to help improve the nutrition status of New Zealanders. This needs to be driven by the milk industry in collaboration with the Ministry of Health and other health agencies.

9.6.3 Future research

In this study I have identified various attitudinal factors that may underlie declining levels of milk consumption. This exploratory study provides a sound base for further research projects.

The sensory quality of milk requires further investigation. The surveys showed that milk was not liked or was not refreshing for a significant proportion of consumers. Therefore it is important to understand what aspects of milk are disliked and in particular how fat levels alter taste perceptions. Milk based beverages may be more acceptable to some consumers, and these may be more refreshing than regular milk. Milk based prototypes could be developed for research purposes.

To develop more appropriate advertising campaigns it would be beneficial to gain a greater understanding of consumer perceptions of 'energy' and other nutritional factors in milk. For example, it would be useful to explore how important iron or other minerals such as magnesium, and zinc that are commonly found in dietary supplements, are for milk consumers. In addition, further investigation of consumers' perceptions of negative nutrients such as fat and cholesterol may provide greater clarity for the development of relevant marketing messages.

Consumers' use of milk and other beverages requires further examination. It may not be realistic for milk to compete as a beverage alongside fruit juice and soft drinks. These drinks may have different social meanings and further research is needed to identify where milk fits amongst the spectrum of drinks.

Food behaviour is related to usage situations and research is needed to explore consumers use of milk in various situations e.g. in social gatherings, at breakfast, as a snack. The types of meals, their settings and social significance determine how milk is used. Recipes and usage ideas need to be relevant to how people live. Understanding how people shop, whether people read milk labels, whether they rely on advice of experts or what they read could influence their purchase behaviour. Consumers' requirement for convenience products and packaging are important factors. Product innovations, which provide solutions to these lifestyle factors, may help to grow consumption.

Finally, it would be advantageous to investigate the societal values and worldviews of milk drinkers versus non-milk drinkers. In addition, inclusion of items, which elicit respondent's habits in relation to the purchasing, and usage of milk could add to the predictive power of milk attitudes.

9.7 Conclusions

In this thesis I have shown that low milk consumption is a potential problem for the nutrition status of some segments of the population, particularly for NZ European women.

For the first time a whole set of attitudes and beliefs about milk has been examined. The findings from this investigation provides an opportunity for the milk industry and for public health nutritionists to develop product innovations, promotional strategies and public health initiatives to address the barriers to drinking milk

In general, women were more positive about milk but they were concerned that milk was fattening. Men were less aware of milk's nutritional benefits and as a result were less appreciative of its value compared to soft drinks. They were however

more aware of men's health issues as evidenced by their greater concern about milk and cholesterol.

The TV milk advertising campaign that took place during the study period failed to generate high appeal from the target audience and risked alienating many women consumers. The campaign appealed mostly to young Maori and Pacific Islands men who were high milk consumers; their milk consumption was unlikely to be capable of increase.

As a result of the campaign there were some changes in attitudes but no change in consumption. More women than men reported using less milk than one year earlier. There were apparent positive changes in beliefs that milk has 'goodness' and provides energy. However, negatives beliefs about allergies, the fat and cholesterol content of milk and the price of milk were increased in magnitude.

There are several implications for marketing and public health. A number of strategies are proposed including the formation of industry-health alliances. Further research is needed to investigate the sensory quality of milk and to understand the relevance of milk in consumer lifestyles.

Appendices

The appendices are numbered in relation to the chapters in which they were referred. For example, Appendix 3 below refers to the discussion about attitudes to fruit and vegetable consumption in Chapter 3.

Appendix 3   Consumer attitudes and fruit and vegetable consumption

Psychosocial correlates of fruit and vegetable consumption were studied in an adult Dutch population (Brug, Lechner & De Vries, 1995). Attitudes were a summation of beliefs about taste, different health consequences, and costs in time and money. Social influences were measured through the social support respondents expected to get from important others to consume adequate amounts of fruit and vegetables and by asking the subjects about the behaviour of important others. Self-efficacy reflected the respondents' ability to consume adequate amounts of fruit and vegetables in various situations.

This study found that self-efficacy and attitudes were consistently and significantly associated with consumption of boiled or otherwise heated vegetables, of salads, and of fruit. Furthermore, respondents reporting low consumption of these food groups had lower self-efficacy expectations and less positive attitudes than subjects with relatively high consumption of fruit and vegetables.

In the UK the contribution of a variety of psychosocial and environmental factors to consumption of fruit and vegetables by children aged 9-11 years has been explored (Gibson, Wardle & Watts, 1998). In this study ninety-two mothers and children were recruited via urban primary health-care practices. Independent predictors of children's fruit intake included mother's nutritional knowledge, mother's frequency of fruit consumption and mother's attitudinal conviction that increasing fruit and vegetable consumption by their children could reduce their risk of developing cancer.

Children's vegetable consumption was independently explained by the child's liking for commonly eaten vegetables and the mother's belief in the importance of disease prevention when choosing her child's food (Gibson et al, 1998). The pattern of influence of the various measures on fruit and vegetable consumption was compared with that on children's confectionery intake. It was found that the mother's liking for confectionery and their children's concern for health in choosing what to eat predicted children's confectionery consumption. It is therefore conceivable that children of this age group may also be influenced by their mother's beliefs about the health benefits of milk. The study show that the nutrition knowledge, consumption behaviour and attitudinal conviction of the mother is important factors in increasing vegetable consumption in their children. These factors might also apply to increasing milk consumption.

There have been similar findings in the United States amongst women served by the Special Supplement Nutrition Programme for Women, Infants and Children (WIC) (Havas, Treiman & Langenberg, 1998). In this study socio-demographic and psychosocial variables were used to predict consumption of fruit and vegetables. It was found that about 21% of the variance in consumption related to self-efficacy, positive attitudes and nutrition knowledge. Socio-demographic variables were not powerful predictors of consumption.

However a recent study in the United States has shown that nutritional concern is of less relevance to most people than taste and cost in relation to consumption of fruits and vegetables, fast foods, cheese, and breakfast cereals (Glanz, Maibach & Goldberg, 1998). Respondents were a national sample of 2,967 adults. Results were based on responses to two self-administered cross-sectional surveys. Respondents reported that taste is the most important influence on their food choices, followed by cost. Demographic and health lifestyle differences were evident across all food measures. The importance of nutrition and the importance of weight control were predicted best by subject's membership in a particular health lifestyle cluster. The importance placed on taste, nutrition, cost, convenience, and weight control also predicted types of foods consumed.
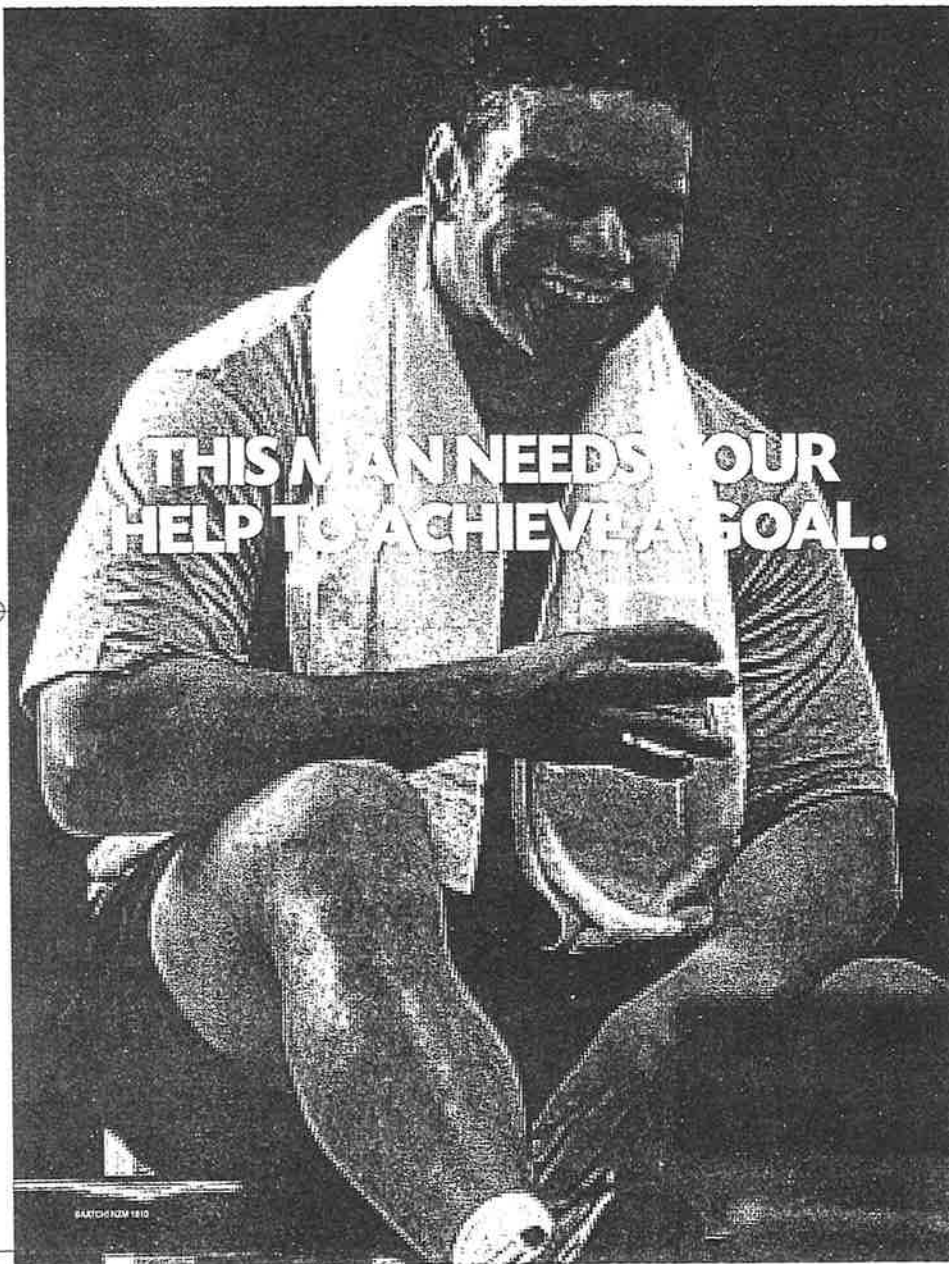
THIS MAN NEEDS YOUR HELP TO ACHIEVE A GOAL.

We have an opportunity to strengthen a whole generation of New Zealanders. We really do.

It's a fact that New Zealanders aren't getting enough calcium.[1]

Over the last fifteen years, our milk consumption has fallen consistently every year.[2]

Down to levels where most 13 and 14 year olds are getting no more than 70% of their recommended daily intake.[3]

Calcium (and in its richest form, milk) is not simply good for kids, as you know, it's essential.

Michael Jones is our milk man with a mission.

He's the focus of a new million dollar campaign to ensure each person in New Zealand has their quota of calcium.

But he can only do so much.

We can talk about the benefits of milk till the cows come home.

But we can't tackle this and win without your help. Together, we need to lay to rest a number of milk-myths.

Milk Myth #1: Milk is Fattening.

Anchor Lite Blue is 98.5% fat free, Calci-Xtra and Super Trim are both 99.9% fat free. Not very fat, we think you'll agree. An apple contains more fat than two glasses of Super Trim.

Milk Myth #2: Calcium is readily available from other foods.

Milk is still the most accessible, digestible and palatable source of calcium for all age groups. No other single food is as complete.

Milk Myth #3: Milk is just for kids.

Adults need milk too. For calcium and other essential nutrients like protein, zinc, riboflavin, and Vitamin B[12]

We've poured the latest findings about milk into a leaflet that we feel will go a long way to re-establishing the goodness of milk. If you're in the Auckland region, supplies of this free brochure will be sent to you soon.

Other regions are welcome to call 0800 ANCHOR for prompt delivery.

Our website, www.anchor.co.nz is a rich source of milk information, too. With your backing, ultimately, Michael can help us convert a generation of New Zealanders.

Life. Milk it. ⚓ Anchor

1. Life in New Zealand Commission Report Volume V1 · Nutrition. University of Otago, 1991. 2. Industry statistics.
3. Brinsdon S, George J, Paulin J, MacFarlane J. A survey of the nutrient intakes of a sample of Form 3 and Form 4 students. Department of Health, Wellington, 1993.

Tararua Moustache.

Kids love milk. Your kids need milk. Milk is an essential part of your family's diet. Tararua milk provides the calcium necessary for kids to grow and maintain healthy teeth and good strong bones. You know there's miles of smiles in every glass of Tararua.

Tararua®

Goodness for your world
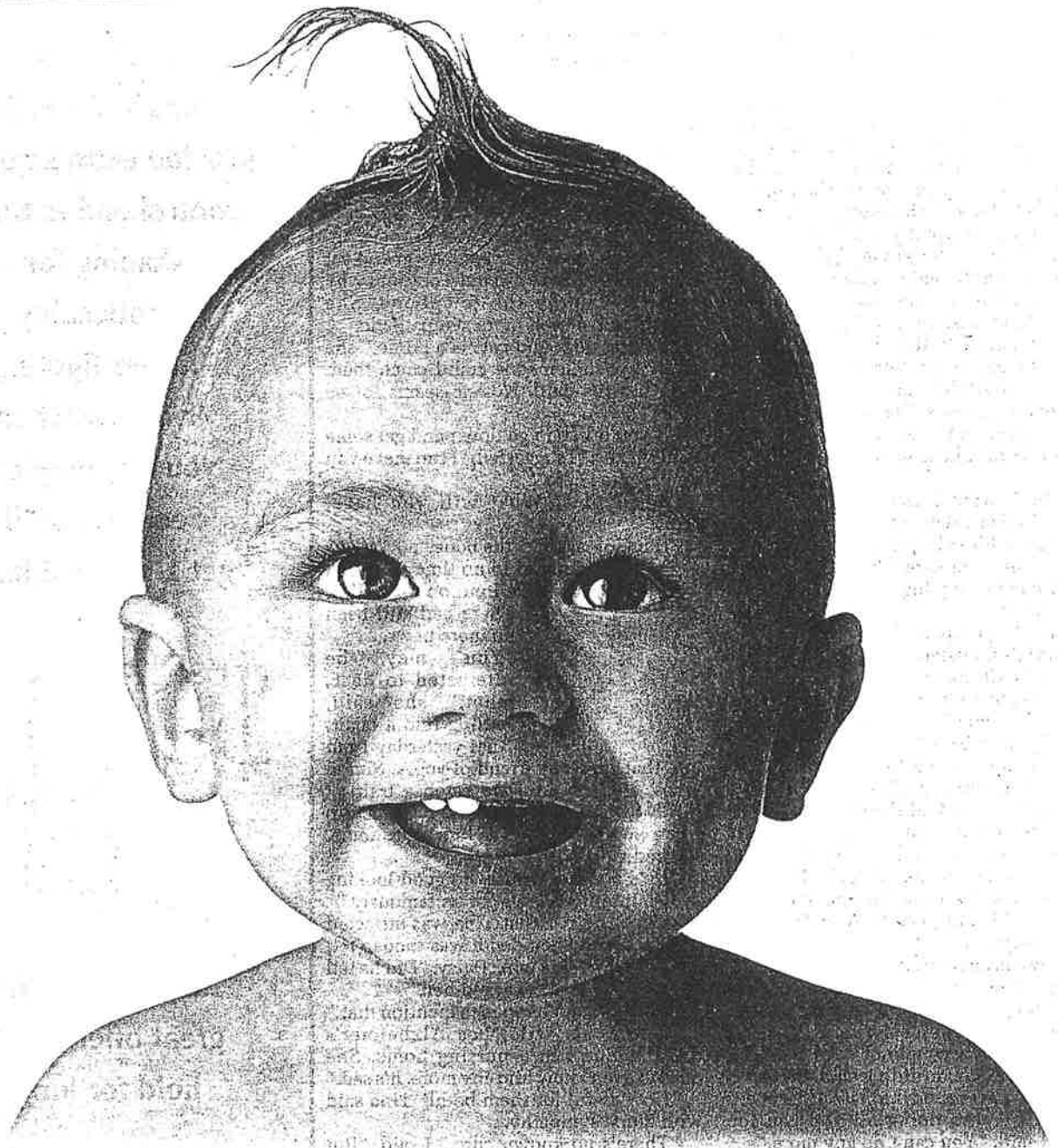
Tararua Teeth

Strong teeth, strong bones, strong bodies, mums know that kids need milk. When your children have outgrown breast milk and formula, then it's time for Tararua to provide the essential amino acids and nutrients their young bodies need to grow. Keep the smiles on your kids' faces, put Tararua in their diet.

Tararua®

Goodness for your world

Ever WONDERED what your BONES are made from?

Most of us imagine our bones to be something hard, white and inanimate – not a living, growing tissue that needs constant feeding and nurturing.

Yet our bones are just as much alive as the rest of our bodies and, similarly, rely on a balanced diet for their good health.

Strong, well-formed bones are made largely from calcium – which is supplied mainly by dairy products.

Without enough calcium, our bones get thin, porous and prone to breaking. This condition is known as osteoporosis – and it's a disease that's affecting more and more New Zealand women.

This quick lunch will supply half your daily calcium needs.

Are you getting enough calcium?	
Average daily requirement:	● ● ● ●
1 glass of homogenised milk	●
1 glass of high-calcium milk	● ●
1 glass of non-fat milk	● ◗
3 slices of cheddar cheese	● ◗
1 pottle of yoghurt	●
1 cup of ice-cream	●

By eating lots of dairy – our richest, most natural source of calcium – you can help prevent osteoporosis. Health experts recommend that women have at least 800mg of calcium a day – 1,000mg if you exercise a lot.

The chart opposite makes it easy to work out how much calcium is contained in different dairy products.

You can introduce more dairy to your diet with very little effort. For instance, start the day with a fresh fruit smoothie or, if you have a sandwich for lunch, make sure there's a slice of cheese in it. When you make pasta dishes remember to sprinkle lots of your favourite cheese on them or mix a few cubes into your salad.

If you're wondering about other ways to enjoy dairy, get a copy of our 'Bright Ideas' booklet by returning the coupon. We can send you back some information on osteoporosis at the same time.

FACT: Osteoporosis is more common than breast cancer, stroke and heart attack combined in women past menopause.

Please send me a free copy of the following booklet(s):

☐ Bright Ideas for Getting all the Calcium You Need
☐ Osteoporosis – Look After Dem Bones

Mrs/Miss/Ms/Mr ....

Address ....

....

.... Telephone (   ) ....

Please post this coupon (no stamp required) to:
Freepost 3342, Dairy Advisory Bureau, PO Box 417, Wellington.

Thank **Dairy** for Goodness

If you want to KNOW the FAT CONTENT of a glass of milk, look at the TABLE below.
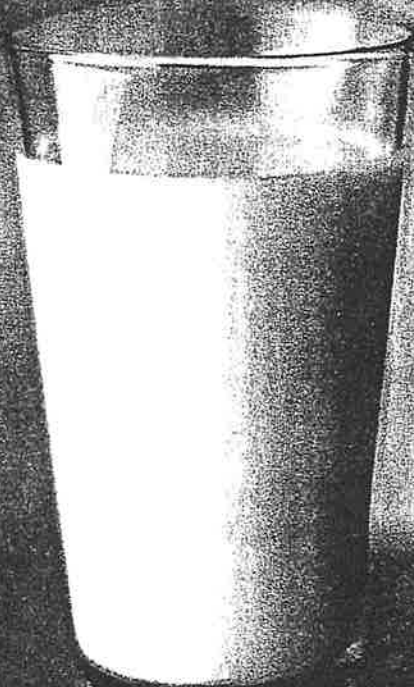
Discovering that ordinary, everyday milk has just a drop of fat may come as quite a surprise to some people.

After all, research shows that most of us think homogenised milk is almost a third fat. The actual figure is just 3.3% – which makes milk less fattening than skinless chicken breast, natural muesli or tofu.

We also have a habit of grossly over-estimating the fat content of cheese, yoghurt, ice cream and, believe it or not, trim milk (see table below).

The fats and figures	
Food	Fat content
Homogenised milk	3.3%
Trim milk	0.4%
Yoghurt	1.5%
Ice cream	11%
Biscuit	25%

Even if you're someone who reads nutrition labels and are fully aware of the fat content of certain foods, it's important not to dismiss those foods just because they contain a bit of fat. You may be missing out on other essential nutrients.

Take dairy products for example. They have some fat, but are also our richest, most natural source of calcium. Just three servings of dairy a day will provide your body with all the calcium it needs – and protect your bones against diseases like osteoporosis.

You can actually introduce more dairy to your diet and lower your fat intake at the same time. For instance, mixing natural yoghurt with desiccated coconut is a great substitute for coconut cream. And using pita bread as a base makes a much lighter, but just as yummy pizza – especially when topped with tomato paste, fresh basil leaves, camembert and black olives. Just 10 minutes under a grill and it's ready to eat.

If you want to know other ways to stay healthy with dairy, simply complete and return the coupon.

FACT: 30-33% of your daily energy needs should come from fat.

Make this low fat pizza with a pita bread base and camembert cheese.

Please send me a free copy of the following booklet(s):

☐ Cutting Down on Fat and Staying Healthy
☐ Bright Ideas to Lower Your Fat Intake.

Mrs/Miss/Ms/Mr ....

Address ....

....

Telephone ( ) ....
AWDFI

Please post this coupon (no stamp required) to:
Freepost 3342, Dairy Advisory Bureau, PO Box 417, Wellington.

Thank **Dairy** for Goodness

GHT 6233

How many women do you know that are completely happy with their bodies? Most of us have at least one thing we'd like to change.

The key to achieving that change lies in what you eat and how much you exercise. (No surprises there you may think.) But unless you get the balance right, you could end up doing your body more harm than good.

This fresh fruit smoothie – a great post workout calcium boost – has just 2.4% fat.

Too much exercise combined with too little food can lead to osteoporosis – a painful, bone-thinning disease that's afflicting more and more New Zealand women.

If you do have an intensive workout programme, it's essential to provide your body with the right 'fuel' – both energy and essential vitamins and minerals.

The fats and figures	
Food	**Fat content**
Homogenised milk	3.3%
Ice cream	11%
Yoghurt	0.1 – 2.0%
Biscuit	25%
Roasted peanuts	49.3%
Muesli bar	19.8%

You also need plenty of calcium to look after your bones – which means a diet rich in dairy products. And before you write off dairy as too fattening, take a look at the chart above. You may be surprised at how little fat there is in dairy products.

FACT:
Osteoporosis can and does occur in young women, especially if they are underweight with low body fat, have stopped menstruating or over-exercise.

For instance, a fresh fruit smoothie – a great post workout calcium boost – has just 2.4% fat. Simply blend half a cup of homogenised milk with half a cup of natural yoghurt and add 2 tbsp of your favourite fruit.

Try to have at least three servings of dairy a day. Then, you can look at yourself in the mirror and know that your bones are as healthy as your body.

If you'd like more information about how dairy can help you stay fit and healthy, complete and return the coupon.

Please send me a free copy of the following booklet(s):

☐ Fit but Fragile – Advice on Bone Health
☐ Cutting Down on Fat and Staying Healthy
☐ Bright Ideas for Getting all the Calcium you Need.

Mrs/Miss/Ms/Mr

Address

Telephone (   )

Please post this coupon (no stamp required) to:
Freepost 3342, **Dairy** Advisory Bureau, PO Box 417, Wellington.

Thank **Dairy** for Goodness

Appendix 6.1 Guidelines of the Human Research Ethics Committee

Research involving Human Subjects

Subsection 10.14, The University of Adelaide Handbook of Administrative Policies and Procedures, Jan 1998

13 Questionnaires

13.1 Straightforward exercises in eliciting information, where the intention is simply to gather true reports of facts (including subjects' perceptions of things) and are unexceptionable do not require clearance from the Committee. Where the information sought is concealed by some form of "trick question" and the information sought is not the ostensible information, the questioning is of ethical concern. Researchers with concerns about the ethical implications of questionnaires should consult the Committee.

Appendix 6.2 Baseline survey consumer questionnaire

Good Morning/Afternoon/evening….. This is _____ calling from Startel Teleperformance, we are currently conducting a short survey on habits and attitudes towards milk by the general population. May I speak with the person who last had his/her birthday please.

If same person continue next sheet, if different person re-introduce yourself and go to next page.

How to answer:

The survey we are conducting is about cow's milk. I'm going to read out some statements about milk and for each one I'd like you to tell me how strongly you agree or disagree with the following statements

1 Strongly Agree 2 Agree 3 Don't know   4 Disagree   5 Strongly Disagree

I think that milk

Milk tastes good	1	2	3	4	5
Milk is refreshing	1	2	3	4	5
Milk provides energy	1	2	3	4	5
I used to like milk as a child	1	2	3	4	5
Milk is good added to cereals and drinks	1	2	3	4	5
Milk is better for you than fizzy drinks	1	2	3	4	5
Milk is a good source of calcium	1	2	3	4	5
I only drink milk because I feel I should	1	2	3	4	5
Milk can cause high blood cholesterol	1	2	3	4	5
Milk has a lot of goodness such as protein, vitamins and minerals	1	2	3	4	5
Fruit juice is better for you than milk	1	2	3	4	5
Milk is more important for children than adults	1	2	3	4	5
Milk is important for bone growth	1	2	3	4	5
Drinking milk is is better than taking calcium supplements	1	2	3	4	5
It is important to drink milk when you're on a weight reducing diet	1	2	3	4	5
You should only drink a low-fat milk when you're on a weight reducing diet	1	2	3	4	5
Drinking a low fat milk is Ok for Adults with high blood cholesterol	1	2	3	4	5
All milk is high in fat	1	2	3	4	5
Regular Milk (Blue Top) is high in fat	1	2	3	4	5
Milk causes allergies in lot of children	1	2	3	4	5
People with lactose intolerance can drink small amounts of milk	1	2	3	4	5
Milk should be the main part of a toddler's diet	1	2	3	4	5
Women need more milk than men	1	2	3	4	5
Adults over 65 need more milk than young adults	1	2	3	4	5
Milk is good value for money	1	2	3	4	5
Milk is expensive compared to fizzy drinks	1	2	3	4	5
There are too many types of milk available	1	2	3	4	5

a) Record Gender   Male   Female

b) May I ask your age please   _____

c) How many people live at this residence _____

d) And how are they related to the respondent
   Partner/Spouse   ____
   Children   ____
   Friends   ____
   Relations   ____
   Flatmates   ____

e) May I ask the ages of the children please? (This question will be asked only of there are children residing at the premises)

f) May I ask your ethnic origin
   NZ European   1
   NZ Maori   2
   Pacific Islander   3
   Asian   4
   Other   5

g) What is the highest level of formal education you have completed

_____ _____

(Probe fully for technical qualifications, graduate degree specialisation)

h) May I ask what is your present occupation

_____ _____

(probe fully for details)

i) May I ask who is responsible for grocery shopping in your household

_____ _____

j) How much milk would you, yourself have on a daily basis, either as a drink or added to cereals, tea and coffee

       less than ¼ litre   1
       ¼ to ½ litre   2
       More than ½ litre   3
       None at all   4

Thank you very much for your time

Appendix 6.3 Factor analysis

There were 10 components extracted from the follow up survey attitudes with a factor score >. 350.

Component	Attitude	Factor Score
1	Milk is important for bone growth	0.501
	Milk is better for you than fizzy drinks	0.489
	Milk is good added to cereals and drinks	0.465
	Drinking milk is better than taking calcium supplements	0.443
	I used to like milk as a child	0.440
	Milk tastes good	0.423
	Milk provides energy	0.385
	Milk has a lot of goodness such as protein, vitamins and minerals	0.410
	Milk is more important for children than adults	0.343
	Milk is good value for money	0.437
	Milk is a good source of calcium	0.440
2	Milk tastes good	-0.397
	Women need more milk than men	0.501
	Milk should be the main part of a toddler's diet	0.434
	Milk is refreshing	-0.429
	Milk provides energy	-0.423
	Fruit juice is better for you than milk	0.414
	Regular Milk (Blue Top) is high in fat	0.401
	Adults over 65 need more milk than young adults	0.355
	You should only drink a low-fat milk when you're on a weight reducing diet	0.354
3	Milk is refreshing	0.410
	There are too many types of milk available	0.579
	People with lactose intolerance can drink small amounts of milk	0.420
	Milk is expensive compared to fizzy drinks	0.394
	I only drink milk because I feel I should	0.353
4	Regular Milk (Blue Top) is high in fat	0.353
	Milk causes allergies in lot of children	0.506
	Milk has a lot of goodness such as protein, vitamins and minerals	-0.367
	All milk is high in fat	0.362
5	Milk is good added to cereals and drinks	-0.354
	Milk has a lot of goodness such as protein, vitamins and minerals	0.519
6	Regular Milk (Blue Top) is high in fat	0.357
	Milk can cause high blood cholesterol	0.458
	I only drink milk because I feel I should	-0.397
	Milk is more important for children than adults	-0.385
7	Milk can cause high blood cholesterol	0.382
	Drinking a low fat milk is Ok for Adults with high blood cholesterol	-0.353
8	Milk is good value for money	0.509
	All milk is high in fat	0.467
9	Drinking milk is better than taking calcium supplements	0.352
	Milk causes allergies in lot of children	0.364
	All milk is high in fat	-0.409
10	Milk is a good source of calcium	0.446

Appendix 6.4 Follow up survey consumer questionnaire

I think that ...

Code		1 AA	2 A	3 ?	4 D	5 DD
Taste	Milk tastes good					
Refresh	Milk is refreshing					
Energy	Milk provides energy					
Childish	I used to like milk as a child					
Oncereal	Milk is good added to cereals and drinks					
Fizzy	Milk is better for you than fizzy drinks					
Calcium	Milk is a good source of calcium					
Obliged	I only drink milk because I feel I should					
Cholest	Milk can cause high blood cholesterol					
Goodness	Milk has a lot of goodness such as protein, vitamins and minerals					
Fruitjui	Fruit juice is better for you than milk					
Forchild	Milk is more important for children than adults					
Bonegrow	Milk is important for bone growth					
Casuppls	Drinking milk is is better than taking calcium Supplements					
Oktodiet	It is important to drink milk when you're on a weight reducing diet					
Lowfat	You should only drink a low-fat milk when you're on a weight reducing diet					
Lowchol	Drinking a low fat milk is Ok for Adults with high blood cholesterol					
Highfat	All milk is high in fat					
Bluetop	Regular Milk (Blue Top) is high in fat					
Allergy	Milk causes allergies in lot of children					
Lactose	People with lactose intolerance can drink small amounts of milk					
Toddler	Milk should be the main part of a toddler's diet					
Women	Women need more milk than men					
Over65	Adults over 65 need more milk than young adults					
Value	Milk is good value for money					
Costfizz	Milk is expensive compared to fizzy drinks					
Range	There are too many types of milk available					
Iron	Is a good source of iron					

1   Record gender

1 Male
2 Female

2   May I ask your age please _____

3   Which ethnic group do you belong to? (Read out)

1 NZ European
2 NZ Maori
3 Pacific Islander
4 Asian
5 Other

4   What is the highest level of formal education you have completed

1 Three years or less at secondary school
2 Four years or more at secondary school
3 Technical or trade certificate
4 University qualification

5   What is your present occupation
    (probe fully for details)

_____

6   How much milk would you, yourself have on a daily basis, either as a
    drink or added to cereals, tea and coffee

1 less than ¼ litre
2 ¼ to ½ litre
3 More than ½ litre
4 None at all

7   How many people in each of these age groups are living in the
    household?

1 Preschoolers (Under 5)	
2 School age (5-12)	
3 Teenagers (13-18)	
4 Adult women (18+)	
5 Adult men (18+)	

8   What TV advertising for milk do you remember seeing recently?
    (Check from videotape of advertising).

9   What was the brand being advertised?

Order of recall	1	2	3
Anchor			
Tararua			
Thank Dairy for			

Goodness			

10   Are there any other ads for milk you remember?
(Please record order of recall)

(Continue Q11, Q12 if respondent aware of any advertisement involving
Micheal Jones)

11   Recalling the TV ad with Micheal Jones, did you find the ad of
interest to you personally?

1 Yes
2 No

12   Apart from trying to get you to buy the product what was the main message
in the ad?

1	Milk is healthy/good for you
2	Milk gives you energy
3	Milk is good for families
4	Other (please specify)
5	Don't know

13   Thinking about the milk you use, would you say you are using -

1 Much more
2 A little more
3 About the same
4 A little less
5 A lot less

than about a year ago?

Appendix 7.1 Demographic predictors of 'people with lactose intolerance can drink small amounts of milk' in the follow up survey.

'people with lactose intolerance can drink small amounts of milk'
A=Agree ?=Don't know D=Disagree   N=719

Sex

x^2=10.28 P=.0013 df=1

Men n=354	**Women** n=365
A=29.66% ?=15.54% D=54.80%	A=16.44% ?=22.19% D=61.37%
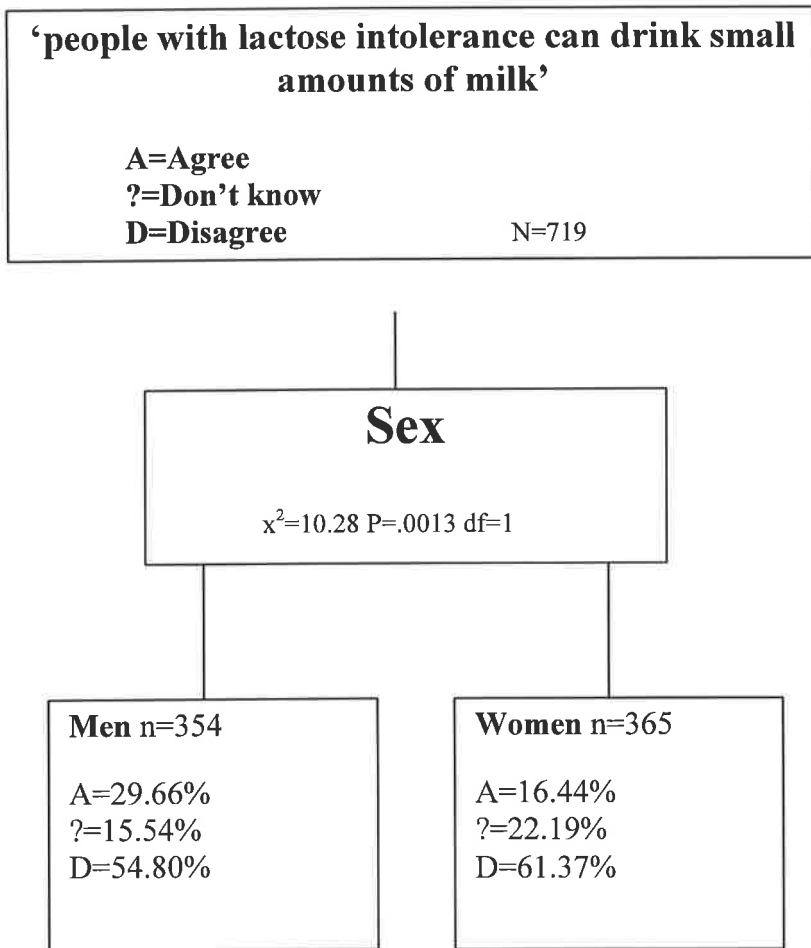
Appendix 7.2 Demographic predictors of 'milk causes allergies in a lot of children' in the follow up survey.

```
┌─────────────────────────────────────────────────────────┐
│        'milk causes allergies in a lot of children'      │
│                                                           │
│           A=Agree                                         │
│           ?=Don't know                                    │
│           D=Disagree                    N=719             │
└─────────────────────────────────────────────────────────┘
                              │
                 ┌───────────────────────────┐
                 │            Age             │
                 │                            │
                 │    $x^2$=12.47 P=.00083 df=1 │
                 └───────────────────────────┘
              │                              │
┌─────────────────────┐          ┌─────────────────────┐
│  16-52 years        │          │  Over 53 years      │
│                     │          │                     │
│  A=30.59%           │          │  A=44.08%           │
│  ? =3.80%           │          │  ? =3.27%           │
│         D=65.61%    │          │         D=52.65%    │
│                     │          │                     │
│  N=474              │          │  N=245              │
└─────────────────────┘          └─────────────────────┘
```
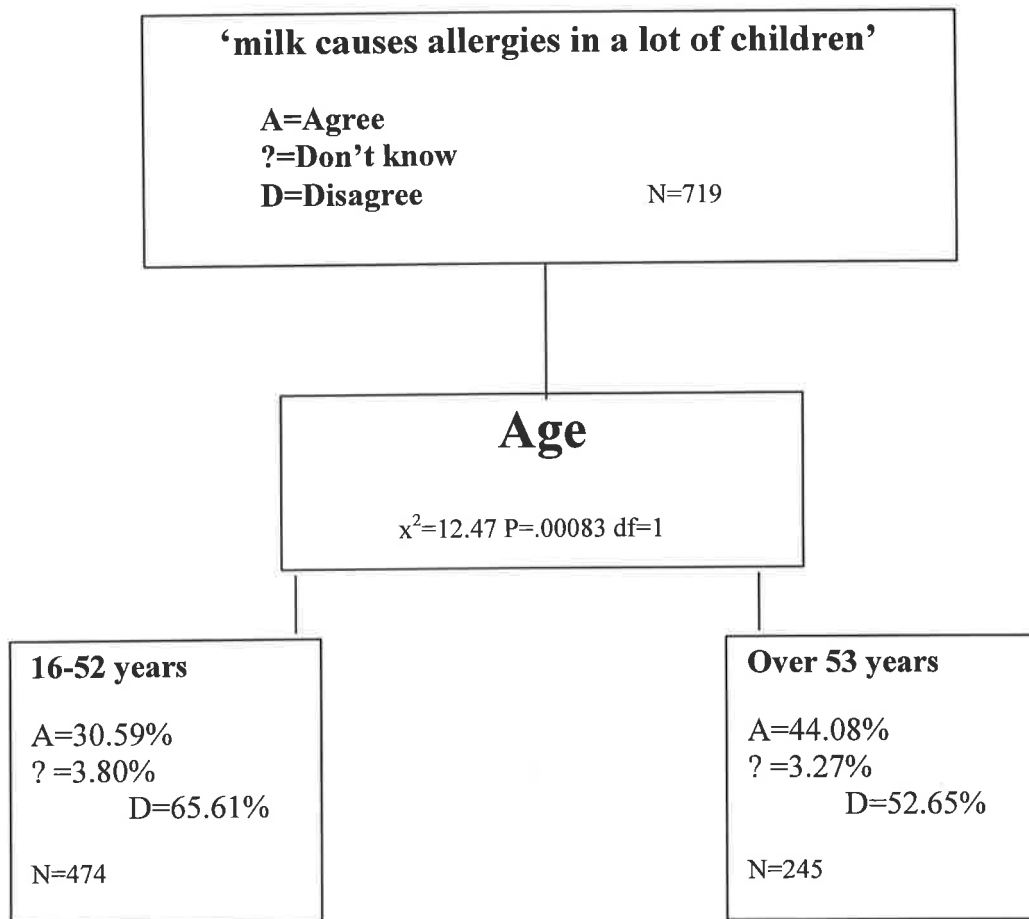
Appendix 7.3 Demographic predictors of 'I only drink milk because I feel I should' in the follow up survey.

'I only drink milk because I feel I should'

A=Agree
?=Don't know
D=Disagree   N=719

Age

$x^2=6.36$ P=.23 df=1

Age 16-52 years

A=19.20%
? =22.78%
        D=58.02%

N=474

Age 53+ years

A=29.98%
? =19.59%
        D=51.43%

N=245

Sex

$x^2=33.01$ P=9.2e-9 df=1

Men

A=44.26%
? =20.49%
        D=35
        .25%

N=122

Women

A=13.82%
? =18.70%
        D=67
        .48%

N=123
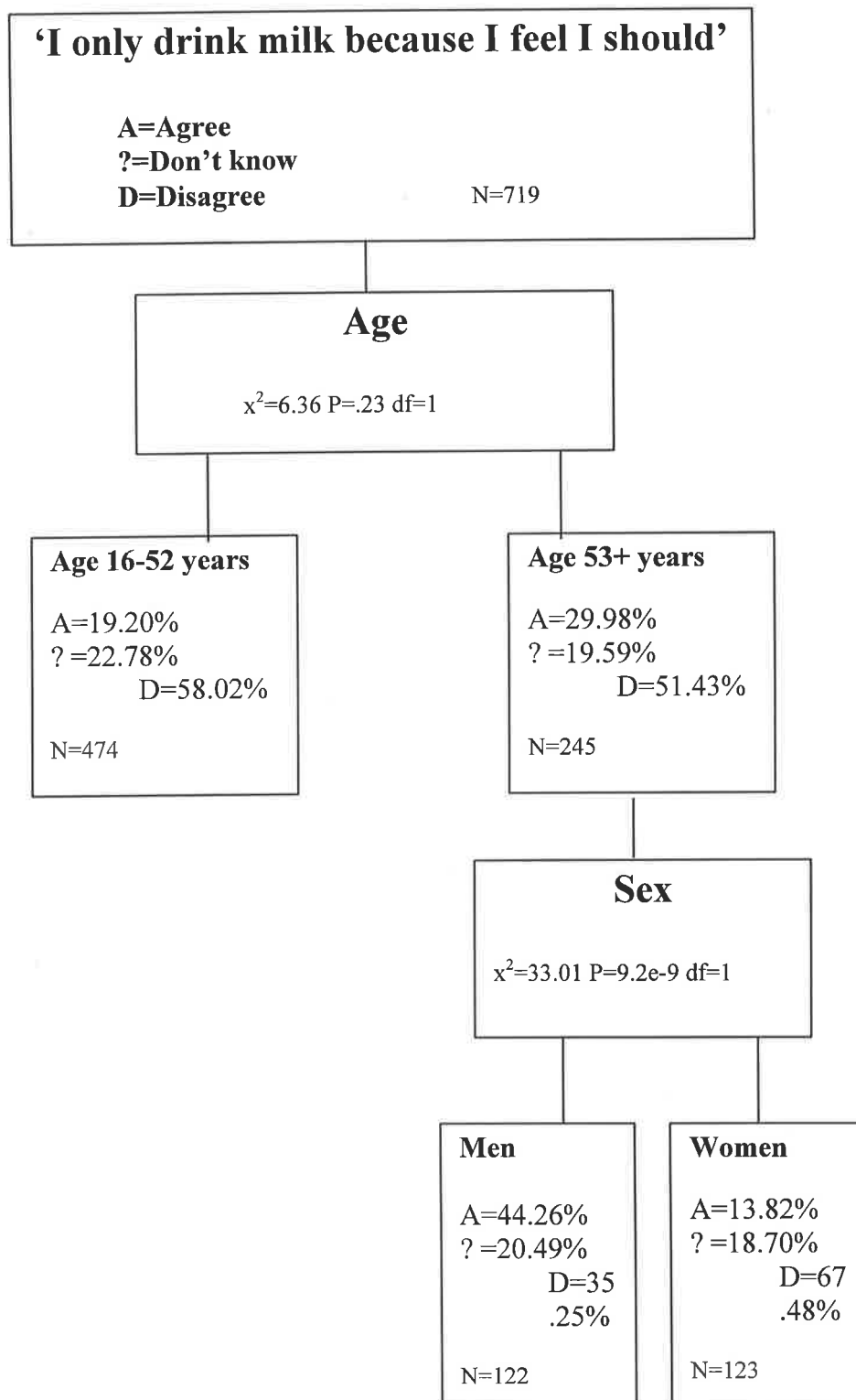
Appendix 7.4 Demographic predictors of 'milk can cause high blood cholesterol' in follow up survey

```
                    ┌─────────────────────────────────┐
                    │  'milk can cause high blood      │
                    │           cholesterol'           │
                    │ Agree                            │
                    │ Don't know                       │
                    │ Disagree             N=713       │
                    └─────────────────────────────────┘
                                     │
                    ┌─────────────────────────────────┐
                    │              Age                 │
                    │      x²=11.74  P=.0012 df=1       │
                    └─────────────────────────────────┘
                        │                        │
        ┌────────────────────────┐   ┌────────────────────────┐
        │ 16-30 years            │   │ 54+ years              │
        │                        │   │                        │
        │ Agree=33.83%           │   │ Agree=22.92%           │
        │ DK =48.20%             │   │ DK =50.83%             │
        │        Disagree=       │   │ Disagree=26.25%        │
        │        17.97%          │   │                        │
        │                        │   │ N=240                  │
        │ N=473                  │   │                        │
        └────────────────────────┘   └────────────────────────┘
                                                 │
                    ┌─────────────────────────────────┐
                    │              Sex                 │
                    │      x²=15.18  P=.00009 df=1      │
                    └─────────────────────────────────┘
                        │                        │
        ┌────────────────────────┐   ┌────────────────────────┐
        │ Men                    │   │ Women                  │
        │                        │   │                        │
        │ Agree=26.50%           │   │ Agree=19.51%           │
        │ DK =61.54%             │   │ DK =40.65%             │
        │ Disagree=11.97%        │   │ Disagree=39.84%        │
        │                        │   │                        │
        │ N=117                  │   │ N=123                  │
        └────────────────────────┘   └────────────────────────┘
```
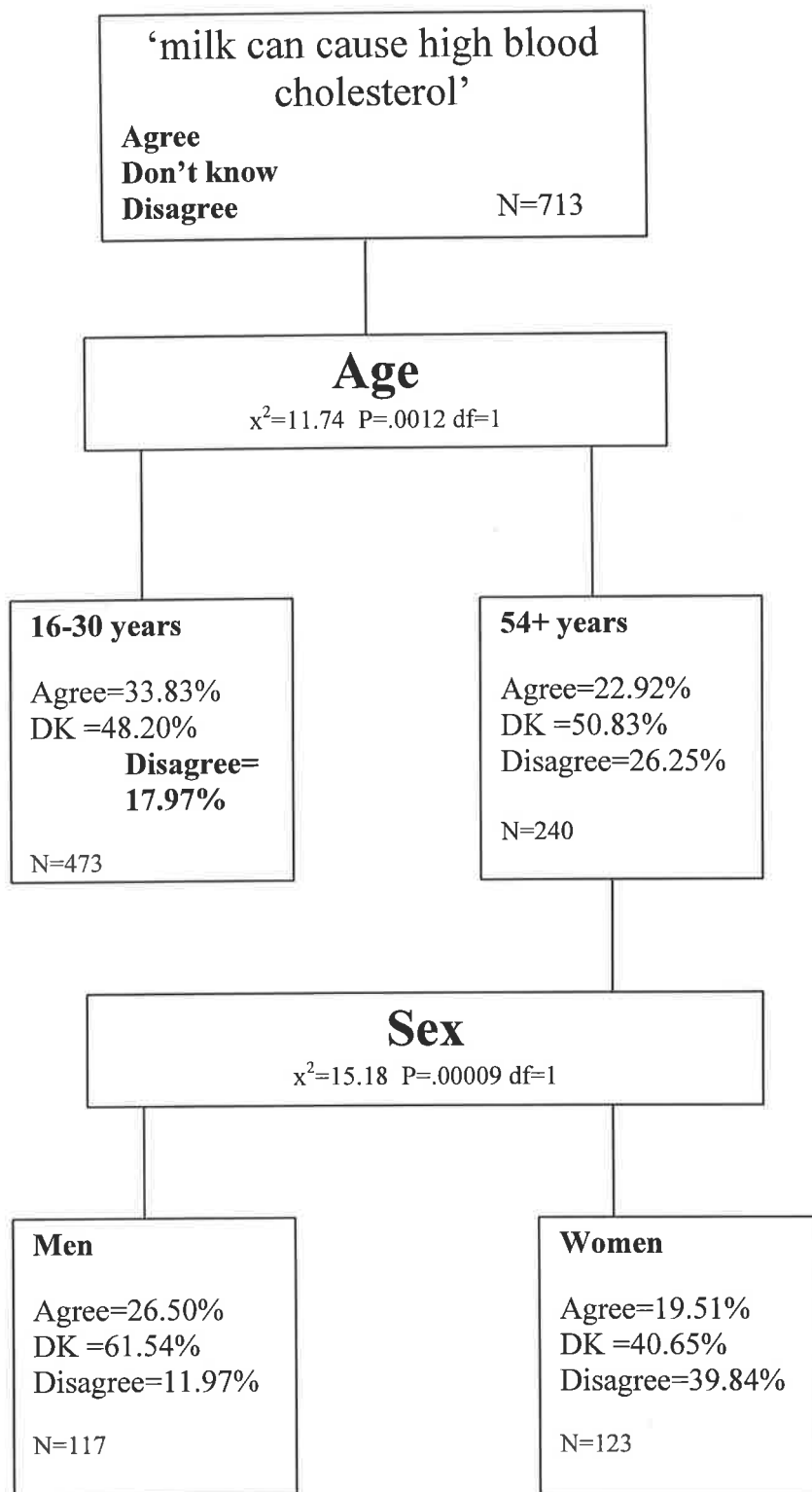
Appendix 7.5 Attitude predictors of 'all milk is high in fat" in follow up survey

'All milk is high in fat'
A=Agree
?=Don't know
D=Disagree

N=717

'fruit juice is better for you than milk' x^2=24.58 P=0.00002 df=2

Agree

A=35.84%
?=24.78%
D=39.39%
N=226

Don't know

A=26.36%
?=26.36%
D=47.27%
N=220

Disagree

A=21.77%
?=15.13%
D=63.10%
N=271

'I only drink milk because I feel I should'
n=226

x^2=10.12 p=0.0029 df=1

'adults over 65 need more milk than young adults' n=220
x^2=5.98 p=0.029 df=1

'Milk is more important than fizzy drinks' n=271

x^2=6.99 p=0.016 df=1

Agree

A=47.46%
?=32.20%
D=20.34%

N=59

? Disagree

A=31.74%
?=22.16%
D=46.11%

N=167

Agree

A=34.18%
?=29.11%
D=36.71%

N=79

? Disagree

A=21.99%
?=24.82%
D=53.19%

N=141

Agree / ?

A=30.53%
?=15.79%
D=53.68%

N=95

Disagree

A=17.05%
?=14.77%
D=68.18%

N=176

Appendix 7.6 Attitude predictors of sex differences in attitudes in follow up survey

Sex

M= men

W= women

N=719

'milk is better for you than fizzy drinks' x^2=28.23 P=5.4e-7 df=1

Agree

Men=44.37%
Women=55.63%

N=577

? / Disagree

Men=69.01%
Women=30.99%

N=142

'people with lactose intolerance can drink small amounts of milk'

x^2=20.98 p=9.3e-6 df=1

'milk is a good source of iron'
x^2=6.16 p=0.026 df=1

Agree

M=62.404%
W=37.60%

N=125

? Disagree

M=39.38%
W=60.62%

N=452

Agree

M=60.00%
W=40.00%

N=75

? Disagree

M=79.10%
W=20.90%

N=67

'milk is expensive compared to fizzy drinks'
x^2=8.15 p=0.0086 df=1

Agree / ?

M=48.41%
W=51.59%
N=157

Disagree

M=34.58%
W=65.42%
N=5295

Appendix 7.7.1 Percentage agreement with attitude statements. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X²	P value
Milk tastes good	31.7	41.4	10.7	13.3	2.9		ns
	35.1	39.0	10.2	12.3	3.5		
Milk is refreshing	16.8	35.3	11.1	27.6	9.1	9.627	0.047
	21.7	36.0	11.5	21.7	9.0		
Milk is good added to cereals and drinks	36.9	42.8	8.3	10.2	1.8		ns
	40.1	42.8	7.8	7.4	1.9		
Milk is expensive compared to fizzy drinks	3.6	12.5	20.5	48.8	14.6	16.681	0.002
	7.4	16.7	17.2	44.8	13.9		
Milk is good value for money	23	44.6	13.5	10.7	8.1		ns
	25.0	44.5	11.7	11.7	7.1		
There are too many types of milk available	5.9	17.8	28.5	33.5	14.3		ns
	9.0	17.9	25.2	32.7	15.2		
Milk provides energy	15.1	39.7	32.7	10.9	1.5	14.134	0.007
	22.4	37.7	27.7	10.2	2.1		
Milk is a good source of calcium	51.5	39.3	6.5	1.4	1.3		ns
	51.9	38.0	6.4	1.3	2.4		
Milk has a lot of goodness such as protein, vitamins and minerals	23.4	54.3	15.8	6.3	.1	24.046	0.0001
	28.1	49.5	15.2	4.5	2.8		
Milk is a good source of iron	11.1	38.1	33.8	13.5	3.5		
All milk is high in fat	1.8	26.6	18.7	44.7	7.9	14.133	0.007
	4.6	23.0	21.6	41.3	9.5		
Regular Milk (Blue Top) is high in fat	14.7	38.8	24	20.9	1.4		ns
	15.3	37.5	24.8	18.3	3.6		
People with lactose intolerance can drink small amounts of milk	5	17	36.3	21.9	19.8		ns
	6.4	16.6	38.7	19.5	18.9		
Milk can cause high blood cholesterol	7.4	22.7	48.9	15	5.8		ns
	6.3	20.8	49.4	15.3	8.2		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	7.4	22.7	48.9	15	5.8	13.491	0.009
	8.2	26.3	49.0	9.2	7.4		
It is important to drink milk when you're on a weight reducing diet	4.9	20.3	44.9	23.8	5.9		ns
	7.0	19.6	44.1	20.6	8.6		
You should only drink a low-fat milk when you're on a weight reducing diet	5.8	32.0	43.5	16.1	2.7	12.397	0.015
	9.9	27.8	42.7	15.4	4.2		
Milk causes allergies in lot of children	5.3	31.7	52	10.5	.4	22.763	.0001
	7.5	27.7	50.8	10.4	3.6		
Milk is important for bone growth	52.7	38.8	4.8	3.2	0.4		ns
	54.4	37.1	5.1	2.4	1.0		
Drinking milk is better than taking calcium supplements	23.6	37.6	25.9	10.8	2.1		ns
	29.5	36.9	22.7	8.4	2.5		
Milk is better for you than fizzy drinks	37.3	45	12.1	5	.6		ns
	38.3	42.1	13.6	4.3	1.7		
Fruit juice is better for you than milk	11.8	25.8	27.5	25.7	9.3		ns
	10.4	21.0	30.6	26.6	11.3		
Adults over 65 need more milk than young adults	17.5	23.1	36.7	17.3	5.3		ns
	16.4	22.0	36.6	18.6	6.4		
Women need more milk than men	22	36.7	25.1	13.5	2.5		ns
	21.7	32.3	29.1	13.1	3.8		
Milk should be the main part of a toddler's diet	34.9	35.3	18.5	9.8	1.4	11.836	0.019
	32.0	33.8	20.6	9.6	4.2		
Milk is more important for children than	27.9	42.4	15.1	10.2	4.3	13.507	0.009

adults	31.5	30.8	17.5	18.4	1.8	
I only drink milk because I feel I should	6.3	17.8	11.4	43.6	20.9	ns
	6.8	15.7	13.9	41.9	21.7	
I used to like milk as a child	27.9	42.4	15.1	10.2	4.3	ns
	31.0	39.4	14.3	10.3	5.0	

Note: The percentage of responses from the follow up survey is given in italics.

AA =Strongly agree, A =Agree, ? = Don't know, D= Disagree, DD=Strongly disagree

Appendix 7.7.2 Percentage agreement with attitude statements amongst women. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X^2	P value
Milk tastes good	34.6	41.5	11.3	9.9	2.7		ns
	37.6	40.1	10.4	8.8	3.0		
Milk is refreshing	12.4	33.8	16.5	29.7	7.7		ns
	20.0	32.1	15.3	24.1	8.5		
Milk is good added to cereals and drinks	39.0	40.1	11.5	9.1	0.3		ns
	43.8	39.5	9.3	6.3	1.1		
Milk is expensive compared to fizzy drinks	3.0	8.0	26.4	48.6	14.0	11.187	.025
	6.6	12.6	20.8	46.6	13.4		
Milk is good value for money	24.2	47.5	17.3	4.9	5.8		ns
	26.0	47.4	13.2	7.1	6.3		
There are too many types of milk available	1.4	21.7	23.6	43.1	10.2		ns
	6.6	19.7	21.1	39.7	12.9		
Milk provides energy	13.2	45.3	32.7	7.7	1.1	16.785	0.002
	24.7	39.2	26.8	7.7	1.6		
Milk is a good source of calcium	55.5	38.5	3.8	1.9	0.3		ns
	58.8	35.4	3.6	1.4	0.8		
Milk has a lot of goodness such as protein, vitamins and minerals	29.9	51.6	13.5	4.5	0.3	12.628	0.013
	35.3	46.0	13.4	2.5	2.7		
Is a good source of iron	11.5	39.2	33.2	13.2	3.0		
All milk is high in fat	2.2	29.3	11.9	51.4	5.2	11.486	0.022
	5.0	23.7	16.8	46.8	7.7		
Regular Milk (Blue Top) is high in fat	13.2	38.5	24.2	24.2	0		ns
	15.9	37.1	24.2	21.7	1.1		
People with lactose intolerance can drink small amounts of milk	3.0	8.2	33.8	29.9	25.0		ns
	4.9	11.5	35.3	26.0	22.2		
Milk can cause high blood cholesterol	7.4	21.4	45.1	16.8	9.3		ns
	5.8	17.8	47.9	17.8	10.7		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	6.3	22.8	48.1	19.0	3.8	10.918	0.027
	11.0	20.8	48.2	13.4	6.6		
It is important to drink milk when you're on a weight reducing diet	6.9	14.3	44.0	28.6	6.3		ns
	9.9	15.1	42.0	23.9	9.1		
You should only drink a low-fat milk when you're on a weight reducing diet	6.6	33.0	38.2	18.4	3.8	10.846	0.028
	13.2	26.8	37.8	17.3	4.9		
Milk causes allergies in lot of children	6.6	29.9	55.2	7.7	0.5	12.015	0.017
	10.1	25.2	52.3	9.0	3.3		
Milk is important for bone growth	58.2	35.2	2.78	3.6	0.3		ns
	62.5	31.0	3.8	2.5	0.3		
Drinking milk is better than taking	28.6	36.5	22.3	9.3	3.3		ns

Attitude	AA	A	?	D	DD	X²	P value
calcium supplements	35.4	33.5	20.9	7.4	2.7		
Milk is better for you than fizzy drinks	42.3	48.9	4.9	3.6	0.3		ns
	44.7	43.3	7.7	3.0	1.4		
Fruit juice is better for you than milk	11.8	25.5	27.2	29.9	5.5		ns
	11.0	18.7	31.9	30.2	8.2		
Adults over 65 need more milk than young adults	17.9	19.0	35.2	20.9	7.1		ns
	18.6	17.8	35.1	21.6	6.8		
Women need more milk than men	22.3	37.1	19.2	18.4	3.0		ns
	21.2	31.9	25.8	17.9	3.3		
Milk should be the main part of a toddler's diet	35.2	33.5	20.6	10.4	0.3		ns
	35.3	29.3	21.4	11.0	3.0		
Milk is more important for children than adults	32.0	33.1	13.8	21.2	0	12.021	0.017
	35.2	26.4	18.1	18.7	1.6		
I only drink milk because I feel I should	4.7	13.5	11.3	47.8	22.8		ns
	5.8	12.6	14.5	43.6	23.6		
I used to like milk as a child	24.5	42.9	14.8	12.9	4.9		ns
	30.4	38.1	13.4	12.6	5.5		

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.3 Percentage agreement with attitude statements amongst women aged 16 to 30 years. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X²	P value
Milk tastes good	30.9	48.0	6.5	8.1	6.5		ns
	33.6	45.1	6.6	7.4	7.4		
Milk is refreshing	15.4	36.6	16.3	24.4	7.3		ns
	22.1	37.7	13.9	17.2	9.0		
Milk is good added to cereals and drinks	45.5	33.3	10.6	10.6	0		ns
	49.2	33.6	10.7	6.6	0		
Milk is expensive compared to fizzy drinks	1.6	11.4	30.9	49.6	6.5	10.598	0.031
	8.2	19.7	22.1	42.6	7.4		
Milk is good value for money	12.2	42.3	34.1	8.1	3.3		ns
	13.1	48.4	22.1	11.5	4.9		
There are too many types of milk available	0.8	25.2	25.2	37.4	11.4		ns
	6.6	26.2	17.2	37.7	12.3		
Milk provides energy	14.6	39.0	30.1	16.3	0		ns
	23.0	33.6	28.7	14.8	0		
Milk is a good source of calcium	52.0	35.0	7.3	4.9	0.8		ns
	52.1	35.5	7.4	3.3	1.7		
Milk has a lot of goodness such as protein, vitamins and minerals	33.3	42.3	18.7	4.9	0.8		ns
	36.9	38.5	18.0	3.3	3.3		
Is a good source of iron	8.2	38.5	35.2	14.8	3.3		
All milk is high in fat	0.8	41.8	11.5	37.7	8.2		ns
	4.1	31.4	20.7	36.4	7.4		
Regular Milk (Blue Top) is high in fat	18.7	37.4	24.4	19.5	0		ns
	21.5	30.6	27.3	19.0	1.7		
People with lactose intolerance can drink small amounts of milk	2.4	8.9	43.9	26.8	17.9		ns
	3.3	14.8	40.2	22.1	19.7		
Milk can cause high blood cholesterol	1.6	29.3	50.4	14.6	4.1		ns
	4.1	23.0	50.8	14.8	7.4		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	2.4	17.9	51.2	27.6	0.8		ns
	3.3	17.2	54.9	18.0	6.6		

Attitude	AA	A	?	D	DD	χ²	sig
It is important to drink milk when you're on a weight reducing diet	4.1	16.3	44.7	31.7	3.3		ns
	4.1	14.8	45.9	27.0	8.2		
You should only drink a low-fat milk when you're on a weight reducing diet	9.8	35.8	35.8	15.4	3.3		ns
	10.7	27.9	38.5	17.2	5.7		
Milk causes allergies in lot of children	7.3	21.1	56.1	14.6	0.8		ns
	9.8	20.5	54.1	12.3	3.3		
Milk is important for bone growth	57.7	33.3	6.5	2.4	0		ns
	58.2	30.3	8.2	3.3	0		
Drinking milk is better than taking calcium supplements	20.3	46.3	23.6	8.9	0.8		ns
	24.6	41.0	23.8	9.8	0.8		
Milk is better for you than fizzy drinks	43.9	48.0	2.4	5.7	0	10.280	0.036
	38.5	43.4	9.8	4.9	3.3		
Fruit juice is better for you than milk	12.2	24.4	26.0	35.0	2.4		ns
	11.5	18.0	37.7	27.0	5.7		
Adults over 65 need more milk than young adults	6.5	17.9	43.1	24.4	8.1		ns
	9.0	18.9	45.1	19.7	7.4		
Women need more milk than men	22.8	43.1	30.9	2.4	0.8		ns
	16.5	35.5	40.5	5.0	2.5		
Milk should be the main part of a toddler's diet	23.6	31.7	35.0	8.9	0.8		ns
	22.1	29.3	37.7	6.6	4.1		
Milk is more important for children than adults	23.0	39.3	10.7	27.0	0		ns
	22.3	29.8	18.2	26.4	3.3		
I only drink milk because I feel I should	9.8	15.4	11.4	38.2	25.2		ns
	8.2	13.1	18.9	32.0	27.9		
I used to like milk as a child	22.0	51.2	8.9	11.4	6.5		ns
	25.4	44.3	9.8	13.9	6.6		

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.4 Percentage agreement with attitude statements amongst women aged 31 to 52 years. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD
Milk tastes good	49.2	33.9	3.4	11.9	1.7
	50.8	34.2	5.8	8.3	0.8
Milk is refreshing	21.2	27.1	13.6	32.2	5.9
	27.5	23.3	15.8	27.5	5.8
Milk is good added to cereals and drinks	45.8	42.4	2.5	8.5	0.8
	50.8	42.5	0	5.8	0.8
Milk is expensive compared to fizzy drinks	7.6	12.7	11.9	46.6	21.2
	10.0	14.2	10.8	47.5	17.5
Milk is good value for money	30.5	49.2	10.2	5.9	4.2
	30.8	50.8	9.2	5.8	3.3
There are too many types of milk available	3.4	16.9	12.7	55.9	11.0
	8.3	14.2	15.0	45.8	16.7
Milk provides energy	13.6	55.9	23.7	6.8	0
	27.5	46.7	19.2	6.7	0
Milk is a good source of calcium	64.4	30.5	4.2	0.8	0
	67.5	29.2	2.5	0.8	0
Milk has a lot of goodness such as protein, vitamins and minerals	38.1	50.8	8.5	2.5	0
	43.3	43.3	10.8	0.8	1.7
Is a good source of iron	17.5	35.8	34.2	10.0	2.5
All milk is high in fat	6.0	20.5	12.8	53.0	7.7
	6.7	20.2	16.8	46.2	10.1
Regular Milk (Blue Top) is high in fat	3.4	41.5	20.3	34.7	0

Statement					
	5.0	42.5	24.2	27.5	0.8
People with lactose intolerance can drink small amounts of milk	3.4	8.5	32.2	33.9	22.0
	4.2	12.5	37.5	29.2	16.7
Milk can cause high blood cholesterol	6.8	29.7	44.1	11.0	8.5
	3.3	25.0	49.2	13.3	9.2
Drinking a low fat milk is Ok for Adults with high blood cholesterol	12.7	20.3	53.4	11.0	2.5
	16.7	19.2	50.8	9.2	4.2
It is important to drink milk when you're on a weight reducing diet	5.1	18.6	50.0	20.3	5.9
	12.6	18.5	45.4	16.8	6.7
You should only drink a low-fat milk when you're on a weight reducing diet	9.3	31.4	30.5	23.7	5.1
	17.5	27.5	30.8	21.7	2.5
Milk causes allergies in lot of children	2.5	33.1	55.9	7.6	0.8
	6.7	25.0	54.2	10.8	3.3
Milk is important for bone growth	66.9	29.7	1.7	1.7	0
	67.5	29.2	2.5	0.8	0
Drinking milk is better than taking calcium supplements	38.1	37.3	11.0	13.6	0
	44.5	35.3	11.8	8.4	0
Milk is better for you than fizzy drinks	39.0	46.6	9.3	4.2	0.8
	43.3	44.2	9.2	2.5	0.8
Fruit juice is better for you than milk	11.9	24.6	32.2	22.9	8.5
	9.2	18.3	31.7	31.7	9.2
Adults over 65 need more milk than young adults	16.1	27.1	36.4	18.6	1.7
	20.8	22.5	37.5	17.5	1.7
Women need more milk than men	24.6	42.4	22.0	11.0	0
	23.3	35.0	26.7	15.0	0
Milk should be the main part of a toddler's diet	39.8	36.4	18.6	5.1	0
	40.8	29.2	17.5	10.0	2.5
Milk is more important for children than adults	39.0	44.1	10.2	6.8	0
	41.7	35.8	13.3	7.5	1.7
I only drink milk because I feel I should	4.2	15.3	11.0	46.6	22.9
	4.2	15.8	14.2	41.7	24.2
I used to like milk as a child	35.0	29.1	31.6	4.3	0
	41.7	30.8	12.5	11.7	3.3

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.5 Percentage agreement with attitude statements amongst women aged 53 years and over. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X²	P value
Milk tastes good	24.4	42.3	23.6	9.8	0		ns
	28.7	41.0	18.9	10.7	0.8		
Milk is refreshing	0.8	37.4	19.5	32.5	9.8	11.277	0.024
	10.6	35.0	16.3	27.6	10.6		
Milk is good added to cereals and drinks	26.0	44.7	21.1	8.1	0		ns
	31.7	42.3	17.1	6.5	2.4		
Milk is expensive compared to fizzy drinks	0	0	35.8	49.6	14.6		ns
	1.6	4.1	29.3	49.6	15.4		
Milk is good value for money	30.9	51.2	7.8	0.8	9.8		ns
	34.1	43.1	8.1	4.1	10.6		
There are too many types of milk available	0	22.8	32.5	36.6	8.1		ns
	4.9	18.7	30.9	35.8	9.8		
Milk provides energy	11.4	41.5	43.9	0	3.3	9.975	0.041
	23.6	37.4	32.5	1.6	4.9		
Milk is a good source of calcium	50.4	49.6	0	0	0		ns
	56.9	41.5	0.8	0	0.8		
Milk has a lot of goodness such as protein, vitamins and minerals	18.7	61.8	13.0	6.5	0		ns
	26.0	56.1	11.4	3.3	3.3		
Is a good source of iron	8.9	43.1	30.1	14.6	3.3		
All milk is high in fat	0	25.2	11.4	63.4	0	13.353	0.010
	4.1	19.5	13.0	57.7	5.7		
Regular Milk (Blue Top) is high in fat	17.1	36.6	27.6	18.6	0		ns
	21.1	38.2	21.1	18.7	0.8		
People with lactose intolerance can drink small amounts of milk	3.3	7.3	25.2	29.3	35.0		ns
	7.3	7.3	28.5	26.8	30.1		
Milk can cause high blood cholesterol	13.8	5.7	40.7	24.4	15.4		ns
	9.8	5.7	43.9	25.2	15.4		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	4.1	30.1	39.8	17.9	8.1		ns
	13.0	26.0	39.0	13.0	8.9		
It is important to drink milk when you're on a weight reducing diet	11.4	8.1	37.4	33.3	9.8		ns
	13.0	12.2	35.0	27.6	12.2		
You should only drink a low-fat milk when you're on a weight reducing diet	0.8	31.7	48.0	16.3	3.3	14.180	0.007
	11.4	25.2	43.9	13.0	6.5		
Milk causes allergies in lot of children	9.8	35.8	53.7	0.8	0		ns
	13.8	30.1	48.8	4.1	3.3		
Milk is important for bone growth	50.4	42.3	0	6.5	0.8		ns
	61.8	33.3	0.8	3.3	0.8		
Drinking milk is better than taking calcium supplements	27.6	26.0	31.7	5.7	8.9		ns
	37.4	24.4	26.8	4.1	7.3		
Milk is better for you than fizzy drinks	43.9	52.0	3.3	0.8	0		ns
	52.0	42.3	4.1	1.6	0		
Fruit juice is better for you than milk	11.4	27.6	23.6	31.7	5.7		ns
	12.3	19.7	26.2	32.0	9.8		
Adults over 65 need more milk than young adults	30.9	12.2	26.0	19.5	11.4		ns
	26.0	12.2	22.8	27.6	11.4		
Women need more milk than men	19.5	26.0	4.9	41.5	8.1		ns
	23.6	25.2	10.6	33.3	7.3		
Milk should be the main part of a toddler's diet	42.3	32.5	8.1	17.1	0		ns
	43.1	29.3	8.9	16.3	2.4		

	AA	A	?	D	DD	X²	P value
Milk is more important for children than adults	34.1	16.3	20.3	29.3	0		ns
	41.5	13.8	22.8	22.0	0		
I only drink milk because I feel I should	0	9.8	11.4	58.5	20.3		ns
	4.9	8.9	10.6	56.9	18.7		
I used to like milk as a child	16.3	43.1	24.4	10.6	5.7		ns
	24.4	39.0	17.9	12.2	6.5		

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.6 Percentage agreement with attitude statements, amongst men. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X²	P value
Milk tastes good	28.7	41.3	10.0	16.9	3.2		ns
	32.5	37.9	9.9	15.8	4.0		
Milk is refreshing	21.5	37.0	5.4	25.5	10.6		ns
	23.4	40.1	7.6	19.2	9.6		
Milk is good added to cereals and drinks	34.7	45.6	4.9	11.5	3.4		ns
	36.2	46.3	6.2	8.5	2.8		
Milk is expensive compared to fizzy drinks	4.3	17.2	14.3	49.0	15.2		ns
	8.2	20.9	13.6	42.9	14.4		
Milk is good value for money	21.8	41.5	9.5	16.6	10.6		ns
	24.2	41.5	10.2	16.4	7.9		
There are too many types of milk available	10.6	13.8	33.5	23.5	18.6		ns
	11.6	16.1	29.4	25.4	17.5		
Milk provides energy	17.2	33.8	32.7	14.3	2.0		ns
	20.1	36.2	28.5	12.7	2.5		
Milk is a good source of calcium	47.3	40.1	9.5	0.9	2.3		ns
	44.0	40.7	9.3	1.1	4.0		
Milk has a lot of goodness such as protein, vitamins and minerals	16.6	57.0	18.3	8.0	0	12.615	0.013
	20.6	53.1	16.9	6.5	2.8		
Is a good source of iron	10.7	37.0	34.5	13.8	4.0		
All milk is high in fat	1.4	24.1	25.8	38.1	10.6		ns
	4.2	22.3	26.6	35.6	11.3		
Regular Milk (Blue Top) is high in fat	16.3	39.3	24.1	17.5	2.9		ns
	14.7	37.9	25.4	15.8	6.2		
People with lactose intolerance can drink small amounts of milk	7.2	26.1	39.0	13.5	14.3		ns
	7.9	21.7	42.1	12.7	15.5		
Milk can cause high blood cholesterol	7.4	24.1	53.3	13.2	2.0		ns
	6.8	23.7	50.8	12.7	5.6		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	3.2	33.2	51.0	6.0	6.6		ns
	5.4	31.9	49.7	4.8	8.2		
It is important to drink milk when you're on a weight reducing diet	2.9	26.9	45.8	18.9	5.4		ns
	4.0	24.3	46.3	17.2	8.2		
You should only drink a low-fat milk when you're on a weight reducing diet	4.9	30.9	49.0	13.8	1.4		ns
	6.5	28.8	47.7	13.6	3.4		
Milk causes allergies in lot of children	4.0	33.5	48.7	13.5	0.3	12.296	0.015
	4.8	30.2	49.2	11.9	4.0		
Milk is important for bone growth	47.0	42.7	6.9	2.9	0.6		ns
	46.0	43.5	6.5	2.3	1.7		
Drinking milk is better than taking calcium supplements	18.3	38.7	29.8	12.3	0.9		ns
	23.4	40.4	24.6	9.3	2.3		
Milk is better for you than fizzy drinks	32.1	41.0	19.5	6.6	0.9		ns
	44.7	43.3	7.7	3.0	1.4		

	AA	A	?	D	DD	
Fruit juice is better for you than milk	11.7	26.1	27.8	21.2	13.2	ns
	9.9	23.4	29.4	22.9	14.4	
Adults over 65 need more milk than young adults	17.2	27.5	38.4	13.5	3.4	ns
	14.1	26.3	38.1	15.5	5.9	
Women need more milk than men	21.8	36.4	31.5	8.3	2.0	ns
	22.3	32.8	32.5	8.2	4.2	
Milk should be the main part of a toddler's diet	34.7	37.2	16.3	9.2	2.6	ns
	28.5	38.4	19.8	7.9	5.4	
Milk is more important for children than adults	27.5	37.0	17.5	17.8	0.3	ns
	35.2	26.4	18.1	18.7	1.6	
I only drink milk because I feel I should	8.0	22.3	11.5	39.3	18.9	ns
	7.9	18.9	13.3	40.1	19.8	
I used to like milk as a child	31.5	41.8	15.5	7.4	3.7	ns
	31.6	40.7	15.3	7.9	4.5	

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.7 Percentage agreement with attitude statements amongst men aged 16 to 30 years. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD
Milk tastes good	38.7	36.9	5.4	12.6	6.3
	40.2	36.6	2.7	12.5	8.0
Milk is refreshing	26.1	35.1	4.5	21.6	12.6
	27.7	39.3	6.3	15.2	11.6
Milk is good added to cereals and drinks	44.1	40.5	0	12.6	2.7
	43.8	42.9	1.87	8.9	2.7
Milk is expensive compared to fizzy drinks	3.6	22.5	4.5	59.5	9.9
	8.9	28.6	5.41	46.4	10.7
Milk is good value for money	21.6	46.8	11.7	16.2	3.6
	20.5	43.8	12.5	17.9	5.4
There are too many types of milk available	3.6	18.0	23.4	35.1	19.8
	7.1	21.4	19.6	33.9	17.9
Milk provides energy	19.8	36.9	31.5	9.9	1.8
	23.2	37.5	27.7	8.0	3.6
Milk is a good source of calcium	45.9	37.8	12.6	0.9	2.7
	46.4	36.6	12.5	1.8	2.7
Milk has a lot of goodness such as protein, vitamins and minerals	15.3	56.9	18.0	9.9	0
	22.3	50.9	14.3	8.9	3.6
Is a good source of iron	10.7	28.6	45.5	8.9	6.3
All milk is high in fat	0.9	20.7	24.3	42.3	11.7
	4.5	20.5	24.1	38.4	12.5
Regular Milk (Blue Top) is high in fat	16.2	42.3	23.4	14.4	3.6
	13.4	37.5	25.0	14.3	9.8
People with lactose intolerance can drink small amounts of milk	1.8	33.3	47.7	12.6	4.5
	2.7	24.1	49.1	12.5	11.6
Milk can cause high blood cholesterol	6.3	18.9	58.6	14.4	1.8
	6.3	18.8	53.6	15.2	6.3
Drinking a low fat milk is Ok for Adults with high blood cholesterol	5.4	31.5	47.7	13.5	1.8
	4.5	26.8	58.0	6.3	4.5
It is important to drink milk when you're on a weight reducing diet	3.6	17.1	49.5	25.2	4.5
	5.4	17.0	50.9	20.5	6.3
You should only drink a low-fat milk when you're on a weight reducing diet	5.4	31.5	47.7	13.5	1.8
	7.1	28.6	45.5	14.3	4.5
Milk causes allergies in lot of children	6.3	27.0	43.2	22.5	0.9

Attitude	AA	A	?	D	DD
	7.1	23.2	44.6	17.9	7.1
Milk is important for bone growth	38.7	50.5	5.4	5.4	0
	38.4	50.9	4.5	4.5	1.8
Drinking milk is better than taking calcium supplements	23.4	36.9	25.2	14.4	0
	26.8	42.0	21.4	9.8	0
Milk is better for you than fizzy drinks	31.5	40.5	13.5	11.7	2.7
	27.7	42.0	14.3	10.7	5.4
Fruit juice is better for you than milk	7.2	33.3	23.4	27.9	8.1
	6.3	31.3	25.9	25.0	11.6
Adults over 65 need more milk than young adults	4.5	21.6	46.8	19.8	7.2
	3.6	20.5	43.8	23.2	8.9
Women need more milk than men	18.9	29.7	31.5	14.4	5.4
	17.9	26.8	32.1	16.1	7.1
Milk should be the main part of a toddler's diet	20.7	45.9	11.7	15.3	6.3
	18.8	41.1	18.8	11.6	9.8
Milk is more important for children than adults	30.6	31.5	23.4	13.5	0.9
	29.5	31.3	20.5	15.2	3.6
I only drink milk because I feel I should	3.6	17.1	17.1	49.5	12.6
	5.4	16.1	17.9	48.2	12.5
I used to like milk as a child	32.4	56.8	3.6	5.4	1.8
	32.1	53.6	2.7	8.0	3.6

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.8 Percentage agreement with attitude statements amongst men aged 31 to 52 years. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD
Milk tastes good	27.3	42.1	11.6	15.7	3.3
	35.0	38.3	11.7	12.5	2.5
Milk is refreshing	26.4	26.4	10.7	22.3	14.0
	25.8	32.5	11.7	15.8	14.2
Milk is good added to cereals and drinks	29.8	42.1	11.6	9.1	7.4
	32.5	44.2	10.8	7.5	5.0
Milk is expensive compared to fizzy drinks	1.7	10.7	24.8	49.6	13.2
	4.2	18.3	20.8	42.5	14.2
Milk is good value for money	15.7	47.9	12.4	14.0	9.9
	20.0	49.2	12.5	13.3	5.0
There are too many types of milk available	5.8	9.1	39.7	25.6	19.8
	7.5	14.2	33.3	25.8	19.2
Milk provides energy	21.5	40.5	19.8	17.4	0.8
	21.7	45.0	17.5	15.0	0.8
Milk is a good source of calcium	43.8	41.3	9.1	1.7	4.1
	40.0	43.3	8.3	1.7	6.7
Milk has a lot of goodness such as protein, vitamins and minerals	15.7	70.2	9.1	5.0	0
	18.3	68.3	9.2	2.5	1.7
Is a good source of iron	11.7	36.7	30.8	19.2	1.7
All milk is high in fat	3.3	23.1	25.6	38.0	9.9
	5.8	21.7	25.8	37.5	9.2
Regular Milk (Blue Top) is high in fat	14.0	33.9	27.3	19.8	5.0
	12.5	34.2	28.3	19.2	5.8
People with lactose intolerance can drink small amounts of milk	7.4	19.8	28.9	19.0	24.8
	8.3	18.3	33.3	17.5	22.5

Milk can cause high blood cholesterol	3.3	38.8	40.5	13.2	4.1
	5.0	37.0	40.3	12.6	5.0
Drinking a low fat milk is Ok for Adults with high blood cholesterol	3.3	46.3	38.0	9.1	3.3
	5.0	48.3	37.5	6.7	2.5
It is important to drink milk when you're on a weight reducing diet	3.3	32.2	37.2	19.0	8.3
	4.2	30.0	38.3	18.3	9.2
You should only drink a low-fat milk when you're on a weight reducing diet	9.1	31.4	42.1	14.9	2.5
	9.2	33.3	44.2	11.7	1.7
Milk causes allergies in lot of children	2.5	29.8	58.7	9.1	0
	2.5	27.5	59.2	9.2	1.7
Milk is important for bone growth	51.2	36.4	7.4	3.3	1.7
	50.0	37.5	7.5	2.5	2.5
Drinking milk is better than taking calcium supplements	18.2	43.8	24.8	12.4	0.8
	23.3	44.2	20.8	10.0	1.7
Milk is better for you than fizzy drinks	24.8	54.5	12.4	8.3	0
	24.2	52.5	15.8	6.7	0.8
Fruit juice is better for you than milk	9.9	30.6	19.0	26.4	14.0
	8.3	26.7	21.7	29.2	14.2
Adults over 65 need more milk than young adults	18.2	24.0	40.5	16.5	0.8
	14.2	25.8	39.2	18.3	2.5
Women need more milk than men	13.2	42.1	38.0	5.8	0.8
	12.5	41.7	37.5	5.0	3.3
Milk should be the main part of a toddler's diet	43.8	22.3	22.3	9.9	1.7
	35.8	27.5	24.2	8.3	4.2
Milk is more important for children than adults	30.6	31.4	12.4	25.6	0
	30.8	31.7	15.0	21.7	0.8
I only drink milk because I feel I should	4.1	17.4	8.3	43.8	26.4
	3.3	10.8	13.3	46.7	25.8
I used to like milk as a child	27.3	40.5	10.7	12.4	9.1
	25.8	41.7	14.2	10.0	8.3

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 7.7.9 Percentage agreement with attitude statements amongst men aged over 53 years. Comparison between responses to the baseline survey and the follow up survey

Attitude	AA	A	?	D	DD	X²	P value
Milk tastes good	20.5	44.4	12.8	22.2	0		ns
	23.0	38.5	14.8	22.1	1.6		
Milk is refreshing	12.0	49.6	0.9	32.5	5.1		ns
	17.2	48.4	4.9	26.2	3.3		
Milk is good added to cereals and drinks	30.8	53.8	2.6	12.8	0		ns
	32.8	51.6	5.7	9.0	0.8		
Milk is expensive compared to fizzy drinks	7.7	18.8	12.8	38.5	22.2		ns
	11.5	16.4	13.9	40.2	18.0		
Milk is good value for money	28.2	29.9	4.3	19.7	17.9		ns
	31.1	32.0	5.7	18.0	13.1		
There are too many types of milk available	22.2	14.5	36.8	10.3	16.2		ns
	19.7	13.1	34.4	17.2	15.6		
Milk provides energy	10.3	23.9	47.0	15.4	3.4		ns
	15.6	26.2	40.2	14.8	3.3		
Milk is a good source of calcium	52.1	41.0	6.8	0	0		ns
	48.4	41.8	7.4	0	2.5		
Milk has a lot of goodness such as protein, vitamins and minerals	18.8	43.6	28.2	9.4	0		ns
	21.3	40.2	27.0	8.2	3.3		
Is a good source of iron	9.8	45.1	27.9	13.1	4.1		
All milk is high in fat	0	28.2	27.4	34.2	10.3		ns
	2.5	24.6	29.5	31.1	12.3		
Regular Milk (Blue Top) is high in fat	18.8	41.9	21.4	17.9	0		ns
	18.0	41.8	23.0	13.9	3.3		
People with lactose intolerance can drink small amounts of milk	12.0	25.6	41.0	8.5	12.8		ns
	12.3	23.0	44.3	8.2	12.3		
Milk can cause high blood cholesterol	12.8	13.7	61.5	12.0	0		ns
	9.0	15.6	59.0	10.7	5.7		
Drinking a low fat milk is Ok for Adults with high blood cholesterol	3.4	23.9	56.4	0	16.2		ns
	6.6	20.5	54.1	1.6	17.2		
It is important to drink milk when you're on a weight reducing diet	0	29.9	57.3	12.8	0		ns
	2.5	25.4	50.0	13.1	9.0		
You should only drink a low-fat milk when you're on a weight reducing diet	0	29.9	57.3	12.8	0	9.587	0.048
	3.3	24.6	53.3	14.8	4.1		
Milk causes allergies in lot of children	3.4	43.6	43.6	9.4	0		ns
	4.9	39.3	43.4	9.0	3.3		
Milk is important for bone growth	50.4	41.9	7.7	0	0		ns
	49.2	42.6	7.4	0	0.8		
Drinking milk is better than taking calcium supplements	13.7	35.0	39.3	10.3	1.7		ns
	20.5	35.2	31.1	8.2	4.9		
Milk is better for you than fizzy drinks	40.2	27.4	32.5	0	0		ns
	43.0	28.1	28.9	0	0		
Fruit juice is better for you than milk	17.9	14.5	41.0	9.4	17.1		ns
	14.8	13.1	40.2	14.8	17.2		
Adults over 65 need more milk than young adults	28.2	36.8	28.2	4.3	2.6		ns
	23.8	32.0	32.0	5.7	6.6		
Women need more milk than men	33.3	36.8	24.8	5.1	0		ns
	36.1	29.5	27.9	4.1	2.5		
Milk should be the main part of a toddler's diet	38.5	44.4	14.5	2.6	0		ns
	30.3	46.7	16.4	4.1	2.5		
Milk is more important for children than adults	21.4	47.9	17.1	13.7	0		ns
	23.0	42.6	15.6	17.2	1.6		

I only drink milk because I feel I should	16.2	32.5	9.4	24.8	17.1	ns
	14.8	29.5	9.0	26.2	20.5	
I used to like milk as a child	35.0	29.1	31.6	4.3	0	ns
	36.9	27.9	27.9	5.7	1.6	

Note: The percentage of responses from the follow up survey is given in italics.

Appendix 8.1 Letter and questionnaire sent to GPs

Dear Doctor,

From the Life in New Zealand dietary survey we know that most New Zealanders don't consume the recommended amount of calcium. This could well be because they are not drinking enough milk. Given the role of calcium in bone disease, we are concerned that the continuing decline in milk consumption may have important health implications. A recent article in The Listener [October 4] has highlighted the increasing problem of osteoporosis.

The Nutrition Foundation wishes to ascertain the views of health professionals on the relationship between milk consumption and health. We would appreciate your help in answering a very short questionnaire to find out about your perceptions of milk. The questionnaire, designed by a postgraduate nutrition student, will only take a few minutes to complete, and your responses will be treated in complete confidence. The results will be available for use by relevant health authorities.

Please return the completed questionnaire in the stamped addressed envelope as soon as possible.

Thank you for your help.

Kind regards,

John Birkbeck

Medical and Scientific Director

Questionnaire

Your views about milk...

How to answer:
Circle the number which best corresponds with your answer
1 STRONGLY AGREE   2 AGREE 3 DON'T KNOW   4 DISAGREE   5 STRONGLY DISAGREE

I think that milk.........	1	2	3	4	5
is a good source of calcium	1	2	3	4	5
is a good source of energy for children	1	2	3	4	5
is a good source of protein	1	2	3	4	5
is a good source of zinc	1	2	3	4	5
is a good source of vitamin B12	1	2	3	4	5
is a major part of a toddler's diet	1	2	3	4	5
is more important for children than adults	1	2	3	4	5
is not essential for adults	1	2	3	4	5
is important for bone growth in children and teenagers	1	2	3	4	5
is important for adults to maintain strong bones	1	2	3	4	5
is better than calcium supplements	1	2	3	4	5
can cause allergies in a tiny number children	1	2	3	4	5
can cause symptoms of lactose intolerance in a few adults	1	2	3	4	5
can be consumed by lactose intolerant people in small amounts	1	2	3	4	5
is important for adults on weight reducing diets	1	2	3	4	5
Such as Lite Blue Top is ok for overweight adults	1	2	3	4	5
such as Blue Top is OK for adults without weight or cholesterol problems	1	2	3	4	5
such as Green Top is OK for overweight adults	1	2	3	4	5
such as Green Top is OK for adults with elevated blood cholesterol	1	2	3	4	5
is available as a range to suit individual needs	1	2	3	4	5

is a refreshing drink for children	1	2	3	4	5
is a refreshing drink for adults	1	2	3	4	5
is good value for money	1	2	3	4	5
tastes good	1	2	3	4	5
is filling	1	2	3	4	5

How important is milk for these people? We want your opinion about age group requirements

How to answer
Circle the number which best corresponds with your answer
1 Not important   2 A little important 3 Quite important 4 Important 5 Very important

Pre-school children (under 5 years)	1	2	3	4	5
School age children (5-11years)	1	2	3	4	5
Teenage girls (12-18 years)	1	2	3	4	5
Teenage boys (12-15years)	1	2	3	4	5
Adult men (19-64 years)	1	2	3	4	5
Adult women (19-64 years)	1	2	3	4	5
Pregnant and lactating women	1	2	3	4	5
Men over 65 years	1	2	3	4	5
Women over 65 years	1	2	3	4	5

Do these people drink about the right amount of milk?

How to answer
Circle the phrase which best corresponds with your answer

Pre-school children (under 5 years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
School age children (5-11years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Teenage girls (12-18 years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Teenage boys (12-18years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Adult men (19-64 years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Adult women (19-64 years)	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Pregnant and lactating women	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Men over 65 years	NOT ENOUGH	ABOUT RIGHT	IN EXCESS
Women over 65 years	NOT ENOUGH	ABOUT RIGHT	IN EXCESS

Background Information

This information is needed for statistical purposes only.

Your sex (circle number of your answer)   **1**   **MALE**   **2**   **FEMALE**

Number of years you have been in general practice   ....YEARS

Your present age   ....YEARS

Appendix 8.2 Reminder letter sent to GPs

Dear Doctor

Two weeks ago a questionnaire seeking your perceptions about the role of milk in the diet was mailed to you.

If you have already completed and returned it to us please accept our sincere thanks. If not, please try to do so today. Because it has been sent to a representative sample of general practitioners, it is extremely important that yours be included in the study so that the results represent accurately the opinions of general practitioners in your area.

If by some chance you did not receive the questionnaire, or it has been mislaid, please call right now, (09) 486 2036 and we will get another one in the mail to you today.

Sincerely,

John Birkbeck

Medical and Scientific Director

Appendix 8.3 Second reminder letter sent to GPs

11 November, 1997

Dear Doctor

One month ago a questionnaire seeking your perceptions about the role of milk in the diet was mailed to you.

If you have already completed and returned it to us please accept our sincere thanks. If not, please try to do so today.

Because it has been sent to a representative sample of general practitioners, it is extremely important that yours be included in the study so that the results represent accurately the opinions of general practitioners in your area.

Please return the enclosed completed questionnaire in the stamped addressed envelope as soon as possible.

Sincerely,

John Birkbeck

Medical and Scientific Director

Bibliography

AC Neilsen (1997). AC Neilsen Market Track. Auckland.

Abraham SF, Mira M & Beumont PJ (1983). Eating behaviours among young women. Med J Aust, 2,225-228.

Abbott WG & Tasman-Jones C (1985). Incidence of acquired primary hypolactasis in three New Zealand racial groups. NZ Med J, 98,228-229.

Advertising Effectiveness Awards (1994). How the awareness of the symptoms of diabetes was increased. Advertising Works 8. Edited by Chris Baker, NTC Publications Ltd, 441-449.

Advertising Federation of Australia (1990). The Australian sugar industry campaign. A report.

Airhihenbuwa CO, Kumanyika S & Agurs TD (1996). Cultural aspects of African American eating patterns. Ethn Health, 1(3), 245-260.

Alexander JM & Tepper BJ (1995). Use of reduced-calorie / reduced-fat foods by young adults: influence of gender and restraint. Appetite, 25,217-230.

Anastasi A (1986). Evolving concepts of test validation. Ann Rev Psychol, 37 (1), 1-15.

Anderson JJB, Tylavsky FA & Halioua L (1993). Determinants of peak bone mass in young adult women: a review. Osteop Int Suppl, 1, S32-36.

Angus RM & Eisman JA (1988). Osteoporosis: The role of calcium intake and supplementation. Med J Aust,148 (12),630-633.

Anderson AS, Cox DN & McKellar S (1998). Take five, a nutrition education intervention to increase fruit and vegetable intakes: impact on attitudes towards dietary change. Br J Nutr, 80 (2), 133-140.

ANZFA (1996). The Food Standard. A regular bulletin of the Australia New Zealand Food Authority, 21, 4.

Armamento-Villlareal R, Villareal DT & Avioli LV(1992). Estrogen status and heredity are major determinants of premenopausal bone mass. J Clin Invest, 90,2464-2471.

Arney WK & Pinnock CB (1993). The milk mucus belief: Sensations associated with the belief and characteristics of believers. Appetite, 20. 53-60.

Appel LJ, Moore TJ & Obarzanek E (1997). A clinical trial of the effects of dietary patterns on blood pressure. N Engl J Med,336,1117-1124.

259

Aubin M, Godin G & Vezina L (1998). Hypercholesterolaemia screening. Does knowledge of blood cholesterol level affect dietary fat intake? Can Family Physician, 44,1289-1297.

ASDA (1998). Australasian soft drink industry-setting the pace. Website: www.softdrink.org.au/html/the_ industry.html

Assael H (1987). Consumer Behaviour and Marketing Action. PWS-Kent Publishing Company, Boston.

Axelson ML, Brinberg D, Durand JH (1983). Eating at a fast-food restaurant. A social psychological analysis. J Nutr Ed, 15, 94-98.

Axelson ML, Federline TL, Brinberg D (1985). A meta-analysis of food and nutrition-related research. J Nutr Educ, 17, 51-54.

Azjen I (1985). From intentions to actions: A theory of planned behaviour. In: Action Control. From Cognition to Behaviour, pp11-39. (Eds.) Kuhl J & Beckmann J. New York, Springer-Verlag.

Ajzen I & Fishbein M (1980). Understanding attitudes and predicting social behaviour. Englewood Cliffs, NJ: Prentice Hall.

Babbie E (1983). The practice of social research. 3rd edition, Belmont:Wadsworth.

Bahna SL (1978). Control of milk allergy: a challenge for physicians, mothers and industry. Ann Allergy, 41,12.

Baker W, Hutchinson W & Moore D (1996). Brand familiarity and advertising: effects on the evoked set and brand preferences. Advances in Consumer Research, 13, 637-642.

Barker ME, Thompson KA & McClean SI (1995). Attitudinal dimensions of food choice and nutrient intake. Br J Nutr, 74(5), 649-659.

Bailey R & Earle M (1993). Home cooking to takeaways. A history of New Zealand eating. Massey University.

Baghurst K (1998) The role of sensory science in food choice. Food Australia, 50 (6), 284-285.

Baker W, Hutchinson W & Moore D (1996). Brand familiarity and advertising: effects on the evoked set and brand preferences. Advances in Consumer Research, 13, 637-642.

Barger-Lux MJ & Heaney RP (1994). The role of calcium intake in preventing bone fragility, hypertension, and certain cancers. J Nutr,124,1406S-1411S.

Barger-Lux MJ, Heaney RP, & Packard PT (1992). Nutritional correlates of low calcium intake. Clin Appl Nutr, 2,39.

Baron JA, Beach M& Mandel JS (1999). Calcium polyp prevention study. N Engl J Med,340,101-107.

Beaglehole R (1990). International trends in coronary heart disease mortality, morbidity and risk markers. Epidemiological Reviews, 12, 1-15.

Berg MA, Niemensivu H & Piha T (1990). Health behaviour among Finnish adult population, Spring 1989. Publications of the National Public Health Institute, Helsinki, Finland.

Berge S. (1997). Trends in consumption of milk products and milk fat in the Nordic countries. Scandinavian Journal of Nutrition, 41,121-124.

Bertino M, Beauchamp GK, Engleman K. (1982). Am J Clin Nutr; 36, 1134-1144.

Betts NM (1985). A method to measure perceptions of food among the elderly. Journal of Nutrition for the Elderly, 4, 1-15.

Birch LL, Billman J and Salisbury Richards S. (1984) Time of day influences food acceptability. Appetite, 5, 109-116.

Birkbeck J (1999). Milk Myths. How many people actually suffer from milk allergy? Diet Health Dialogue, Dairy Advisory Bureau, New Zealand. No 29, 12-14.

Blundell JE, Burley VJ & Cotton JR (1993). Dietary fat and the control of energy intake: Evaluating the effects of fat on meal size and post meal satiety. Am J Clin Nutr, 57, 7725-7785.

Blundell JE & Green SM (1996). Properties of food and appetite control: implications for food choice and body weight gain. In: Multidisciplinary approaches to food choice. Ed. A. Worsley.

Bolin TD & Davis AE (1969). Asian lactose intolerance and its relation to intake of lactose. Nature, 222,382-383.

Bolin TD & Davis AE (1969). Primary lactase deficiency: genetic or acquired. Am J Dig Dis,15,679-692.

Bonjour JP, Carrie A & Ferrari Sl (1997). Calcium-enriched foods and bone mass growth in preburtal girls: a randomised, double-blind, placebo-controlled trial. J Clin Invest, 99(6),1287-1294.

Booth DA. (1985) Annals NY Acad.Sci; 443, 22-41

Booth DA, Shepherd R. (1988) Sensory influences on food acceptance: -the neglected approach to nutrition promotion. British Nutrition Foundation: Nutrition Bulletin 1988,13 (1), 39-54.

Borrud L, Wilkinson Enns C, & Mickle S (1997). What we eat: USDA surveys food consumption changes. Commun Nutr Inst;1997,4-5.

Brewer JL, Blake AJ & Rankin SA (1999). Theory of reasoned action predicts milk consumption in women. J Am Diet Assoc, 99 (1),39-44.

Brink S & van Schalkwyk DJ (1982). Serum ferritin and mean corpuscular volume as predictors of bone marrow iron stores. S Afr Med J, 61 (12),432-434.

Brown A (1992). Town Milk. A history of Auckland's town milk supply. New Zealand Milk Corporation Ltd. Arrow Press

Brug J, Lechner L & De Vries H (1995). Psychosocial determinants of fruit and vegetable consumption. Appetite, 25, (3), 285-296.

Bryant GD, Chu YK & Lovitt R (1970). Incidence and aetiology of lactose intolerance. Med J Aust, 1,1285-1288.

Cadogen J, Eatall R & Jones N (1997). Milk intake and bone mineral acquisition in adolescent girls: a randomised, controlled intervention trial. BMJ, 317,1255-1260.

Calnan M, Cant S (1987). The social organisation of food consumption: A comparison of middle class and working class households. International Journal of Sociology and Social Policy, 10 (2), 53-59.

Calnan M, Williams S (1991). Style of life and the salience of health: An exploratory view of health related practices in households of differing socio-economic circumstances. Sociology of Health and Illness, 13 (4), 506-529.

Cardello AV (1996) The role of human senses in food acceptance. In Meiselman HL and MacFie HJH (eds). Food choice, acceptance and consumption. Blackie Academic and Professional, London.

Carson TA, Siega-Riz AM & Popkin BM (1999). The importance of breakfast meal type to daily nutrient intake: Differences by age and ethnicity. Cereal Foods World, 44 (6), 414-422

Chan GM, Hoffman K, McMurry M (1995) Effects of dairy products on bone and body composition in pubertal girls. J Peadiat, 126,551-556.

Charles P, Eriksen PE & Hasling C (1991). Dermal, intestinal, and renal obligatory losses of calcium : relation to skeletal calcium loss. Am J Clin Nutr, 54,266S.

CM Research (1998). Consumer monitor, Module one, Calcium/Osteoporosis. Prepared for: Dairy Advisory Bureau, Wellington.

Cobiac L (1994). Lactose: a review of intakes and importance to health of Australians and New Zealanders. Food Australia,46,S3-S27.

Colmar Brunton (1991). The health status of New Zealanders and the attitudes of health professionals and consumers to diet and disease. In: Diet Health Dialogue (5), New Zealand Dairy Board.

Cook TD & Campbell DT (1963). Quasi-experimentation. Design and analysis issues for field settings. Houghton Mifflin Company. Boston.

Committee on Nutrition (1999). Calcium requirements of infants, children and adolescents. American Academy of Pediatrics. Pediatrics, 104 (5), 1152-1157.

Consumer Link (1998). Breakfast eating habits of New Zealanders. Commissioned by Crossman porter, June 1998.

Corney MJ, Issanchou S & Shepherd R (1996). Effects of food label health and nutrition claims on consumer perceptions. Creative Applications: Sensory Techniques Used in Conducting Packaging research with Consumers, ASTM STP 1316, A Gelinas Ed: American Society for Testing and Minerals, pp.3-15.

Council on Foods and Nutrition : American Medical Association (1962). Confections and carbonated beverages in schools. JAMA,1118.

Coveney J & Baum F (1996). Socioeconomic status, gender and family food choice. In: Multidisciplinary approaches to food choice. A Worsley (Ed), pp. 61-65.

Crotty P, Rutishauser I & Cahill M (1992). Food in low-income families. Austr J Pub Health, 16(2), 168-174.

CSPI (1998). Soft drinks undermining Americans' health. Teens consuming twice as much 'liquid candy' as milk. Website, www.cspinet.org Calculations from US Dept. Agr. Nationwide Food Consumption Survey, 1977-78; Continuing Survey of Food Intakes by Individual, 1978-88, 1994-96

Cummings SR, Black DM & Nevitt MC (1990) Appendicular bone density and age predict hip fracture in women. JAMA, 263:665-668.

Cummings SR, Kelsey JL & Nevitt MC (1985). Epidemiology of osteoporosis and osteoporotic fractures. Epidemiol Rev, 7, 178-208.

Dairy Industry Newsletter (1998). Eden Publishing Company, Norfolk UK, 17 (9), No21.

Dairy Research Institute (1948). The effect of sunlight on the nutritional properties and flavour of milk in glass bottles. Publication No. 211. Issued in collaboration with the Nutrition Research Department of the New Zealand Medical Research Council, New Zealand Department of Health.

Dalman PR, Siimes MA & Stekel A (1980). Iron deficiency in infancy and childhood. Am J Clin Nutr,33,86-118.

Dalsky GP (1989). The role of exercise in the prevention of osteoporosis. Compr Ther,15(9),30-37.

Dalsky GP, Stocke KS & Ehsani AA (1988). Weight-bearing exercise training and lumbar bone mineral content in postmenopausal women. Ann Intern Med,108(6),824-828.

Davis P, McLeod K & Ransom M (1997). The New Zealand Socioeconomic Index of Occupational Status (NZSEI). Catalogue Number 23.101.0097. Statistics New Zealand, Wellington.

De Castro JM (1994). Family and friends produce greater social facilitation of food intake than other companions. Physiol Behav, 56(3), 445-455.

De Castro JM (1997). Socio-cultural determinants of meal size and frequency. Br J Nutr, 77,S39-54.

De Castro JM, Brewer EM & Elmore DK (1990). Social facilitation of the spontaneous meal size of humans occurs regardless of time, place, alcohol or snacks. Appetite, 15(2),89-101.

De Graff C, Van der Gaag M & Kafatos A (1997). Stages of dietary change among nationally-representative samples of adults in the European Union. Eur J Clin Nutr, 51(2), S47-56.

Department of Health (1991). Food for thought. Report of the Nutrition Taskforce, Wellington.

DiClemente CC, Prochaska JO & Fairhurst SK (1991). The process of smokong cessation: an analysis of precontemplation, contemplation, and preparation stages of change. J Consult Clin Psychol,59(2),295-304.

Dillman DA (1978). Mail and telephone surveys: the total design method. New York: Wiley.

Donovan RJ, Egger G & Francas M (1998). TARPARE: A method for selecting target audiences for public health interventions. Aust NZ J Public Health, 23, 280-284.

Donovan RJ & Rossiter JR (1982). Store atmosphere: an environmental psychology approach. Journal of Retailing 58,36-56.

Dupin H, Hercberg S & Lagrange V (1984). Evolution of the French diet: Nutritional aspects. World Rev. Nutr. Diet. 44,57-84.

Eaton SB & Konner MJ (1985). Paleolithic nutrition. N Engl J Med, 312,283-289.

Eaton SB, Konner MJ & Shostak M (1988). Stone Agers in the fast lane: chronic degenerative diseases in evolutionary perspective. Am J Med, 84,739-749.

Eatom SB & Nelson DA (1991). Calcium in evolutionary perspective. Am J Clin Nutr, 54,281S-287S.

Eck LH & Hackett-Renner C (1992). Calcium intake in youth: Sex, age and racial differences in NHANES II. Prevent Med, 21,473-482.

Edwards K (1990). The interplay of affect and cognition in attitude formation and change. J Personality and Social Psychology,59, 202-216.

Eisenman R & Longen K (1980). Restricting snack foods in schools. Natl Food Rev, Summer, 27.

Elbon SM, Johnson MA & Fischer JG (1996). Developing an instrument to measure the influence of knowledge, behaviours, and attitudes on milk consumption patterns in older participants of a community wellness group: a pilot study. J Nutr Elder, 15(4), 21-37.

Elliot J (1996). Osteoporosis. Primary Health Care New Zealand, August:19-22

Elliot J (1997). Hip fractures rise as NZ population ages. Bone Alert, 3(2): 2-3

Environ, (1998), Analyses by Environ based on USDA CSFII, 1994-96 Two Day Data.

Fallon AE & Rozin P (1983). The psychological bases of food rejections by humans. Ecology of Food and Nutrition,13,15-2.

Fanti O, Faugere MC & Gang Z (1998). Systematic administration of genistein partially prevents bone loss in ovariectomised rats in nonestrogen-like mechanism. Am J Clin Nutr, 68 (suppl),1517S. (abstr).

Feather NT (1982). Expectations and actions: Expectancy value models in psychology. Hillsdale, NJ: Erlbaum.

Feather NT (1992). Values, valences, expectations and actions. J Social Issues, 48 (2), 109-124.

Feather NY, Norman MA & Worsley A (1998). Values and valences: Variables relating to the attractiveness of food in different contexts. J of Applied Social Psychology 28 (7),636-656

Fischer R, Griffin F & England S (1961). Taste thresholds and food dislikes. Nature, 191,1328.

Fishbein M & Ajzen I (1975). Belief, Attitude, Intention and Behaviour. Menlo Park,CA :Addison-Wesley.

Food and Nutrition Service, USDA (1984). Proposed rule. Fed register, 49,9426.

Gardner MP (1985). Does attitude toward the ad affect brand attitude under a brand evaluation set? Journal of Marketing Research 22, 192-198.

Garland C, Shekell RB & Barrett-Connor E (1985). Dietary vitamin D and calcium and risk of colorecetal cancer: a 19-year prospective study in men. Lancet 2:307-309.

Gibney , Sibman-Grant M & Stanton JL (1995). Consumption of sugars. Am J Clin Nutr, 62,178S-193S.

Gibson EL, Wardle J & Watts CJ (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. Appetite,31(2),205-228.

Gilchrist N (1997). Christchurch girls' osteoporosis study findings. Dialogue. Dairy Advisory Bureau Issue No 22. And, The effects of dairy food supplements on bone mineral density in teenage girls (unpublished data).

Giles M & Asher I (1991). Prevalence and natural history of otitis media with perforation in Maori school children. J Laryngol Otol, 105(4), 257-260.

Glinghammer B, Venturi M & Rowland IR (1997). Shift from a dairy product-rich to a dairy product-free diet: influence on cytotoxicity and genotoxicity of faecal water – potential risk factors for colon cancer. Am J Clin Nutr, 66,1277-1282.

Glanz K, Basil M & Maibach E (1998). Why Americans eat what they do taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. J Am Diet Assoc, 10,1118-1126.

Goulding A, Cannan R & Williams SM (1998). Bone Mineral Density in Girls with Forearm Fractures. J Bone Miner Res, 13, 143-148

Graves JK (1998). Mineral adequacy of vegetarian diets. Am J Clin Nutr, 48, 859-862.

Greene GW, Rossi SR & Reed GR (1994). Stages of change for reducing dietary fat intake to 30% of energy or less. J Am Diet Assoc,94(10),1105-1110.

Grunert KG. (1994). Cognition and economic psychology. In: H Brandstatter and W Guth (Eds); Essays in economic psychology, pp.91-108. Berlin: Springer.

Grunert KG, Brunso K and Bisp S. (1993) Food related life-style: Development of a cross-culturally valid instrument for market surveillance. MAPP Working Paper No.12. Denmark: The Aarhus School of Business.

Guenther PM (1986). Beverages in the diets of American teenagers. J Am Diet Assoc, 86(4), 493-499

Hair JF, Anderson RE & Tatham RL (1998). Multivariate data analysis. 5th Edition. Prentice-Hall International, Inc. New Jersey.

Harnack L, Stang J & Story M (1999). Soft drink consumption among US children and adolescents: Nutritional consequences. J Am Diet Assoc, 99,436-441.

Harris PG. (1991). Liquid milk report. National Dairy Council. London.

Havas S, Treiman K & Langenberg P (1998). Factors associated with fruit and vegetable consumption among women participating in WIC. J Am Diet Assoc, 10, 1141-1148.

Heaney RP (1993). Nutritional factors in osteoporosis. Annu Rev Nutr,13,287-316.

Heaney RP. 1996 Age considerations in nutrient needs for bone health: older adults. J Am College Nutr, 15 (6), 575-578.

Heaney RP, Barger-Lux MJ (1994). Low calcium intake: the culprit in many chronic diseases. J Dairy Sci,77, 1155-1160

Heaney RP, Recker RR (1982) Effects of nitrogen, phosphorus and caffeine on calcium balance in women. J Lab Clin Med, 99,46.

Hennekens CH & Buring JE (1987). Epidemiology in medicine. Little, Brown and Company, Boston.

Hertzler AA, Wenkam N & Standal B (1982). Classifying cultural food habits and meanings. J Am Diet Assoc,80,421-425.

Heywood P & Lund-Adams M (1991). The Australian food and nutrition system: a basis for policy formulation and analysis. Austr J Public Health,15:258-270.

Hiddink GJ, Hautvast JG & van Woerkum (1995). Nutrition guidance by primary-care physicians: perceived barriers and low involvement. Euro J Clin Nutr.49, 842-851.

Hiddink GJ, Hautvast JG & van Woerkum CM (1997). Consumer's expectations about nutrition guidance: the importance of primary-care physicians. Am J Clin Nutr (suppl). 65, S1974-S1979.

Hill DA, Delaney LM & Roncal S (1997). A chi-square automatic interaction detection (CHAID) analysis of factors determining trauma outcomes. J Trauma, 42(1),62-66.

Hofstede G (1997). Cultures and organisations. Software of the mind. Intercultural cooperation and its importance for survival. McGraw-Hill International (UK) Ltd.

Holt PR, Atllasoy EO & Gilman J (1998). Modulation of abnormal colonic epithelial cell proliferation and differentiation by low fat dairy products. JAMA, 280,1074-1079.

Hølund U (1999). Strength and weakness of a nutrition communication strategy to health opinion formers: examples from a case study. Euro J Clin Nutr.53, Suppl 2, S54-S57.

Horwath C(1999). Applying the Transtheoretical Model to eating behaviour change: challenges and oportunities. Nutr Res Rev,12,1-38.

Host A, Jacobsen HP & Jalken S (1995). The natural history of cow's milk protein allergy/intolerance. Eur J Clin Nutr, 49,S13-18.

Huang HC, Lin TK & Ngui PW (1993). Analysing a mental health survey by chi-squared automatic interaction detection. Ann Acad Med Singapore, 22(3), 332-337.

Hunter JE & Applewhite TH (1996). Isomeric fatty acids in the US diet: levels and health perspectives. Am J Clin Nutr,44,707-717.

Hyman J, Baron JA & Dain BJ (1998). Dietary and supplemental calcium and the recurrence of colorectal adenomas. Cancer Epidemiol Biomarkers & Prevention, 7,291-295.

Institute of Medicine (1997). Dietary Reference Intakes. Nutr Rev, 55,(9), 319-326.

International Dairy Federation (1997). The world dairy situation. Bulletin of the International Dairy Federation No 323.

Jacoby J, Syzabillo G & Bustato-Scach J (1977). Information acquisition behaviour in brand choice situations. J Consumer Research, 3, 209-216.

James WP, Nelson M & Ralph A (1997). Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. BMJ,314 (7093),1545-1549.

Janz NK & Becker MH (1994). The health belief model: a decade later. Health Education Quarterly II (1), 1-47.

Jardine A (1999). Iceland stance on GM foods pulls in shoppers. UK Marketing Magazine, 25 March.

Johnson AO, Semenya JG & Buchowski MS (1993). Correlation of lactose maldigestion, lactose intolerance, and milk intolerance. Am J Clin Nutr, 57,399-401.

Johnson RK & Kennedy E (2000). The 2000 Dietary Guidelines for Americans: what are the changes and why were they made? The Dietary Guidelines Advisory Committee. J Am Diet Assoc, 100, (7), 769-774.

Jones G, Nguyen T, Sambrook PN & Kelly PJ (1994). Symptomatic fracture incidence in elderley men and women: The Dubbo Osteoporosis Epidemiology Study (DOES). Osteoporosis Int, 4,277-282.

Kato I, Akhmedkhanov A & Koenig K (1997). Prospective study of diet and female colorectal cancer: The New York University Women's Health Study. Nutr Cancer, 28 (3), 276-281.

Kirk D (1999). All the way. The official New Zealand rugby football union world cup magazine.

Knegt Y, den Hartog AP (1982). Plaats en sociale functies van voedsel in de samenleving. In AP den Hartog (Ed.), Voeding als Maatschappelijk Verschijnsel. Scheltema en Holkema BV, Utech. Pp. 116-151. (In Dutch)

Koivisto U, Edlund B, Sjoden P. (1994) Exposure to milk or water at preschool lunch for 3 months influences children's choice of elementary school lunch drink 4 months later. Appetite, 23,265-274.

Kotler P & Armstrong G. (1990) Marketing: An introduction. Second edition, Prentice Hall.

Kretchmer N (1971). Lacose and lactase –A historical perspective. Gastroenterologia, 61, 805.

Kretchmer N (1971). Memorial lecture: Lactose and lactase –A historical perspective. Gastroenterologia, 61,805.

Krondl M, Lau D (1982) Social determinants in human food selection. In: Barker LM ed. Psychobiology of Human Food Selection. Westport, Conn: AV1. Pp.139-151.

Laitinen S, Rasanen L, Viikari J (1995). Diet of Finnish children in relation to the family's socio-economoc status. Scandinavian Journal of Social Medicine 23(2) ,88-94.

Lazer W. (1963) Life style concepts and marketing. In: SA Greyser (Ed). Toward scientific marketing,pp.243-252. Chicago: American Marketing Association.

Lee C (1993). Attitudes, knowledge, and stages of change: a survey of exercise patterns in older Australian women. Health Psychol, 12(6), 476-480.

Leighton G, Clarke ML. (1929) Milk consumption and growth of schoolchildren: second preliminary report on tests to Scottish Board of Health, Lancet,1,40-43.

Lichtenstein AH, Kennedy E & Barrier P (1998). Dietary fat consumption and health. Nutr Rev, 56(5), S3-19.

Life in New Zealand Survey (1991). Hillary Commission Report (1991). Vol. VI: Nutrition, University of Otago.

Life in New Zealand Survey (1995). Data from Technical report no 2 (1993) and No 38 (1995), Prepared by LINZ Activity and Health research Unit, University of Otago, Dunedin.

Ling AM & Horwath C (1999). Self-efficacy and consumption of fruit and vegetables: Validation of a summated scale. Am J Health Promot,13(5),290-298.

Lloyd HM, Paisley CM & Mela DJ (1993). Changing to a low fat diet: attitudes and beliefs of UK consumers. Eur J Clin Nutr, 47 (5), 361-373.

Lonnerdal B (1990). Cow's milk during the second half-year of life, effect on iron status. Editorial. J Pediatr Gastroenterol Nutr, 11(3), 302-303.

MAFF (1986). Household food consumption and expenditure-1984. Annual report of the National Food survey Committee, HMSO.

Magidson J (1988). Improved statistical techniques for response modeling. Progression beyond regression. Journal Direct Marketing, 2 (4), 6-18.

Mann J (1999). Nutrition education for medical students: the University of Otago experience. Euro J Clin Nutr.53, Suppl 2, S62-S66.

Martins Y, Pelchat ML, & Pliner P (1997). "Try it; it's good and it's good for you": Effects of taste and nutrition information on willingness to try novel foods. Appetite, 28, 89-102.

Matkovic V (1991). Diet, Genetics and Peak Bone Mass of Adolescent Girls. Nutrition Today, March/April, 21-24.

Matkovic V (1996). Nutrition, genetics and skeletal development. J Am Col Nutr, 15,556-569.

MatkovicV & Illich J (1993). Calcium requirements for growth: are current recommendations adequate? Nutr Rev,51,171-180.

Matkovic V, Kostial K & Simonovic I (1979). Bone status and fracture rates in two regions of Yugoslavia. Am J Clin Nutr,32,540-5489.

McCarron DA (1992) Calcium nutrition and hypertensive cardiovascular risk in humans. Clin Appl Nutr, 2,45.

McCarron DA, Morris CD & Cole C (1982) Dietary calcium in human hypertension. Science, 217,127-169.

McConaghy J (1989).`Adults beliefs about the determinants of successful dietary change. Community Health Studies, 13(4), 492-502.

McCracken RD (1971). Origins and implications of the distribution of adult lactase deficiency in human populations. Environ. Child Health 17,7.

McWinnie J, Carter P (1993). Women defining health: Food, diet and body image, Health education research, 8(1), 35-41.

Mela DJ (1988). Sensory assessment of fat content in fluid dairy products. Appetite, 10(1), 37-44.

Metcalfe PA, Scragg RK & Tukuitonga CF(1998) Dietary intakes of middle-aged European, Maori and Pacific Islands people living in New Zealand. NZ
Med J, 111,310-313.

Milk Nutrition Committee (1938). Milk and Nutrition. National Institute for Research in Dairying, Reading.

Ministry of Agriculture and Forestry (1999). www.maf.govt.nz.

Ministry of Health (1991). Mortality and demographic data. New Zealand Health information service, Wellington.

Ministry of Health (1999). NZ Food: NZ People. Key results of the 1997 National Nutrition Survey. Wellington.

Ministry of Health (1995). National plan of Action for nutrition. The Public Health commission's advice to the Minister of Health 1994-1995.

Mitchell AA & Olsen JC (1981). Are product attribute beliefs the only mediator of advertising effects on brand attitude? Journal of Marketing Research 18, 318-332.

Moses N, Baanilivy M & Lifshitz F. Fear of obesity among adolescent girls. Pediatrics, 33, 393-398.

Munnings F (1992). Osteoporosis: What is the role of exercise? The Physician and Sportsmedicine, 20(6),127-138.

Murcott A (1995). Symposium on 'Pyscho-social influences on food choice: implications for dietary change'. Proceedings of the Nutrition Society, 54,729-735.

Murphy J. (1987). Branding. A key marketing tool. Basingstoke, MacMillan.

Murphy S, Khaw KT & May H (1994). Milk consumption and bone mineral density in middle aged and elderly women. BMJ, 308,939-941.

Najman JM (1988). The measurement of socio-economic inequality and social class in Australia: a review of past practices and recent developments. Community Health stud, 12(1), 31-41.

National Institute of Health (1994). Consensus Development Panel on Optimal Calcium Intake. JAMA 272, (24),1942-1948

National Institute of Health (1996). Meeting calcium requirements with food. Consensus Development Conference Report. Washington DC: US Dept of Health and Human Services.

National Institute of Health (1997). Embrace your health. Lose weight if you are overweight. NHLBI and Office of Research on Minority Health, NIH Publication, 97-4061.

National Plan of Action for Nutrition (1995). The Public Health Commission's Advice to the Minister of Health 1994-1995, Wellington.

New Zealand Dairy Board (1980). A survey of the New Zealand dairy industry. Fourth edition. External Economics Division, New Zealand Dairy Board, Wellington.

New Zealand Dairy Board (1999). www.nzmilk.co.nz.

New Zealand Dairy Group (1997). www.nzdairy.co.nz/public/profile/anchorProducts/AnchorProducts.htm.

New Zealand Dairy Group (1998). New Zealand Dairy Group of Companies Annual Report.

Nordin BE (1996). Calcium. J Food Nutr, 42,67-82.

Nordin BE, Need AG & Morris HA (1991). Sodium, calcium and osteoporosis. In Nutrional Aspects of Osteoporosis, Serono Symp. Publ. Ed. P Burckhardt, RP Heaney, 85,279-295. New York: Raven.

Norris VP. (1983) Towards social control in the advertising agency. Journal of advertising 12 (1), 30-33.

Nowak M & Crawford D (1998). Getting the message across: adolescent's health concerns and views about the important of food. Aust J Nutr Diet,55,3-8.

NSDA (1998). National Soft Drink Association website, www.nsda.org

Nutrition Section, Ministry of Health (1980). Schoolchildren's breakfasts. Survey by the Environmental Health branch of the Public Health Division in the Ministry of Health, Wellington.

O'Brien KO, Abrams SA & Liang LK(1998). Bone turnover response to changes in calcium intake is altered in girls and adult women in families with histories of osteoporosis. J Bone Min Res,13 (3),491-499.

Olney TJ, Holbrook MB & Batra R (1991). Consumer responses to advertising: the effects of ad content, emotions, and attitude toward the ad on viewing time. Journal of Consumer Research 17, 440-453.

Oram N (1996) Plausible influences of food attributes on children's food preferences. In: Worsley A, ed. Multidisciplinary approaches to food choice. Adelaide: Food Choice Conference, 5-9.

Orr JB. (1928). Milk consumption and the growth of children. Lancet, 1,202-203.

Oski FA, Honig AS& Helu B (1983). Effect of iron therapy on behaviour performance in non-anaemic, iron –deficient infants. Paediatrics,71,877-880.

Paganini-Hill A, Chaos A & Ross RK (1991). Exercise and other factors in the prevention of hip fractures: the Leisure World study. Epidemiology, 2,16-25.

Pangborn RM, Dunkley WL.(1964) Difference-preference evaluation of milk by trained judges. J Dairy Science, 47,1414-1416.

Pangborn RM, Bos KE & Stern JS. (1985) Dietary fat and taste responses to fat in milk by under-, normal, and overweight women. Appetite, 6 (1), 25-40.

Parodi PW (1997). Cows' milk fat components as potential anticarcinogenic agents. J Nutr, 127,1055-1060.

Pearce NE, Davis PB & Smith AH (1984). Mortality and social class in New Zealand. III: male mortality by ethnic group. NZ Med J,97(748),31-35.

Pliner P (1982). The effects of mere exposure on liking for edible substances. Appeteite: Journal for Intake Research , 3, 283-290.

Pliner P& Fleming AS (1985). Food cravings and aversions and cravings in pregnancy: A review. Unpublished manuscript, University of Toronto.

Pliner P & Pelchat M (1991). Neophobia in humans and the special status of foods of animal origin. Appetite, 20, 111-123.

Pollay RW (1987). On the value of reflections on the values in "The Distorted Mirror". Journal of Marketing 51 (July), 104-109.

Pollay RW (1986). The distorted mirror: Relections on the unintended consequences of advertising. Journal of Marketing 50 (April) 18-36.

Pollitt E, Soemantri AG & Yunis F (1985). Cognitive effects of iron deficiency anaemia. Lancet, 1,158.

Pollitzer WS, Anderson JB (1989). Ethnic and genetic differences in bone mass: A review with a heriditary vs. environmental perspective. Am J Clin Nutr, 50,1244-1259.

Popcorn F (1996). Clicking, Thorsons, London.

Potter SM, Baum J & Teng H (1998). Soy protein and isoflavones: their effects on blood lipids and bone density in postmenopausal women. Am J Clin Nutr,68 (suppl),1375S-1379S.

Prattala R & Keinonen M (1984). The use and the attributions of some sweet foods. Appetite,5 (3), 199-207.

Prochaska J (1991) Assessing how people change. Cancer 1,67 (3 Suppl), 805-807.

Prue T. (1998). An all embracing theory of how advertising works. Admap. NTC Publications Ltd. Feb; 18-23.

Raats MM & Shepherd R (1991). An evaluation of the use and perceived appropriateness of milk using the repertory grid method and the 'item by use' appropriateness method. Food Quality and Preference, 3, 89-100.

Raats MM & Shepherd R (1992). Free-choice profiling of milks and other products prepared with milks of different fat contents. J Sensory studies, 7,179-203.

Raats MM, Shepherd R (1993). The use and perceived appropriateness of milk in the diet: a cross-country evaluation. Ecol Food Nutr, 30, 253-273.

Rappoport L, Peters GR, Downey R (1993). Gender and age differences in food cognition. Appetite, 20,33-52.

Rappoport L, Peters GR & Huff-Corzine I (1992). Reasons for eating: an exploratory cognitive analysis. Ecol Food Nutr, 28,171-189.

Recker RR, Davies KM & Hinders SM (1992). Bone gain in young women. JAMA,268, 2403-2408.

Renner E (1994). Dairy calcium, bone metabolism and prevention of osteoporosis. J Dairy Sci 77:3498-3505.

Research International (1998). Nutrition confusion on the rise. In: Kellogg's Update- Nutrition Research Summaries, Issue 2.

Riggs B & Melton L (1986). Involutional osteoporosis. N Engl J Med,314,1676-1686.

Roberts DJ (1988). Changes in the demand and supply for milk and dairy products. Proc Nutr Soc,47,323-329.

Rokeach MJ (1968). The roles of values in public opinion research. Public Opinion Quarterly 32, 547-549.

Rokeach M (1973). The nature of human values. New York: Free Press.

Rozin P (1976). Psychobiological and cultural determinants of food choice. In T. Siverstone (Ed.), Appetitite and food intake (pp 285-312). Berlin (W): Abakon Verlagsgesellscaff.

Rozin P & Fallon AE (1980). The psychological characterisation of foods and non-foods: A preliminary taxonomy of food rejections. Appetite,1,193-201.

Rozin P & Fallon AE (1987). A perspective on disgust. Psychological Review,94, (1),23-41.

Rozin P & Fallon AE (1988). Body image, attitudes to weight and misperceptions of figure preferences of the opposite sex: A comparison of males and females in two generations. Journal of Abnormal Psychology, 97,342-345.

Rozin P, Fischler C & Imada S (1998). Attitudes to food and the role of food in life in the USA, Japan, Flemish Belgium and France. Possible implications for the diet-health debate (In press).

Rozin P & Vollmecke TA (1986). Food likes and dislikes. Ann Rev Nutr, 6, 433-456.

Russell DG, Wilson NC (1991). Life in New zealand Commission report Volume I: executive overview. University of Otago.

Saap SG (1991). Impact of nutritional knowledge within an expanded rational expectations model of beef consumption. J Nutr Ed; 23,214-222.

Sandler RB, Slemenda CW & LaPorte (1985). Postmenopausal bone density and milk consumption in childhood and adolescence. Am J Clin Nutr,42,270-274.

Santich B (1992). The incompatibility of nutrition ideals with low income. Food Australia, 44(5), 230-234.

Santich B (1996). A brief history of food choice in Australia. `In: Multidisciplinary approaches to food choice. Ed. A. Worsley.

Saunders C, Manhire J & Campbell H (1997). Organic farming in New Zealand: An evaluation of the current and future prospects including assessment of research needs. Department of Economics and Marketing, Lincoln University. For MAF Policy.

Scalmati A, Lipkin M & Newmark H (1992). Calcium, vitamin D, and colon cancer. Clin Appl. Nutr, 2(4),67-74.

Schwartz SH (1992). Universals in the content and structure of values: theoretical advances and empirical tests in 20 countries. Advances in Experimental Social Psychology, 25,1-63.

Schwartz SH (1994). Are there universal aspects in the structure and contents of human values? J Social Issues, 50,19-45.

Schwartz SH & Inbar-Saban N (1988). Value self-confrontation as a method to aid in weight loss. Journal of Personality and Social Psychology, 54(3), 396-404.

Scrimgeour F (1998) Government chews the fat as dairy industry milks consumers. The New Zealand Herald, 1 December.

Scrimshaw NS, Murray AB (1988). The acceptability of milk and milk pro ducts in population with a high prevalence of lactose intolerance. Am J Clin Nutr, 48(suppl 1),1083-1325.

Serra-Majem LL, Calvo JR & Male ML (1999). Population attitudes towards changing dietary habits and reliance on general practitioners in Spain. Euro J Clin Nutr. 53, Suppl 2, S58-S61.

Siega-Riz AM, Popkin BM & Carson T (1998). Trends in breakfast consumption for children in the United States from 1965 to 1991. Am J Clin Nutr, 67(suppl),748S-756S.

Shattuck AL, White E & Kristal AR (1992). How women's adopted low fat diets affect their husbands. Am J Public Health, 82(9), 1244-1250.

Shepherd R. (1990) Behavioural modelling of fat consumption. Food Quality and Preference, 2, 89-94.

Shepherd R. (1988) Belief structure in relation to low fat milk consumption. J Human Nut & Diet, 1 421-428.

Shepherd R, Sparks P & Bellier S (1991). Attitudes and choice of flavored milks: extension of Fishbein and Ajzen's theory of reasoned action. Food Q Preference, 3,157-164.

Shepherd R & Stockley L (1985). Fat consumption and attitudes towards food with a high fat content. Hum Nutr: Appl Nutr, 39A, 431-442.

Shepherd R & Towler G (1992). Nutrition knowledge, attitudes and fat intake: application of the theory of reasoned action. J Hum Nutr Diet, 5,387-397.

Simoons FJ (1978). The geographic hypothesis and lactose malabsorption: A weighing of the evidence. Digest Dis, 23,963-980.

Singh BM, Wise PH. 1994 Effect of advertising on awareness of symptoms of diabetes among the general public: The British Diabetic Association Study. BMJ, 308.

Smith A, Baghurst K (1992). Public health implications of dietary differences between social status and occupational category groups. Journal of Epidemiology and Community Health, 46,406-416.

Smith EL & Gilligan C (1991). Physical activity effects on bone metabolism. Calcif Tissue Int, 49,S50-54.

Sobal J, Khan LK, Bisogni C. (1998) A conceptual model of the food and nutrition system. Soc. Sci. Med, 47 (7), 853-863.

Sowers M, Khirsagar A & Crutchfield M (1991). Body composition, age and femoral bone mass of young adult women. Ann Epidemiol, 1,255-301.

Sowers JR, Zemel MB & Zemel PC(1991). Calcium metabolism and dietary calcium in salt sensitive hypertension. Am J Hypertension, 4,557.

Stafleu A, Van Staveren WA & De Graaf C (1996). Nutrition knowledge and attitudes towards high-fat foods and low-fat alternatives in three generations of women. Eur J Clin Nutr,50(1),33-41.

Statistics New Zealand (1998). 1996 Census. Families and households. Catalogue no. 02.012.0096.

Steele P, Dobson A & Alexander H (1991). Who eats what? A comparison of dietary patterns among men and women in different occupational groups. Australian Journal of Public Health, 15(4), 286-294.

Steenkamp JB, Van Trijp HCM. (1989) Quality guidance: A consumer-based approach for product quality improvement In: GJ Avlonitis (Ed.) Proceedings of the 18th Annual Conference of the European Marketing Academy, pp.717-736. Athens:EMAC.

Stopes C & Woodward L (1998). Consumer demand and the market for organic food. Elm Farm Research Centre, UK.

Strychar IM, Potvin L & Pineault R (1993). Changes in knowledge and food behaviour following a screening program held in a supermarket. Can J Public Health, 84(6), 382-388.

Tansey G & Worsley A (1995). Food, Culture and Human Needs. In: The Food System. Earthscan Publications Ltd. London.

Teegarden D, Lyle RM & Proulx WR (1999). Previous milk consumption is associated with greater bone density in young women. Am J Clin Nutr, 69,1014-1017.

Tetra Pak Ltd (1998). Soft drink's Division. Children's drinks: what children and their mothers really think. Children's Drinks Report.

Tin C, Hwang B & Wu T (1988). Developmental changes of lactose malabsorption in normal Chinese children: a study using breath hydrogen test with a physiological dose of lactose. J Paed Gastroent and Nutr, 7(6), 848-851.

Towler G & Shepherd R (1992). Application of Fishbein and Ajzen's expectancy-value model to understanding fat intake. Appetite 18,15-27.

Troiano R, Flegal K & Kuczmarski R (1995). Overweight prevalence and trends for children and adolescents: the National Health and Nutrition Examination Surveys, 1963-1991. Arch Pediatr Adolesc Med, 149,1085-1091.

Truswell AS & Darnton-Hill I (1981). Food habits of adolescents. Nutr Rev, 39,73.

Truswell AS, Hiddink GJ & Hautvast JG (1999). Editorial. Family doctors and patients: is effective nutrition interaction possible? Euro J Clin Nutr.53, Suppl 2, S1-S2.

Tuorila H (1986). Sensory profiles of milk with different fat contents. Lebensm. Wiss. Technol.19, 344-345.

Tuorila H (1987) Selection of milks with varying fat contents and related overall liking, attitudes, norms and intentions. Appetite, 8,1-14.

Tuorila-Ollikainen H, Laheenmaki L & Salovaara H (1986). Attitudes, norms, intentions and hedonic responses in the selection of low salt bread in a longitudinal choice experiment. Appetite, 7,127-139.

Tuorila H & Pangborn RM (1988). Prediction of reported consumption of selected fat containing foods. Appetite 11,81-95.

Tuorila H, Pangborn RM & Schutz HG (1990). Choosing a beverage: Comparison of preferences and beliefs related to the reported consumption of regular vs. diet sodas. Appetite 14,1-8.

Tuschl RL, Laessle RG & Platte P (1990). Differences in food choice frequencies between restrained and unrestrained eaters. Appetite, 14, 9-13.

Underhill P (1999). Why we buy. The science of shopping. Simon and Schuster, Rockefeller Centre, New York.

USDA (1996). US Department of Agriculture Continuing Survey of Food Intakes of Individuals (CSFII), 1994-1996 (Data Tables 9.4,9.7,10.4, 10.7).

Walker J & Ball M (1993). Increasing calcium intake in women on a low fat diet. Eur J Clin Nutr, 47 (10),718-723.

Wardle J & Beales S (1986). Restraint, body image and food attitudes in children from 12 to 18 years. Appetite, 7,225-217.

Walter T, Kovalskys J & Stekel A (1983). Effect of mild iron deficiency on infant mental developmental scores. J Pediatr, 102,519-522.

Watt RG (1997). Stages of change for sugar and fat reduction in an adolescent sample. Community Dent Health, 14(2), 102-107.

Wechsler H, Basch C & Zybert P (1995) The availability of low-fat milk in an inner city Latino community: implications for nutrition education. Am J Public Health, 85, 1690-1692.

Wells WD (1975). Psychographics: A critical review. Journal of Marketing, 12(2),196-213.

Westbrook RA & Black WC (1985). A motivation-based shopper typology. Journal of Retailing 61,78-102.

Wham CA (1997). The Nutritional management of food intolerance. Journal of the New Zealand Dietetic Association, 51(2), 57-62.

Wham CA (1987). Adverse reactions to food. In: Are we really what we eat? Ed: J Birkbeck. Dairy Advisory Bureau.

Williams (1997). Breakfast move into snacks expands usage occasions. Retail Today. June 1997.

Wilson G (1989). Family food systems, preventative health and dietary change: A policy to increase the health divide. Journal of Social Policy, 18(2), 167-185.

Wilson PJ & Horwath CC (1996). Milk product consumption and socio-economic status in women. Proc Nutr Soc of NZ, 21, 35-41.

Wiseman J (1994). Beliefs about food components, foods, fat and heart disease in New Zealand. British Food Journal, 96(11), 14-19.

Witternan JCM, Willett WC & Stampfer MJ (1989). A prospective study of nutritional factors and hypertension among US women. Circulation, 80,1320-1327.

Woodfield, (1998). Breakfasts in vogue. Grocers' Review. December 1997/January 1998.

Worsley A (1987). Community and family studies at Otago. J Assoc Home Science Alumnae New Zealand, 56, 54.

Worsley A (1988). Co-habitation –Gender effects on food consumption. International Journal of Biosocial Research, 10(2), 107-122.

Worsley A (1989). Perceived reliability of source of health information. Health Education Research, 4,367-376.

Worsley A (1990). Lay persons' evaluations of health: an exploratory study of an Australian population. Epidemiology and Community Health, 44,7-11.

Worsley, Coonan & Baghurst (1983). Nice, good food and us: a study of children's food beliefs. J Food Nutr,40 (1),35-40.

Worsley A & Worsley AJ (1990). The nutrition information needs of New Zealand general practitioners. Nutrition Research, 10,1099-1108.

Worsley A & Worsley AJ (1991). New Zealand general practitioners' nutrition opinions. Austr J Nutr Diet. 48, 7-10.

Worsley A, Worsley A, McConnon S (1991). Kiwis, food and cholesterol: New Zealand consumers' food concerns and awareness of nutrition guidelines. Aust J Public Health, 15 (4), 296-300.

Wyshak G & Frisch R (1994). Carbonated beverages, dietary calcium, the dietary calcium/phosphorus ratio, and bone fractures in girls and boys. J Adolesc Health, 15,210-215.

Wyshak G, Frisch R & Albright T (1989). Nonalcoholic carbonated beverage consumption and bone fractures among women former college athletes. J Orthop Res, 71,91-99.

Wyshak G & Frisch RE (1994). Carbonated beverages, dietary calcium, the dietary calcium/phosphorus ratio, and bone fractures in girls and boys. J Adolesc Health, 15, 210-215.

Zaichowsky J. (1995). Defending your brand against imitation. Quorum Books.