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Factors Influencing Diet and Health Concerns among Canadian Consumers

by

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Abstract

This thesis focuses on Canadian consumers concerns and attitudes towards healthy eating. The analysis is based on two years (2007 and 2008) of the Nielsen Health and Wellness survey data (Nielsen, 2008) and Nielsen Homescan household food purchase data. These datasets are used to investigate, first participating Canadian consumers stated food and health behaviour, and second the actual revealed meat purchase patterns of the same households.

The results from logistical regression models show how differences in social-demographic factors and food behaviours affect consumers' health and dietary concerns. Significant variables are gender, age, family lifestyle, changing eating habits towards a healthier lifestyle, and information from products' Nutrition Facts Tables. These variables are key factors that increase the probability of Canadians being more concerned about their future health, healthy eating, as well as obesity in their household.

In the second analysis, meat purchase patterns across survey participants with varying stated levels of health and dietary concerns are investigated using descriptive data analysis. Although the first part of analysis suggested that consumers are getting more knowledgeable about making healthier food choices and diet-health related problems resulting from an unbalanced diet, no differences in meat purchase patterns related to households' stated diet and health concerns were found.

The discrepancies between stated and revealed food, diet, and health preferences among Canadians suggest that more emphasis needs to be placed on consumer

information and education to improve healthy food choices in meat and other products. Also, the relationship between consumer socioeconomic and demographic characteristics and their impact on consumer health behaviour requires further attention. Improved knowledge and information regarding Canadian consumers' diet and health behaviour can support more efficient marketing programs for healthier products and assist policy makers in designing more effective policies aimed at changing Canadians' diets to promote healthier lifestyles.

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Chapter 1

Introduction

World Health Organization (WHO) describes unhealthy diet as "one of the major risk factors for a range of chronic diseases, including cardiovascular diseases, cancer, diabetes and other conditions linked to obesity" (WHO, 2011). Studies have shown that the rate of obesity, its risk factors, and its negative health outcomes have increased significantly over the past two decades among both adolescents and children (Ball and McCargar, 2003). It has also been suggested that almost 60% of Canadian adults ages 18 and over (14.1 million Canadians) are either obese or overweight (Tjepkema et al., 2005). Obesity is known to increase the risk of disability and death. Katzmarzyk and Arden (2004) show that being overweight and obese accounted for 57,000 deaths in Canada from 1985 to 2000. In addition, the costs of physical inactivity and obesity were $5.3 billion and $4.3 billion in 2001, respectively (Katzmarzyk and Janssen, 2004). This corresponds to a combined 4.8% of the total health care costs in Canada.

Cash et al. (2004) analyzes previous studies conducted to evaluate the correlation between four food-related diseases (coronary heart disease, cancer, stroke, and diabetes) with the intake of various food components (fruits, vegetables, meat, eggs, whole grains, alcohol, sugar, dairy, fish, pulses, soy, and nuts). The report estimates that in 1993, $29.4 billion (in 2004 Canadian dollars) in health care costs has been spent on these four diet-related diseases (19% of all Canadian health care costs in 1993).

Over the last twenty decades, Canadian food-health knowledge has undergone some changes triggered by increasing diet and nutrition awareness programs to provide consumers about the potential health consequences of certain diets (Azancot et al., 1997). A 1989 collaborative survey by the National Institute of Nutrition (NIN) and the Canadian government shows that nutrition was "very" or "extremely" important to 59% of the Canadian adults. The highest percentages of respondents were very concerned with the level of fat and cholesterol in their diets. Interestingly, the primary sources of diet-related information were radio, TV and magazines, followed by friends, family and product labels. However, most of the respondents reported doctors and dieticians as the most trusted sources of information (Beggs et al., 1993).

Compared to the 1980's, today's consumers are even more exposed to media advertisements, information from health professionals, governmental regulations, and food programs of various health organizations. Winning the consumers' trust is, however, not an easy task. As indicated above, although consumers receive most of their nutrition-related information from media and their immediate social circles, they still consider the health professionals as the most trusted source. Increasing amounts of food information and related claims correlate with increasing consumer skepticism (Eden et al., 2008). Hence, further studies are required to address the consumers' perception of quality of food-related information which in turn impacts their purchase behaviour.

Acknowledging the fact that health concerns affect consumers' food preferences is a key factor in providing them with the exact products they are

willing to buy, as well as the type and amount of information they are interested to know about the product they are buying. This increased consumer concern supplemented with new governmental regulations have had food product manufacturers add detailed labels to their products showing ingredients, functionality, and similar other information (Drichoutis et al., 2006). The U.S. Nutritional Labelling Education Act, and the recent amendments controlled by the U.S. Foods and Drugs Act (mandatory nutrition labelling, Daily Values for certain nutrients, defining serving sizes, and health claims) are among strategies employed to standardize the quality and amount of information provided to consumers (U.S. FDA, 1994; Nayga, 1998b).

Given concerns over food-related diseases, the World Health Organization (WHO) recommended increased government involvement in developing national strategies to encourage improved diets and increased physical activity. Among the available options are education and public awareness, guidelines on children' food advertisement and marketing, educational food labelling, etc. (WHO, 2003). Some programs that have been developed and implemented in the US are Recommended Daily Allowances, Food Pyramid, the Surgeon General's Report on Diet and Health, the Five-a-Day for Better Health, and the Dietary Guidelines for Americans (Nayga, 1997). The Government of Canada has also provided similar programs to increase the level of public awareness around the prevalence of diet-related diseases such as healthy eating messages towards healthier lifestyle, to reduce salt, sugar and fat intake, and nutrition labelling education (Agriculture and Agri-Food Canada, 2007b).

In addition to governmental regulations, non-governmental organizations (NGOs) are also playing a role in public education towards healthier diet choices. Canadian NGOs like the Canadian Cancer Society, Heart and Stroke Foundation of Canada (HSFC), the Canadian Lipid Nurse Network, the Canadian Association of Cardiac Rehabilitation, and the Dieticians of Canada have been active through holding social marketing campaigns and presenting dietary recommendations (Cash et al., 2004).

As a result of the implementation of food marketing strategies and governmental regulations, consumer perceptions of health and nutrition have changed significantly. For example, Americans have shifted their diet away from high-fat, and high-protein (veal, beef, lamb) and have started to consume more fresh fruits and vegetables (Resurreccion, 2003; Jimenez-Colmenero, 1996). However, despite several improvements in information and education, several studies emphasise persistent food habits and behaviours that cause diet-related health outcomes leading to a high cost burden to society.

1.1 The Economic Problem

A market system works under the assumption that rational producers and consumers make utility-maximizing decisions based on available information. The market functions at an optimum level when producers maximise profit and consumers maximise utility. An efficient market is one which transfers enough information to consumers to allow them to evaluate product attributes effectively and make informed decisions to maximise utility (Emons, 1997; Emons, 2000). However, in the health and

wellness market, two important failures, the absence of sufficient information to consumers (i.e., welfare loss) and high negative externalities, are observable (Cash et al., 2006). As an example, increasing rates of obesity and its secondary health outcomes are some of the negative externalities for society which is created by suboptimal consumer food behaviour (Caswell and Mojduszka, 1996; Jimenez-Colmenero et al., 2001; Cash et al., 2006; Drichoutis et al., 2006). To lower welfare loss and market inefficiency, government, industry, and NGO intervention is needed to provide and develop sufficient information and make it more accessible to modify consumer behaviour (Cash et al., 2006).

By analysing Canadian consumers' attitudes, perceptions, and behaviours towards health and diet, this study attempts to identify the factors that influence consumer behaviour. The results of this study will guide private marketing plans, social marketing strategies, and policy making with the goal of mitigating the current market failures, and improving the health and wellness of Canadian consumers.

1.2 Research Problem and Thesis Objectives

Consumer concerns and attitudes towards healthy eating have been suggested as a major contributing factor to the structural change in food demand and food product differentiation in the Canadian food sector (Caswell et al., 1996).

Previous studies have suggested several factors influence food purchase and consumption decisions related to diet quality and health. For instance, consumer preferences for food attributes such as the amount of fat and cholesterol, genetically-modification, convenience, and taste influence consumption decisions

(Shepherd and Towler 1992; Tuorila and Pangborn 1988). Another important factors are consumer socio-demographic characteristics (Kinsey and Senauer, 1996).

The objective of this thesis is to analyse Canadian consumers' attitudes, perceptions, and behaviours towards health and diet. The thesis also investigates the implications of diet-health preferences on Canadian consumers' meat purchases.

The first research objective is:

1- to investigate the impact of consumer characteristics such as socio-demographic factors, food purchase patterns, knowledge and usage of food labelling, on their concerns about future health status, making healthy food choices, and obesity concerns in their household.

Changes in consumer attitudes towards food and health have impacted the meat sector significantly. Accordingly the consumption of beef has declined in the US during the past 20 years (Schroeder, and Mark, 2000). A similar pattern has occurred in Canada. At the same time, pork and chicken have become more popular among Canadian consumers. Beef, especially, has lost market share relative to other meat types in most western societies (Resurreccion, 2003). Canadian beef consumption dropped from approximately 50 kg per capita in 1975 to just under 20 kg in the mid 90's. Even in 2008, compared to 2006, the amount of beef, veal, and lamb dropped in the Canadian diet, while pork consumption was slightly more than the 2006 level. Also, poultry meat in Canadians' diet has increased by 1.9 kg, while the amount of red meat declined by 3.7 kg in the last

decade (Statistics Canada, 2010). Although US consumers are still consuming 15% more beef than Canadians, the US beef industry has witnessed a 42% decline (Purcell, 2000; Unterschultz, 2000). As discussed in the next chapter, research has shown a causal linkage between increasing rates of coronary heart disease and consumption of foods high in fat (Malla et al., 2007). A number of studies on the topic of health and diet have focused on the impact of high levels of meat consumption on dietary health and specifically addressed over-consumption of processed meat products that have the potential to negatively affect human health in the long run (Omenn et al., 1996; Yates et al., 1998; Jimenez-Colmenero et al., 2001; Desmond, 2006). Based on a report by U.S. Department of Agriculture, Economic Research Service (2005), the consumption of beef in the US has changed mainly because of increasing health concerns, a demographic change, increasing preference for convenience, and food away from home consumption, and changes in relative food prices.

In response to the changes in consumer behaviour towards healthier meat products, meat industries have emphasized research and innovation on health attributes and related product differentiation without compromising taste and quality (Maynard et al., 2004; Verbeke et al., 1999). However, the increasing retail product differentiation has translated into greater pressure for upstream meat producers. At the retail level, new meat products have spurred brand competition as higher quality products compete over attribute bundles, such as lower sodium content and leaner meat products (Nilsson et al., 2006). Considering these new market conditions, it is critical for the meat industry to gain a better understanding

of consumer attitudes, their meat preferences, in the context of health and diet concerns in Canada. Accordingly, the second objective is to:

2- determine to what extent the stated diet health concerns listed above affect Canadian consumers' actual meat purchase decisions.

To address these objectives, this study uses two market research datasets provided by Nielsen Canada. The first dataset is the Nielsen Health and Wellness survey conducted in 2007 and 2008. The questionnaire includes several questions about consumers' socio-demographic characteristics, healthy eating behaviour, and their concerns about organic food, fat and saturated fat, obesity, and food package labelling. This data is used to estimate the impact of Canadian consumers' concerns, perceptions, and behaviours on stated health, diet, and obesity concerns.

The second dataset is the 2008 Nielsen "Homescan" panel. The "Homescan" panel tracks meat purchases of participating households across all Canadian provinces. One specific feature of the data is a large overlap in participating households between the two Nielsen datasets. Roughly 8,000 households participated in both surveys. This allows us to directly link consumer stated concerns and their actual meat purchases to compare consumers concern levels to their actual meat purchases.

Chapter 2

Literature Review

2.1 Introduction

Health-related problems caused by poor dietary choices have increased dramatically over the last decade. The Canadian Community Health Survey (CCHS) (2004) conducted by the Health Statistics Division of Statistics Canada indicates that the majority of Canadians do not follow a balanced diet as described by Canada's Food Guide (2007). For instance, most Canadians do not eat the minimum required daily servings of fruits and vegetables. Instead total fat intake makes up a large proportion of their daily calories and most consumers do not consume enough servings of dairy products.

Rising health care costs from diet related diseases such as cardiovascular diseases, diabetes, and high blood pressure have created pressure for governments, researchers, policy makers, health organizations, and the food industry to come up with solutions to improve dietary choices and healthier lifestyles among North American consumers. For example, the academic research on food, health, and diet has focused on changing food policies, providing more beneficial information to consumers through labelling or licensing, and designing new pre-packaged foods recipes. In response to growing pubic concerns over the economic burden of the poor North American diet an increasing number of economic studies have been conducted (Golan et al., 2008).

The following literature review provides an overview of previous studies relevant to the topic of this thesis. Some of the provided literature may not be

directly relevant to this study's empirical analyses, but are important to be reviewed in the context of health and consumer behaviour.

2.2 Socio-demographic Characteristics

Compared to decades ago, research has shown that consumers are more receptive towards messages concerned with nutrition, health, food safety, and food quality, environmental and animal welfare (Gofton et al., 1991; Blades, 2000; Harper et al., 2002; Fraser, 2001; Resurreccion, 2003; Urala et al., 2003; Rimal et al., 2005; Agriculture and Agri-Food Canada, 2007a; Hailu et al., 2009). The economic literature has emphasised that a number of different factors need to be considered in the context of healthy food behaviour. Several studies have shown that individuals' socio-demographic characteristics are important factors in determining consumers' eating habits and consequently diet health outcomes (USDA, 1998; Ricciuto et al., 2006). For example, females, whites, individuals with higher education, smaller households, individuals with a better knowledge of their own diet and health status, and those that are more aware of the link between diet and disease, are more likely to try health enhancing foods and show a better dietary health preventive behaviour (Nayga, 1998a; Ricciuto, 2006; Petrovici et al., 2006). Women with higher incomes have been shown to have healthier diets (e.g., lower consumption of sugary drinks) and exercise more often. Both men and women with higher incomes usually pay more attention to control their body weight and have been found to pay greater attention to their health and nutrition (Mancino et al., 2004). Studies by Bogue (2005), Nayga (1998a), and

Resurreccion (2003) indicate that the most responsive groups to health promotion campaigns and health-enhancing food advertisements are households of higher socio-economic status. The above studies also show that these groups are more likely to try low-fat and low-cholesterol foods. However, these same households tend to buy more ready-to-eat meals and larger quantities of ground beef (the leaner varieties).

Another socio-demographic characteristic that should be taken into account when studying the behaviour of consumers in response to health promotion programs is consumer's age. Bogue (2005) shows that the age group of 35–54 has been most concerned about health promotion campaigns and health-enhancing food advertisements compared to younger (18-34) and older age groups (55+). The annual report of the Heart and Stroke Foundation (2006) supports this study, reporting that compared to 1996, the rate of obesity, physical inactivity, and lack of knowledge about health related issues, has increased among those Canadians that constitute today's Baby Boomer generation. Resurreccion (2003) claims that although older consumers purchase ground beef more frequently than younger consumers, older consumers tend to choose the leaner meat types. Ricciuto et al. (2006) indicates that households with older adults spent a larger share of their income on vegetables and fruits. Petrovici et al. (2006) notes that age can have a positive influence on consumer's dietary health preventive behaviour.

Information, individual's knowledge about nutrition, education and product labelling are important factors in the context of consumer's behavioural change

towards healthier diets. The next section describes the role and importance of information and product labelling in consumer's purchase decision process.

2.3 Mandatory Labelling

Communicating nutrition information to consumers plays an important part in improving healthy food choices given they are willing to pay a higher retail price for a product that provides more information (Jacob et al., 1977; Bender et al., 1992). The availability of credible information about nutrition, existing food knowledge, and individual's education are factors shown to influence food behaviour (Kim et al., 2000; Petrovici et al., 2006; Yen et al., 2008; Drichoutis et al., 2006). One form of providing information about those food attributes that enables consumers to make more appropriate food choices is food labelling. Previous studies confirmed that use of nutrition labels can lead to better food choices and improve overall diet quality (Drichoutis et al., 2009, Kim et al., 2000, Teisl et al., 2001, and Variyam et al., 1996). Cowburn et al. (2004), show that development in nutrition labelling, however small, plays an important role in consumers' selection of healthier food choices. In addition, consumers socio-economic and demographic factors play an important role in nutrition information use. For instance, being older, having less education, being male and being a member of larger households decreases the probability of searching for and using nutrition information. (Burton and Andrews, 1996; Bender and Darby, 1992; Katona and Mueller, 1955; Schultz, 1975; Kim et al., 2001; McLean-Meyinsse, 2001; Drichoutis et al., 2005). At the same time, households with younger

children and married consumers are more likely to search for nutritional information (Feik et al., 1986; McLean-Meyiness, 2001). In addition, Chern et al. (1995), in an empirical demand model for varieties of fat and oil, conclude that health information is a powerful factor to change consumer's perception of the healthiness of a diet.

The economic literature generally distinguishes two types of labelling, mandatory and voluntarily labelling. In order to correct the market failure of a lack of information on the nutritional properties of foods, governments can use mandatory labelling regulations to provide necessary information to consumers. As such, mandatory labelling is a policy that regulates how specific product or process information is presented to consumers. The goal is to improve social welfare by consumers making more informed food purchase decisions (Teisl, 1998). In comparison, voluntary food labelling is used by private companies to communicate all other food attributes to consumers. The effectiveness of both policies and voluntary labelling programs can be measured through the use of economic models. For instance, cost-benefit analysis and willingness-to-pay studies have long been applied to measure the effectiveness of food labelling programs (Prathiraja et al., 2003; Lusk et al., 2004).

Consumers typically evaluate several attributes of a food product such as its price, quality, or nutritional value before making a purchase decision. During the decision process consumers rely on their experience with a product, available product information, knowledge about attributes, and other factors that can influence their purchasing decision. The process through which consumers

evaluate product quality has been described in detail by Darby et al. (1973), Nelson (1974) and Caswell et al. (1996). According to these studies, not only is the availability of information crucial to consumers, but also its credibility or trustworthiness. This is especially important since food manufacturers have a tendency to exaggerate quality claims that may mislead consumers about the true characteristics of a product. Three types of attribute categories, search, experience and credence attributes, impact the consumer's purchasing decision. Search attributes are those attributes that can be evaluated prior to purchase through reasonable research and product examination based on previous knowledge (e.g., price, size, and color). Experience attributes are the attributes that consumer can only evaluate after having purchased and used a product (short-term use only) (e.g., choosing a particulat brand of a product without sampling it). Credence attributes are the attributes that can not be evaluated even after purchase and use of the product (e.g., organically grown products). Lack of technical expertise, need for special tools and equipment, or high search cost of information characterise credence attributes.

The level of involvement in regulating the labelling of these attributes varies. In the case of search attributes, consumers do not rely on mandated informational labelling, since they are in a position to evaluate product quality independently. For the case of experience attributes (flavour, texture) mandatory labelling may only be warranted when food safety is an issue. However, in the case of credence attributes, consumers depend on a mandatory or voluntary provision of information to make informed purchase decisions. In this context the credibility of

information becomes important as consumer trust may vary depending on the information sources. Governments may have an essential role in preventing market failures caused by imperfect information. Providing necessary information or enforcing regulations on food producers to provide such information are among the tools available to governments to counter market failures in the context of health and diet (Cash and Lacanilao, 2007). An example of an existing mandatory regulation of labelling and information provision in the food sector is the 1990 Nutrition Labelling and Education Act (NLEA) in the U. S. (implemented in 1994). Nayga (1998b) argues that marketing strategies similar to standardizing health claims on food packages by the Nutritional Labelling and Education Act have been effective in improving consumers' perceptions of reliability of labels and health claims on food packages. For instance, some consumers may trust more direct governmental certification and labelling (e.g., Canada Organic certification program) compared to private certification programs (e.g., Fair Trade labelling) (Caswell et al., 1996).

In 2005, mandatory nutrition labelling was implemented in Canada in the form of standardized nutrition information panels showing consumers the macro- and micronutrient contained in a food product (Health Canada, Food and Nutrition). In addition, food manufactorer could make any voluntary nutrient content and health claims. For instance, Caswell et al. (1996) note that such nutritional labelling can help to transfer credence attributes into search attributes which are readily available to the consumer before purchase.

2.4 Regulations

In response to growing public concerns over obesity and its related health implications in North America, governments have invested in several other policy efforts to improve consumers' diets. Apart from labelling and information policies, governments have particularly invested into research investigating the potential impacts of tax incentives and/or tax penalties for specific foods. In order to increase the consumption of healthy foods that are currently under consumed, tax incentives have been suggested. Removing or reducing taxes on healthier foods such as certain vegetables and fruits would reduce their relative price and likely increase their consumption. In addition, to reduce the consumption of foods deemed unhealthy, taxes have been proposed. Increasing the price of foods containing undesirable ingredients (e.g., sugar, trans-fats, and sodium) is thought to reduce their consumption and make consumers switch to healthier alternatives.

Subsidizing the cost of low-energy, nutrient-dense foods and at the same time taxing high-energy, low-nutrient foods could protect consumers from unhealthy diets or "guide" them towards healthier ones (Nestle et al., 2000). This can be achieved by utilizing Canada's General Sales Tax and Harmonized Sales Tax (GST/HST) system. Horgen (1998) reports that higher tax on snack foods reduces their consumption while creating additional government revenue to fund health promotional programs.

An example of a successful nutrition policy intervention that has shifted consumer demand towards a healthier alternative and away from an unhealthy ingredient is the partial ban on trans-fats in North America (for instance in potato

chips). The Federal Nutrition Regulation enacted in 2003 requires mandatory disclosure of the trans-fat content in packaged foods (Unnevehr et al., 2008; U.S. Department of Health and Human Services, 2003). Other successful examples of government direct intervention to change consumption patterns are the Food Stamps, National School Lunch, and National School Breakfast programs (Capps and Schmitz, 1991).

Using the National Health and Nutrition Examination Survey (NHANES), Gundersen et al. (2009) show that receiving free and reduced price school meals through the National School Lunch Program (NSLP), can improve the health outcomes of children in the U.S. Using the same data (NHANES), the results of Bhattacharya et al. (2004) indicate that school nutrition programs not only may help to fight with nutritional insufficiency and over-consumption of unhealthier foods (e.g., fatty foods) among children, it may also improve the nutrition of their families.

Cash and Lacanilao (2007) argue that governments can reduce the burden of obesity related diseases on private companies by reducing their indirect labour cost (health insurance premiums and productivity lost due to illness). Another policy approach suggested to cope with unhealthy eating is the "Polluter Pays" principle borrowed from the environmental economics literature. The approach proposes to raise taxes on those individuals that consistently follow undesirable eating habits and eventually result in food-related diseases that increase public health care cost (Cash and Lacanilao, 2007).

The model developed by O'Donoghue and Rabin (2006) evaluates the relationship between welfare gains and unhealthy food taxes when an individual has a self-control and over-consumption problem. Their study indicates that an improvement in total social surplus can happen by taxing unhealthy items and returning the earnings to society. The authors even claim that Pareto improvements in welfare can be created by such taxes, since these taxes offset over-consumption of consumers with self-control problem and naturally reallocate income to no self-control problems consumers with lower consumption.

The results of a study by Schroeter et al. (2007) show that high-calorie food taxes could result in a lower consumption of unhealthy foods based on estimates of price, income, and weight elasticity. For example, a tax on high-calorie soft drinks could decrease soft drink consumption and eventually result in soft drink consumers' losing weight.

Another rationale for implementing taxes on unhealthy foods is to control for the addictive potential they may have. The "rational food addictions" model states that addictive consumption of specific unhealthy foods (e.g., fast foods) can be absolutely rational and utility maximizing from the dependant's point of view. Richards et al. (2004) studied addiction to foods and/or nutrients such as carbohydrates, fat, sodium, and junk foods using a multivariate rational addictions model. Analyzing the link between obesity and rational addiction to food nutrients, their results suggest that price-based policies (as opposed to information-based policies) on carbohydrate-intensive foods might be more efficient to control over-consumption.

The idea of intentional price increases for certain food categories have also been tested by Santarossa and Mainland (2003) using demand system analysis (LA/AIDS). Similar to authors of previous studies, they concluded that price increases can be an effective way of leading people from unhealthy habits to healthier diets. However, it should be noted that not all researchers agree with the idea of food tax to change dietary habits. In their study of the impact of price policies on behavioural change in the context of the obesity problem, Zheng et al. (2008) show that such policies would be effective in reducing the demand for unhealthy foods, but they may not be as effective in increasing the consumption of healthier alternatives.

Kuchler et al. (2004) argue that small tax increases may not have a significant impact on the level of change in food intake or health. The authors model a 1, 10, and 20 percent tax increase in a demand analysis for selected salty snacks. They conclude that only very high tax rates on salty snacks would eventually impact the quality of the average consumer's diet.

Smed et al. (2005) argue that a tax or subsidy policy alone may not be sufficient to tackle the obesity problem although the policy may reduce consumers' overall energy intake. The authors suggest that taxes or subsidies have to be combined with other policy instruments such as information campaigns to achieve the common objective of diet-health policy. Smed et al. (2005) studied four scenarios: taxes on all fats, saturated fat, added sugar, and a subsidy on fibre. Their model combines food intake behaviour and a model for the conversion of food intake and nutrient intake. The model results show that although a tax on fats

results in less fat consumption, it increases sugar consumption. The same result holds for a tax on sugar, where a reduction in sugar intake leads to a higher intake of fats.

In contrast, another way of addressing the diet-health problem and related diseases is through subsidizing healthier food alternatives. For instance, Cash et al. (2005) argue that subsidizing vegetables and fruits by only 1% would prevent almost 10,000 cases of coronary heart disease and strokes in the U. S. alone. In other words, even a relatively small subsidy could result in substantial health benefits to society. Other studies confirm that reducing the price of healthier food may positively affect BMI levels (Asfaw, 2007; Gelbach et al., 2007).

In developing food tax or subsidy policies, the balance between the energy and nutritional value of the targeted foods needs to be considered. For example, policies need to account for the fact that price of sugar per calorie is much lower compared to fruits, vegetables, or lean meat (Drewnowski and Specter, 2004). A low-income consumer who spends a large portion of his income to fulfill basic energy needs, rather than being concerned with the nutritional value of his diet, will be more likely to eat a diet high in energy dense foods that are lower in nutritional value and so be most affected by food price policy aimed at changing dietary behaviour (Cash et al., 2007). In this context, Chouinard et al. (2007) state that a fat tax that includes dairy products, might cause significant welfare losses for elderly and low-income families.

2.5 Food Industry Response to the Healthy Eating Trend

The shift in consumer behaviour towards health and diet in North America has triggered a broad response in different food industries. Innovations in technology (e.g., less intensive processing methods) and substitutions of ingredients (e.g., substitution of trans-fats, use of whole grains) have lead to improved product quality and nutritional values in some foods. Also, food industries have invested more into educating and informing consumers about healthier options through voluntary labelling, advertising, and increasingly internet based information services and hotlines (e.g., Kellogg's online "tools for healthier living").

One specific trend in the food industry has been what Agriculture and Agri-Food Canada (2007a) has called the "Better for You" product labelling. By labelling their products as "Better for You", manufacturers emphasize the amount of reduction of "unhealthy" ingredients such as the level of fat, sodium, sugar, carbohydrates, etc. This has been proven to be an effective method of signalling beneficial product attributes to consumers (Wansink et al., 2004; Anders et al., 2010). Health Canada (2008) reports a significant rise in the number of "Better for You" products sold in Canada since the labelling the health claims has been allowed in 2003.

This "new" category of products includes organic, fortified/functional, natural health foods, and products with reduced levels of salt, sodium, and fat, etc. Organic foods, defined as foods "produced without chemical fertilizers, synthetic pesticides, hormones, irradiation, and genetic engineering" (Agriculture and Agri-Food Canada, 2007a) are perceived to be healthier by many consumers.

Fortified/functional products, mostly consumed for their specific health benefits (e.g., milk, yogurt, cereal, bread, juices, and eggs or meats enriched with Omega-3, or other healthful ingredients).

In addition, Malla et al. (2007, page 116) define functional food as a product "that has physiological benefits and/or reduces the risk of a chronic disease beyond a basic nutritional function". This definition is an example of the change the food industry has undergone towards linking consumer health and diet. Malla et al. (2007) show evidence of increasing rates of coronary heart disease and high cholesterol levels due to diets high in trans-fatty food. They evaluate the potential health and social welfare benefits of consuming trans-fat-free canola oil (a novel functional food) as a substitute for existing oils in Canada.

Several studies have discussed the correlations between a variety of dietary components and human health, as well as how adequate nutrition can prevent consumers from future food related illnesses (Omenn et al., 1996; Yates et al., 1998). A majority of these studies has focused on the effects of high levels of meat consumption on human health. For example, over-consumption of some meat products such as processed meats can negatively affect human health in the long run (Jimenez-Colmenero et al., 2001; Desmond, 2006). While some substances already exist in the live animal, (e.g., fat, cholesterol), other elements are added during the meat processing stages for technological, microbiological or sensory reasons (e.g., salt, nitrite, phosphate). Not all of these added ingredients contribute to the nutritional value of a product. Frequent consumption of foods high in fat and cholesterol can contribute to obesity which in turn increases the

risk of cardiovascular diseases; and diets high in sodium will increase the risk of arterial hypertension (Jimenez-Colmenero et al., 2001). A survey done by Armstrong and Doll (1975) indicates high correlation between meat consumption to colon cancer, breast cancer, uterus cancer, prostate cancer, and kidney cancer. Their study was a motivation to other scientists to do epidemiological investigation into this subject in more details. The epidemiological investigations also show the relationship between the risk of getting colorectal cancer (Norat and Riboli, 2001), breast and prostate cancer (Biesalski, 2002; Bingham, 1999) and meat consumption. Also Matos and Brandani (2002) mention the relationship between increase in risks of stomach, pancreatic, breast, prostate, and kidney cancers and red meat consumption.

At the same time, in a review of additional epidemiological researches done by Truswell (2002) out of 44 studies 31 cases show no evidence of red meat intake and colorectal cancer. In addition, although epidemiological and animal experiments show a positive relationship between meat consumption and cancer, it contains some nutrients such as folic acid, selenium, zinc, and other components that help to prevent from chronic diseases (Biesalski, 2002).

Some examples of the role the food industry (meat industry, in this case) can play to alleviate some of these negative impacts are discussed in the works of Desmond (2006), De La Torre et al. (2006), and Arihara (2006).

Desmond (2006) discusses the link between sodium as a major ingredient in processed meats and its negative health outcomes when consumed excessively. As a result, public health and regulatory authorities have pushed the European and

North American meat industry into finding ways to reduce salt usage in meat processing. For instance through substituting salt with other flavour enhancers.

The article by De La Torre et al. (2006) focuses on increasing the level of Conjugated Linoleic Acid (CLA) in animals muscle tissue. CLA is believed to have several health benefits for humans. Therefore, the meat industry has invested into research trying to increase its content in several farm animal species (specifically in beef cattle).

Research by Arihara (2006) focuses on the physiological aspects of meat products by analyzing new ways of designing novel functional meat products to the benefit of human health. The article emphasises the hurdles in developing and introducing functional meat products and recommends further work to be done on ensuring food safety and on informing consumers of the nutritional value of meat products.

In addition to food attribute innovations, food producers and retailers are concentrating more and more on the marketing of nutritional and safety attributes. However, tailoring products to the health preferences of specific consumer groups with different socio-economic characteristics may be as important as producing the food products themselves. This shift in perception has resulted in the idea of the industry anticipating consumers' tastes and preferences midst the new trend of low-fat, low-cholesterol food demand to be able to develop and design specific marketing programs (Nayga, 1998a; Anders et al., 2010).

2.6 The Role of Health Organizations in Promoting Healthy Lifestyles

The Canadian Cancer Society, Hearth and Stroke Foundation of Canada (HSFC), the Office of Nutrition Policy and Promotion at Health Canada, the Canadian Diabetes Association, and the Dieticians of Canada are just some of the organizations in Canada that run social marketing programs to promote healthy food behaviour and healthy lifestyles in general. Health promotion programs by the Heart and Stroke Foundation of Canada help consumers learn to live healthier as part of a "Heart Healthy Lifestyle". For instance, the organization provides healthy recipes to consumers to provide them with ideas for healthy meal options. The HSFC's "Health Check", a food information program and product label designed to help consumers pick healthier food options through showing the Health Check logo on food packages, based on Canada's Food Guide to Healthy Eating recommendations.

The award-winning education campaign labelled "Mix it Up" or "5 to 10 a Day … Are You Getting Enough?" organized by the Canadian Cancer Society and the HSFC, encourages Canadians to eat at least five servings of vegetables and fruit every day. The Canadian Food Guide, published first as Canada's Official Food Rules in 1942, is a publication to promote healthy eating habits, dietary diversity, and keeping active (Health Canada, 1997). Health Canada, studied the change in food purchase patterns based on the Food Expenditure Survey series (1986-2001) and the current Canadian Community Health Survey Cycle 2.2, Nutrition Focus. The study claims that 86% of Canadians have heard about the Food Guide and that they were aware of its guidelines towards keeping

a balanced diet, serving size, and nutritional information, etc. Over half of the participants who have seen the Food Guide, claimed that they used it as a source of information that enables them to measure the healthiness of their daily diet (Health Canada, 2004).

"Healthy Eating is in Store for You" (HESY), launched in 2003 as a healthy eating awareness program, funded by Health Canada and sponsored by the Canadian Diabetes Association (CDA) and the Dieticians of Canada, aims at educating consumers about the proper use of the nutrition information on food packages to help them make healthier food choices. This program mainly targets women with families, low income Canadians, groups with lower literacy levels, and people having or being at risk of developing type-2 diabetes (CDA, 2010).

Another healthy eating promotional program by the Dietitians of Canada is titled "Eat Well, Live Well". The program includes various healthy eating awareness programs and a national annual campaign called "March in Nutrition Month" with different themes each year. For example, the 2004 campaign, named "Eat Well, Play Well" was held to encourage school-age children and youth to maintain a healthy diet and active lifestyle (Dietitians of Canada, 2010).

Chapter 3

Theoretical Models for Analysing Healthy Eating Behaviour

3.1 Introduction

This chapter introduces economic and social science frameworks that have been developed and applied to analyze consumer behaviour in the context of food consumption decisions, diet, and health outcomes.

Consumer utility theory allows us to explain consumers' consumption behaviour and its influencing factors from a utility maximization standpoint. For instance, explicitly accounting for health in a consumer's utility function allows researchers to directly model the impact of the consumption of certain foods or a diet on individual's overall utility level.

A second approach for analysing human behaviour in the context of health risks are social cognitive models such as the Protection Motivation Theory (Rogers, 1983). These models seek to explain the relationship between different coping mechanisms in humans in response to various health threats. For example, social cognitive models allow us to better understand motivations behind behavioural change towards healthy eating in response to the health threat of obesity and cardio-vascular disease.

3.2 Consumer Utility Theory

Rational individuals maximize their utility by consuming a variety of goods or products (foods) subject to a budget constraint. Specifically with regards to food consumption and preparation consumers may also face a time constraint. Health is

an important factor in consumers' utility maximizing consumption decisions as it likely impacts an individual's utility level in the short and long run. A consumer's health status (*H*) might be important as it may constrain the consumption of certain foods that an individual might be able to eat for health reasons. Or health can be an indirect shift factor in the utility function that changes the derived utility of the consumption of specific foods (Grossman, 1972). Frequent consumption of unhealthy foods (e.g., foods high in trans-fats) may result in poor health and such may lower an individual's utility in the long run.

Grossman (1972) and many subsequent studies that have analyzed consumer's health and food behaviour included a number of socio-economic and demographic variables (e.g., age, education, income, gender) that likely influence individual behaviour and hence affect the utility of consumption decisions (Binkley, 2010).

Recognizing factors that influence individual's diet and health-related behaviour is important to understanding consumer food demand and its implications for food marketing and health policy. The majority of the studies that analyze consumption decisions in the context of health are based on the seminal work of Grossman (1972) on the demand for health capital. Binkley (2010) studies the implications of current unhealthy consumption choices on long term utility outcomes based on a utility maximization model.

Time and budget may be important constraints on consumers' utility function in the context of food, diet, and health. Monsivais and Drenowski (2009) state that diets high in nutrition can often be more expensive than those high in energy, meaning that low income consumers may consume more high energy foods (e.g.,

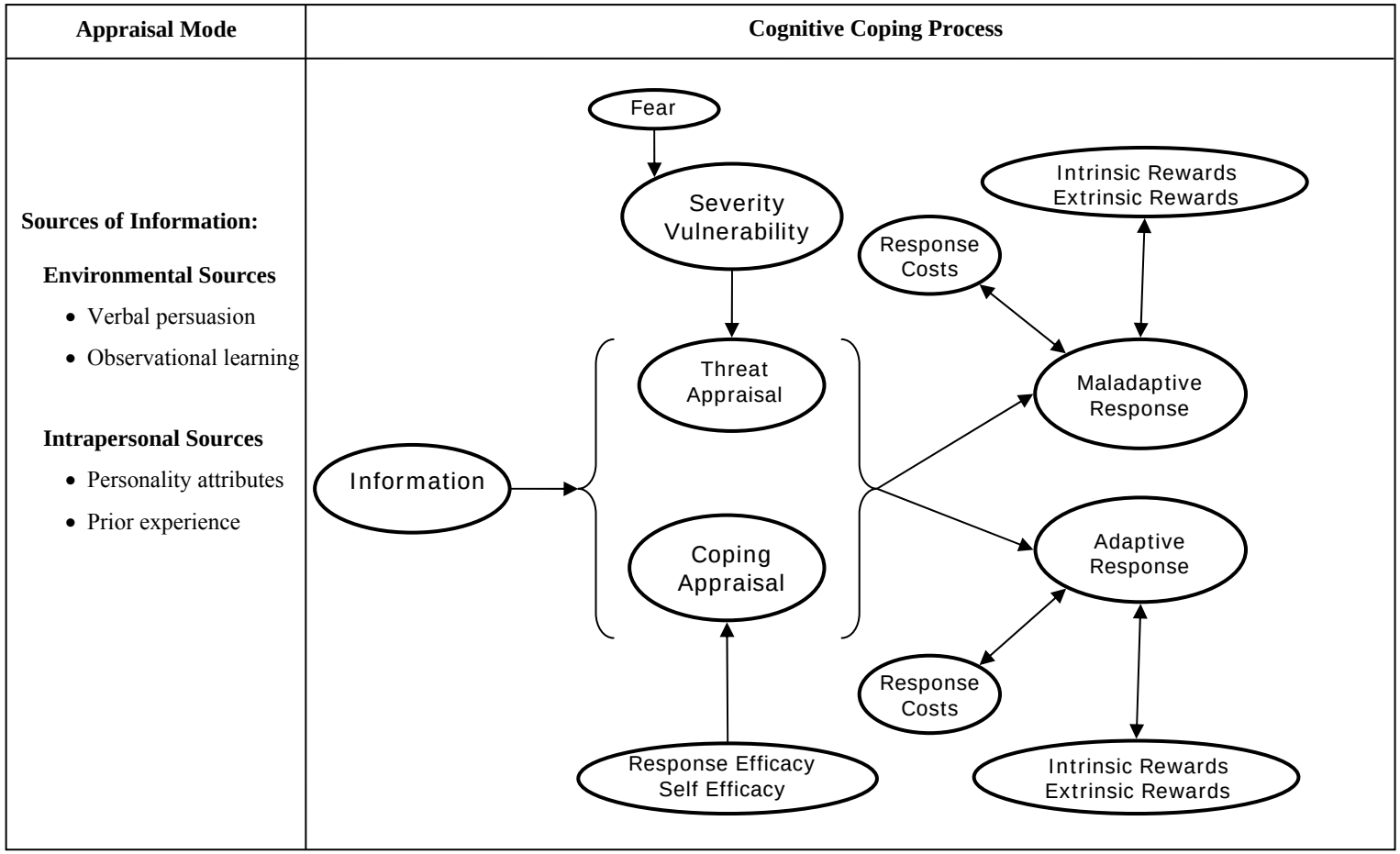
chocolate bars) with negative implications on diet quality and health. Time constraints can be another limiting factor to healthy eating as consumers need to trade off different activities with the time necessary to prepare home cooked meals. Time constrained consumers may spend less time cooking meals and therefore eat more processed purchased meals, which also may limit diet quality.

3.3 Social Cognitive Models

Another approach to study consumer's consumption behaviour and its implications for health and wellbeing are social cognitive models. The Health Belief Model (HBM) (Rosenstock, 1966), the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), the Subjective Expected Utility (SEU) model (Duncan Luce, 1992; Nau, 2007), and the Protection Motivation Theory (PMT) (Rogers, 1983) are some of the social cognitive theories used to explain how consumers perceive a health threat and the mechanisms behind their motivation to react to the threat and prevent an expected negative outcome (Weinstein, 1993).

These models help researchers explain an individual's behaviour or change in response to information about the potential threat a specific behaviour (e.g., smoking, drug or food abuse) may pose to their health. Different models have been developed over time to evaluate the impact of different consumer characteristics and environmental factors (e.g., knowledge and social environment) which shape an individual's motivation to change a specific behaviour.

Figure 3.1 Schematic of Decision Processing in Protection Motivation Theory



Source: Rogers (1983).

Figure 3.1 exemplifies an individual's decision process considering information, perceived severity of a situation, ability to cope with a situation, which will all influence the individual's behaviour response to a threat.

3.2.4 Protection Motivation Theory

Protection Motivation Theory, initially developed by Rogers (1975), explains the reasons and mechanisms behind changes in people's attitudes and behaviours. Focussing more on the cognitive processes that initiate behavioural changes, PMT represents an expansion of the more general previous Persuasive Communication Theory (Rogers, 1983). The majority of PMT applications have been in the area of predicting health behavioural changes, such as alcohol consumption, improving healthy lifestyles, and disease prevention through improving diagnostic health behaviours (Rogers, 1983). According to Weinstein (1993) PMT describes individual's motivational mechanisms to prevent negative health outcomes in response to the recognition of a health threat. As part of PMT an individual's decision process regarding a potential change in behaviour is broken up into two main mechanisms the "Threat Appraisal Mode" and the "Cognitive Coping Process".

In the "Appraisal Mode", an individual acknowledges and evaluates a threat followed by an assessment of whether he/she can prevent the negative outcome by adapting a coping strategy. For example, when somebody realizes the consequences of smoking (appraisal of the health threat) and subsequently stops smoking, he/she is showing an adaptive response to cope with the health threat of

smoking. In case of a maladaptive response, the individual would continue to smoke despite knowing about the negative outcomes of smoking. As part of the threat appraisal and coping response appraisal the individual gathers and uses information from environmental sources such as family and friends and intrapersonal sources that can include personal prior experiences.

Also of importance is the individual's perception of the severity and vulnerability to a threat. Fear can influence the evaluation of the severity of threat and cause hopelessness which may prevent any form of behavioural change. On the other hand, confidence of one's ability to cope with a certain threat will decrease the perceived severity and motivate behavioural change.

As such, response efficacy is the individual's belief of the effectiveness of taking a particular action to prevent the negative outcome of a given threat. Self-efficacy, on the other hand, is one's own belief in the effectiveness of a behavioural response to avoid the harmful outcomes of the given threat (Rogers, 1983). A part of the evaluation process within the PMT is the individual's perception of the potential rewards of either a maladaptive response or adaptive response to a threat.

3.4 Previous Applications of the PMT

The majority of previous PMT studies have been conducted in the medical public health literature. For example, the study by Beck and Lund (1981) investigated dentistry students' motivations and adaptive behaviour towards tooth hygiene practices after receiving persuasive messages. The persuasive

communication as part of the study using messages to create fear and providing information about the severity of the lack of tooth hygiene as well as self-efficacy measures were shown to influence students' motivation to improve tooth hygiene practices.

Rogers (1983), Prentice-Dunn and Rogers (1986), and Rogers and Prentice-Dunn (1997) have applied the PMT framework as a model to explain inconsistencies in the influence of threatening information regarding breast cancer on women motivation to use BSE (breast self-examination), by taking into account the health decisions affected by the cognitive processes. The results of Rippetoe and Rogers (1987) indicate that the most significant variables in predicting women's intentions to perform BSE are response efficacy, the severity of breast cancer, and self-efficacy among the PMT components.

The study by Plotnikoff and Higginbotham (2002) compared two groups of patients with coronary heart disease. The study focused on measuring patients' intentions to adopt low fat diets. As part of the PMT study approach one group received information about their potential life threatening condition and coping strategies to deal with it, and the second group received no information at all. The authors found a higher probability of intention to change behaviour to adapt a low-fat diet among those patients who received threat and coping messages. Information regarding their vulnerability and severity of their condition did not have a significant effect on their adaptive behaviour response.

Another study by Plotnikoff et al. (2002) confirms this finding. The authors showed that an emphasis on coping appraisal using persuasive messages is more

effective in motivating individuals to reduce factors that increase the chance of coronary heart disease compared to emphasising threat appraisal messages in the context of a PMT approach.

Cranfield et al. (2007) used the PMT framework in the context of food consumption decisions and consumer health status. The study specifically focuses on factors that influence changing dietary behaviours in Canada. The authors model the food choice process as a means to protect health status by weighing the "risks and benefits" of specific consumption choices. According to PMT, the individual has two behavioural options to deal with the problem: adaptive or maladaptive coping (Boer and Seydel, 1996). According to PMT consumers assess their own vulnerability to the threat associated with continuing a specific (maladaptive) behaviour such as the continuous consumption of potentially harmful foods (e.g., foods high in sugar, fat, sodium). This threat appraisal process is often initiated by fears of the potential consequences of maladaptive behaviour, new information, and interactions with family, friends, and peers. At the same time, the individual considers and evaluates their own ability to change behaviour in order to cope with the potential outcomes of unhealthy nutrition in the long term. The coping appraisal process is influenced by the individual's perceived efficacy of a behavioural change towards a healthier lifestyle. The outcome of the individual's appraisal process can be summarized as a balance of the perceived benefits versus the perceived cost of changing one's nutrition behaviour. Depending on whether the perceived benefits of better nutrition exceed

the perceived cost or not, will motivate the individual to take specific actions towards a healthier diet (Cranfield et al., 2007).

The study by Cranfield et al. (2007), applies PMT to specifically investigate factors that influence Canadian consumers demand for foods that promote health. The analysis is based on the 2004 Canadians' Demand for Food Products Supporting Health and Wellness survey conducted by Agriculture and Agri-food Canada. Roughly 2,000 consumers participated in the survey answering questions regarding socio-demographic factors, household lifestyle choices, and questions regarding their familiarity and consumption of foods with functional ingredients. Using the survey data, the study estimates three discrete choice models focused on household's increased consumption of functional foods, and household's increased consumption of vegetables, and fruits. In order to test the validity of PMT the authors include several perception and attitudinal questions in the form of dummy variables in the analysis. For instance, response efficacy was modeled using a dummy variable based on participant's response to the question "Some foods contain active components that reduce risk of diseases and improve long term health". The authors' results on the PMT variables (response efficacy and threat appraisal) indicate that consumers seem to follow a "PMT style process" when considering behavioural change with respect to food choices. For instance, consumers who strongly agreed that certain foods can improve future health were more likely to change their diet health behaviour. Also, consumers that showed a higher level of perceived risk from food related diseases were more likely to change their consumption behaviour. However, Cranfield et al.'s (2007) results

also showed that the probability of changing household dietary behaviour was closely related to participant's interest in learning about foods with health benefits. The results regarding the impact of various socio-demographic variables on health-related changes in food consumption behaviour was largely mixed. The authors conclude that including PMT variables in the analysis significantly contributed to explaining Canadian consumers' motivation towards dietary change. However, people's motivation to adapt healthier diets hinges on their interest in learning about the health benefits of specific foods. The study by Cranfield et al. (2007) is the only study in Canada that uses the PMT framework in the context of consumer's food, diet, and health behaviour. Both Cranfield et al. and Floyd et al. (2000) provide reviews of empirical applications of the PMT framework.

Chapter 4

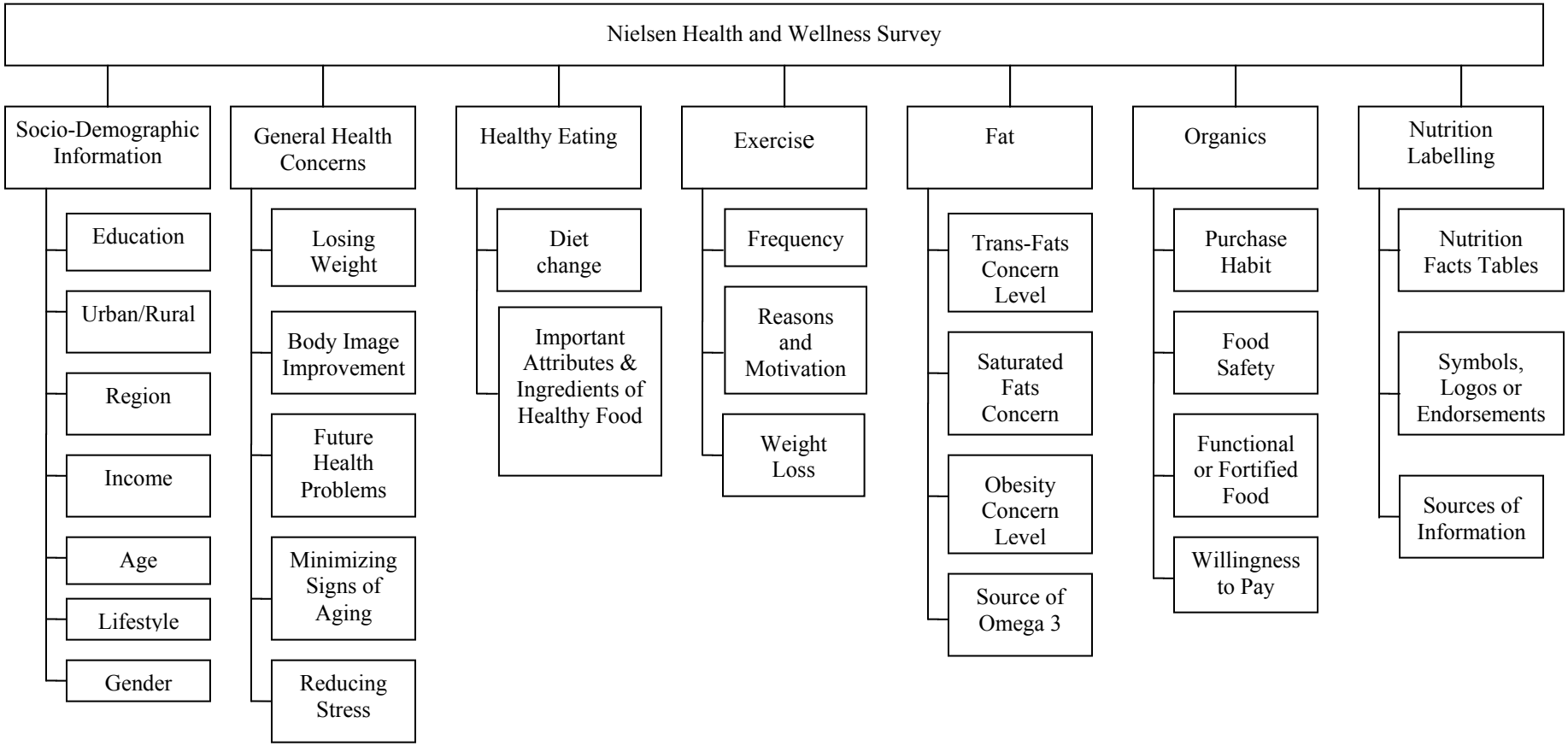
Data

4.1 Introduction

The Nielsen "Health and Wellness Survey" has been conducted since 2007 to collect data on Canadian consumers' perceptions, attitudes, and behaviours related to food consumption, physical activity, and wellbeing (Nielsen, 2007). The survey contains information on participant's socio-demographic characteristics, their stated concerns about health and diet, their past and current food purchase behaviour, their exercise behaviour, and the importance of food labelling and food-health related information in their food purchase decisions. The survey also asked participants about their opinion regarding the importance of fortified and organic foods in their households' diet. The structure of the survey is presented in figure 4.1.

The survey is particularly valuable tool that allows researchers to get a better understanding of Canadian consumers' concerns and preferences towards health and diet issues.

Figure 4.1 Nielsen Health and Wellness Survey Structure



4.1.1 Survey Components

The Health and Wellness Survey was conducted across Canada in English and French language versions. The number of Canadian household participated in the August 2007 version is 7,630 and 8,114 in the June 2008 survey. The survey was designed to be representative of the Canadian population, but shows deviations from the 2006 census in several categories The survey questionnaire itself is broken down into 7 main categories of questions:

- Socio-demographics: 11,
- General health concerns: 6,
- Healthy eating: 18 questions in 2007 and 19 in 2008,
- Exercise and physical activity: 4,
- Trans fats, Saturated Fats, and Obesity: 6,
- Organics: 13,
- Nutritional labelling: 11.

4.1.2 Variable Description

Table 4.1 provides a description of those variables selected from both surveys (2007 and 2008) that were used in the following analysis to estimate the link between Canadian consumers' perceptions, attitudes, and behaviours related to diet and health and related concerns about health and wellbeing. Table 4.2 presents mean and standard deviations of the variables used in the analysis.

Table 4.1: Description of Variables used in the Analysis

Variables	Definitions
Dependent variables	
CHealth	0 = not concerned at all about minimizing potential future health problems.
	1 = not very concerned about minimizing potential future health problems.
	2 = somewhat concerned about minimizing potential future health problems.
	3 = very concerned about minimizing potential future health problems.
CHFood	1 = concerned about eating healthy at least for one meal a day (breakfast, or lunch, or dinner, or snack time/between meals)
	0 = otherwise
CObesity	0 = not concerned at all about obesity in regards to her/himself or other members of the household.
	1 = somewhat concerned about obesity in regards to her/himself or other members of the household.
	2 = very concerned about obesity in regards to her/himself or other members of the household.
Explanatory variables	
Socio-demographic variables	
HHHEd	1 = Household Head Education level is to Elementary School
	2 = Some High School Education
	3 = Completed High School
	4 = Technical or College Education
	5 = Completed Technical or College
	6 = Some University Education
	7 = Completed University
URBRUR	0 = The participant lives in Urban area
	1 = The participant lives in Rural area
RegM	1 = The Maritimes, 0 = otherwise
RegQ	1 = Quebec, 0 = otherwise
RegO	1 = Ontario, 0 = otherwise
RegMS	1 = Manitoba/Saskatchewan, 0 = otherwise
RegAB	1 = Alberta, 0 = otherwise
RegBC	1 = British Colombia, 0 = otherwise

Table 4.1 (continued): Description of the Variables used in the Analysis

Variables	Definitions
Inc	03/11 = income is under $20k
	13/15 = between $20k and $29k
	16/17 = between $30k and $39k
	18/19 = between $40k and $49k
	21/23 = between $50k and $69k
	26/99 = over $70k
LSTYLES	1 = (young, middle aged, older) single lifestyle, 0 = otherwise
LSTYLEF	1 = (new, established, maturing) families lifestyle, 0 = otherwise
LSTYLEC	1 = Childless (younger, middle aged) couples, 0 = otherwise
LSTYLEE	1 = Empty Nester lifestyle, 0 = otherwise
GEND	1 = Female, 0 = male
Age2	1 = 25-34, 0 = others
Age3	1 = 35-44, 0 = others
Age4	1 = 45-54, 0 = others
Age5	1 = 55-64, 0 = others
Age6	1 = 65 and older, 0 = others
Healthy eating variables	
Rsweet	1 = Reducing intake of artificial sweeteners/sugar substitutes and sugar during the past 3 months, 0 = otherwise
Rcal	1 = Reducing intake of calories during the past 3 months, 0 = otherwise
Rcarb	1 = Reducing intake of carbohydrates during the past 3 months, 0 = otherwise
Rfat	1 = Reducing intake of Fat or cholesterol or Trans fatty acids during the past 3 months, 0 = otherwise
Rsalt	1 = Reducing intake of salt/sodium during the past 3 months, 0 = otherwise
ADDvit	1 = Incorporating Vitamins or Minerals into the household's diet during the past 3 months, 0 = otherwise
ADDfib	1 = Incorporating fibre or Omega3 or Organic foods or Probiotic Active Culture or Whole grains into the household's diet during the past 3 months, 0 = otherwise
ADDfv	1 = Incorporating fruits or vegetables into the household's diet during the past 3 months, 0 = otherwise
ADDwm	1 = Incorporating water or milk into the household's diet during the past 3 months, 0 = otherwise

Table 4.1 (continued): Description of the Variables used in the Analysis

Variables	Definitions
CONV	1 = Thinking about healthy eating, convenience is the most important in my purchase decision, 0 = otherwise
TASTE	1 = Thinking about healthy eating, taste is the most important in my purchase decision, 0 = otherwise
AFFORD	1 = Thinking about healthy eating, affordability is the most important in my purchase decision, 0 = otherwise
HLTNUT	1 = Thinking about healthy eating, health and nutrition is the most important in my purchase decision, 0 = otherwise
NoHLTNUT	1 = I don't choose foods for health or nutritious purposes, 0 = otherwise
HLTalt	1 = I substitute ingredients for healthier alternatives, 0 = otherwise
Organics variables	
WTPfort	1 = I am willing to pay more for organic, fortified with vitamins and mineral types of foods, 0 = otherwise
WTPhlt	1 = I am willing to pay more for healthier (reduced risk of chronic diseases, reduced fat, sugar, salt, low carb and calorie) types of foods, 0 = otherwise
Nutrition labelling variables	
NFTeve	1 = I refer to the Nutrition Facts table on packaged foods/beverages every time shopping for household groceries, 0 = otherwise
NFTsmt	1 = I sometimes refer to the Nutrition Facts table on packaged foods/beverages every time shopping for household groceries, 0 = otherwise
NFThb	1 = I refer to the Nutrition Facts table on packaged foods/beverages when considering customary diet habits (kosher, vegetarian, Halal, etc.), 0 = otherwise
NFThc	1 = I refer to the Nutrition Facts table on packaged foods/beverages when considering health conditions, 0 = otherwise
NFTsp	1 = I refer to the Nutrition Facts table on packaged foods/beverages for special occasions and events, 0 = otherwise
NFTnev	1 = I never refer to the Nutrition Facts table on packaged foods/beverages, 0 = otherwise
Dietsymb	5 = Looking for dietary or nutrition-related symbols/logos or endorsements every time shopping households groceries
	4 = Looking for dietary or nutrition-related symbols/logos or endorsements most of the time shopping households groceries
	3 = Looking for dietary or nutrition-related symbols/logos or endorsements sometimes shopping households groceries
	2 = Looking for dietary or nutrition-related symbols/logos or endorsements rarely shopping households groceries
	1 = Never looking for dietary or nutrition-related symbols/logos or endorsements when shopping households groceries

Source: Nielsen Health and Wellness survey (2007, and 2008).

Table 4.2 Descriptive Statistics of Variables Used

Factor	2007	
	Mean	Std Dev
Dependent variables		
CHealth	2.33	0.66
CHFood	0.90	0.30
CObesity	1.06	0.77
Explanatory variables		
Socio-demographic variables		
HHHEd (1-7)	4.65	1.77
URBRUR (0-1)	0.41	0.49
RegM (0-1)	0.12	0.33
RegQ (0-1)	0.23	0.42
RegO (0-1)	0.32	0.47
RegMS (0-1)	0.11	0.32
RegAB (0-1)	0.11	0.31
RegBC (0-1)	0.11	0.31
Inc (3-54)	26.28	12.79
LSTYLES (0-1)	0.26	0.44
LSTYLEF (0-1)	0.23	0.42
LSTYLEC (0-1)	0.19	0.39
LSTYLEE (0-1)	0.32	0.47
GEND (0-1)	0.7	0.46
Age (1-6)	4.32	1.24
Healthy eating variables		
Rsweet (0-1)	0.52	0.01
Rcal (0-1)	0.36	0.01
Rcarb (0-1)	0.23	0
Rfat (0-1)	0.71	0.01
Rsalt (0-1)	0.43	0.01
ADDvit (0-1)	0.48	0.01
ADDfib (0-1)	0.71	0.01
ADDfv (0-1)	0.73	0.01
ADDwm (0-1)	0.57	0.01
CONV (0-1)	0.61	0.01
TASTE (0-1)	0.58	0.01
AFFORD (0-1)	0.46	0.01
HLTNUT (0-1)	0.47	0.01
NoHLTNUT (0-1)	0.08	0
HLTalt (1-5)	2.96	0.01
Organic variables		
WTPfort (0-1)	0.3	0.01

Table 4.2 Descriptive Statistics of Variables Used

Factor	2007	
	Mean	Std Dev
WTPhlt (0-1)	0.58	0.01
Nutrition labeling variables		
NFTeve (0-1)	0.25	0
NFTsmt (0-1)	0.75	0
NFThb (0-1)	0.05	0
NFThc (0-1)	0.24	0
NFTsp (0-1)	0.37	0.01
NFTnev (0-1)	0.13	0
Dietsymb (1-5)	3.62	0.01

Source: Nielsen Health and Wellness Survey (2007).
Note: Variables descriptions are described in table 4.1.

Note: The descriptive statistics for 2008 are very similar to those for 2007 and therefore, are not included in the above table.

Table 4.3 compares the socio-demographic characteristics of the survey participants with the socio-demographic information elicited by the 2006 Canadian Census. While the demographic composition of the Health and Wellness Survey is consistent between 2007 and 2008, it differs in several factors when compared to the 2006 Canadian Census. The majority of survey participants have a college or university degree, are between 45 and 54 years of age, and live in urban areas. Also, a large share of survey participants can be classified as "empty nesters". Since the meal planner of a household is often female, the Nielsen survey over-samples females, compared to the 2006 Census.

In addition, in terms of regional representations and the age composition of the survey participants, the survey and Census are relatively close in numbers.

Table 4.3 Socio-Demographic Factors Percentages Compared with the 2006 Canadian Census Demographic Information

Factor	2007	2008	2006 Census [1]	Factor	2007	2008	2006 Census [1]
HHHEd (1-7)				**Age (1-6)**			
Elementary School	3%	3%	24% [2]	25-34	7%	8%	14%
Some High School	11%	11%		35-44	21%	19%	14%
Completed High School	17%	18%	26% [3]	45-54	26%	27%	16%
Some Technical or College	13%	14%		55-64	23%	23%	13%
Completed Technical or College	23%	23%		65+	22%	22%	14%
Some University	9%	9%					
Completed University	23%	23%	51% [4]				
LSTYLE (0-1)				**URBRUR (0-1)**			
LSTYLES	26%	26%	42%	Rural	41%	41%	19%
LSTYLEF	23%	22%		Urban	59%	59%	81%
LSTYLEC	19%	19%					
LSTYLEE	32%	33%					
Gender (0-1)				**Region (0-1)**			
Female	70%	69%	50%	The Maritimes	12%	12%	7%
Male	30%	31%	50%	Quebec	23%	22%	24%
				Ontario	32%	32%	38%
				Man/Sak	11%	12%	7%
				Alberta	11%	11%	10%
				BC	11%	11%	13%

[1] Numbers are rounded.
HHHED: [2] Not high school graduate, [3] High school graduate, [4] College or university
Source: Nielsen Health and Wellness survey 2007, 2008. Statistic Canada, Census 2006.

4.2 Comparison of Changes in Responses from 2007 to 2008

Since the Nielsen Health and Wellness Survey was conducted in two consecutive years, this section compares participants' responses to various questions asked in 2007 and 2008. To determine whether participants' perceptions, concerns levels, and attitudes towards diet and health issues and related food purchase behaviour have changed year over year.

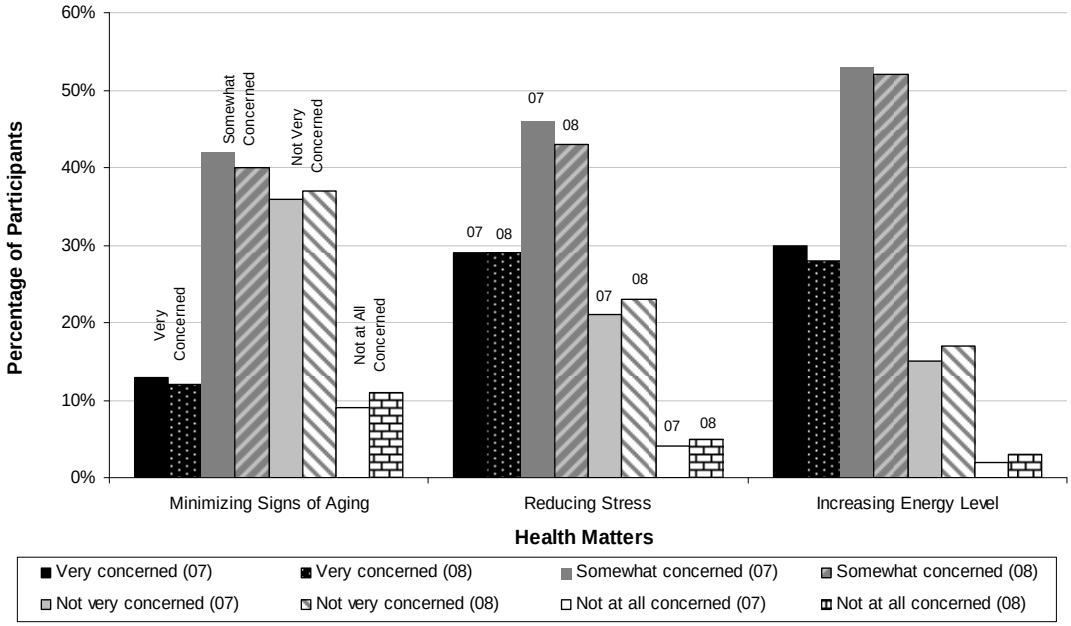
The following figures provide an overview of participants' responses to a number of key aspects to the diet-health-food discussion:

- perceptions of general health matters,
- healthy eating practices,
- obesity concerns,
- dietary changes,
- changing food purchases,
- use of nutrition information.

4.2.1 Levels of Concern with Different Health Matters

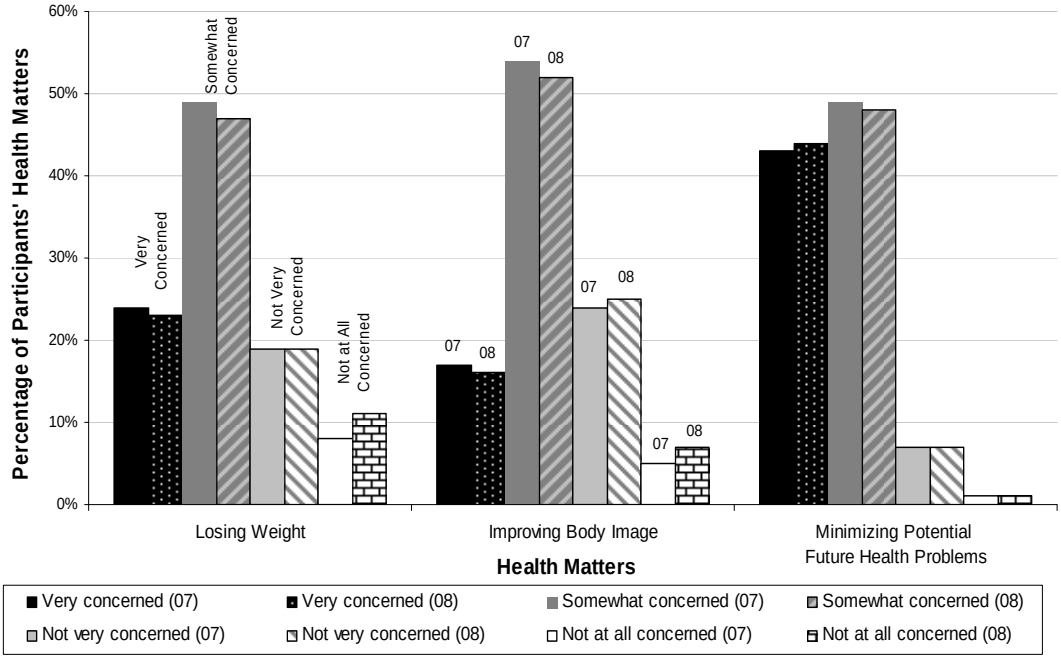
Figures 4.2 and 4.3 illustrate participant's stated levels of concern with minimizing signs of aging, reducing stress, increasing energy levels (figure 4.2a), and losing weight, improving body image, and minimizing potential future health problems (figure 4.2b).

Figure 4.2a Stated Concern Levels with Different Health Matters



Source: Nielsen Health and Wellness Survey 2007 and 2008.

Figure 4.2b Stated Concern Levels with Different Health Matters



Source: Nielsen Health and Wellness Survey 2007 and 2008.

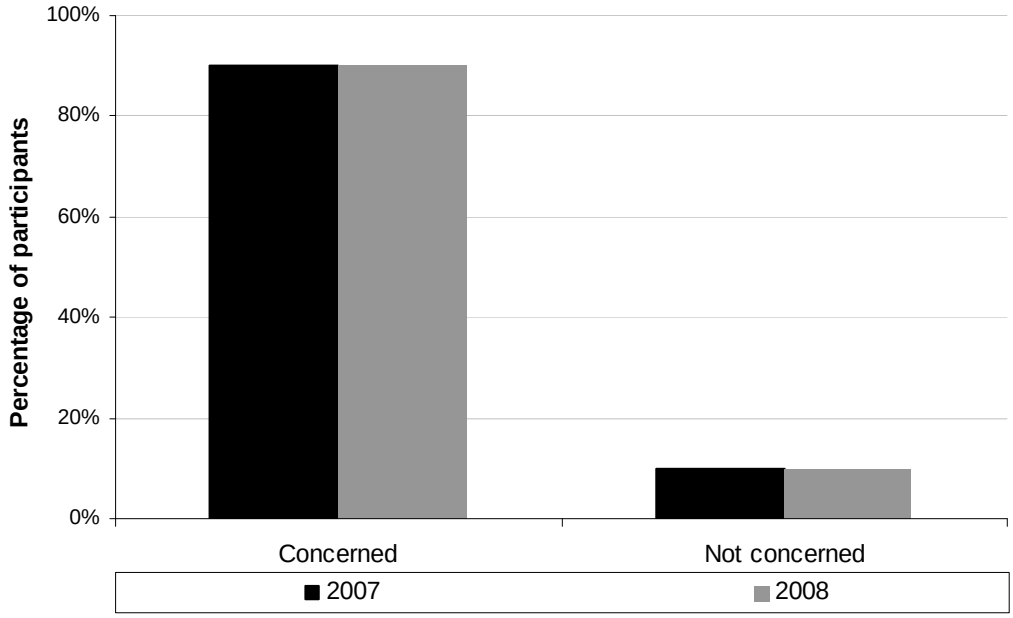
For each item, figure 4.2 presents the levels of stated concern for 2007 and 2008 (pair) from left to right starting with very concerned to not concerned at all. Comparison of participants' responses in 2007 and 2008 shows a close level of concern with all selected health matters with only minor changes across concern levels and between years. However, it is notable that in both years, more than 40% of participants were very concerned with minimizing future health problems; the highest percentage of very concerned responses among all health matters. Another observation worthwhile noting is that in both years, almost half of all respondents stated to be at least somewhat concerned with the majority of the health matters. Interestingly, a very large proportion of Canadians indicated that they are very or at least somewhat concerned about their body image.

4.2.2 Participants' Concern with Eating One Healthy Meal a Day

One of the main objectives of this study is to investigate the impact of consumer characteristics such as socio-demographic factors, food purchase patterns, knowledge and usage of food labelling, on their concerns about making healthy food choices.

To explore participant's healthy eating patterns, respondents were asked whether they eat a healthy meal for at least one meal a day (breakfast, lunch, dinner, or even snacking). Figure 4.3 shows that 90% of participants in both years have at least one healthy meal every day. This share remained constant from 2007 to 2008.

Figure 4.3 Levels of Concern with Eating one Healthy Meal a Day

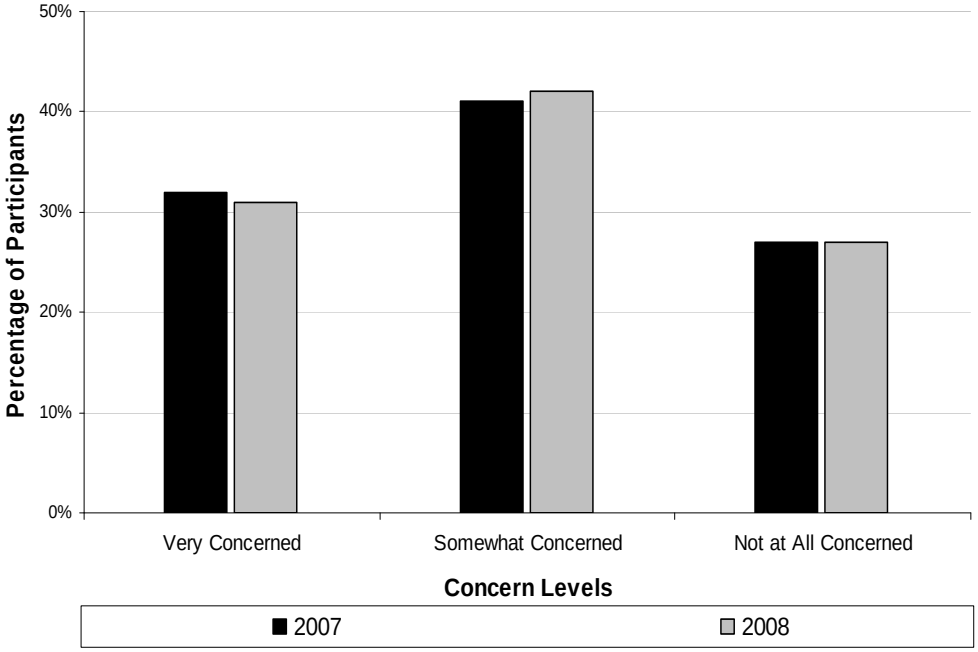


Source: Nielsen Health and Wellness Survey 2007 and 2008.

4.2.3 Obesity Concerns

One of the objectives of this study is to better understand how Canadians react to increasing information, food labelling, and health knowledge in terms of their diet behaviour. Obesity is believed to be one of the main public health issues across North America and contributor to the increasing incidence of coronary heart disease and diet related diabetes (Keys et al., 1965). For this reason it is interesting to observe how survey respondents rank in terms of their stated concern levels of obesity and its link to their households' diet. Figure 4.4 illustrates a slight increase in the percentage of participants who indicated to be somewhat concerned about obesity in 2007 and 2008.

Figure 4.4 Participants' Stated Obesity Concern Levels



Source: Nielsen Health and Wellness Survey 2007 and 2008.

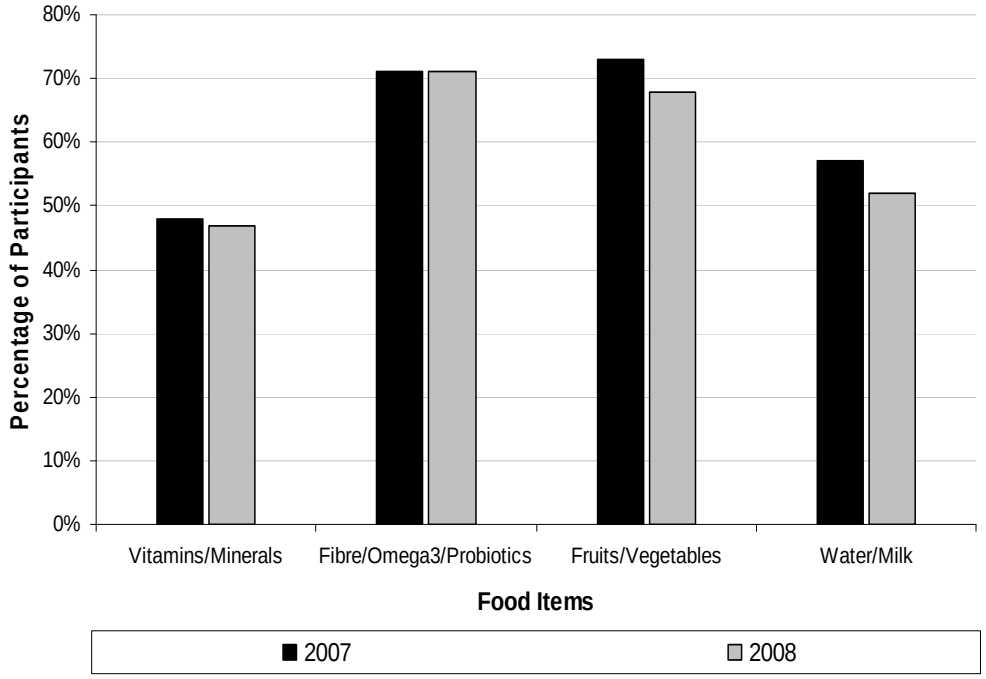
Figure 4.4 shows that more than 40% of participants were at least somewhat concerned and more than 30% were very concerned with the issue of obesity in their households. The levels, however, have not changed much from 2007 to 2008.

4.2.4 Changes in Dietary Behaviour

Figure 4.5 compares participants' conscious changes in eating patterns of specific food ingredients and foods between 2007 and 2008. Specifically, participants increasing intake of foods deemed healthful and Figure 4.6 illustrates participants' conscious decisions to lower the consumption of selected ingredients and foods that are deemed unhealthy. The selected ingredients and foods are important to take into account since the over-consumption of these items can have

adverse health effects (e.g., sodium intake and blood pressure). Malla et al. (2007) present evidence showing an increasing incidence of coronary heart disease and rise in cholesterol levels as a result of diets high in trans-fats. Also, according to Jimenez-Colmenero et al. (2001), diets high in fat can lead to obesity and related increased risk of colon cancer. Figure 4.6 shows that a significant percentage of respondents have claimed that they have reduced the amount of sweeteners, fat, and salt in their diet. However, fewer respondents have reduced their caloric or carbohydrate intake levels. Jimenez-Colmenero (1996) confirms that consumers often think of a "Healthy Diet" as limiting the amounts of fat, salt, caffeine, and cholesterol. Figure 4.6 also shows that although the reduction in consumption levels varies across unhealthy ingredients, Canadian consumers have reduced their consumption of all five items from 2007 to 2008.

Figure 4.5 Households' Stated Increase in Consumption of Healthful Food Ingredients



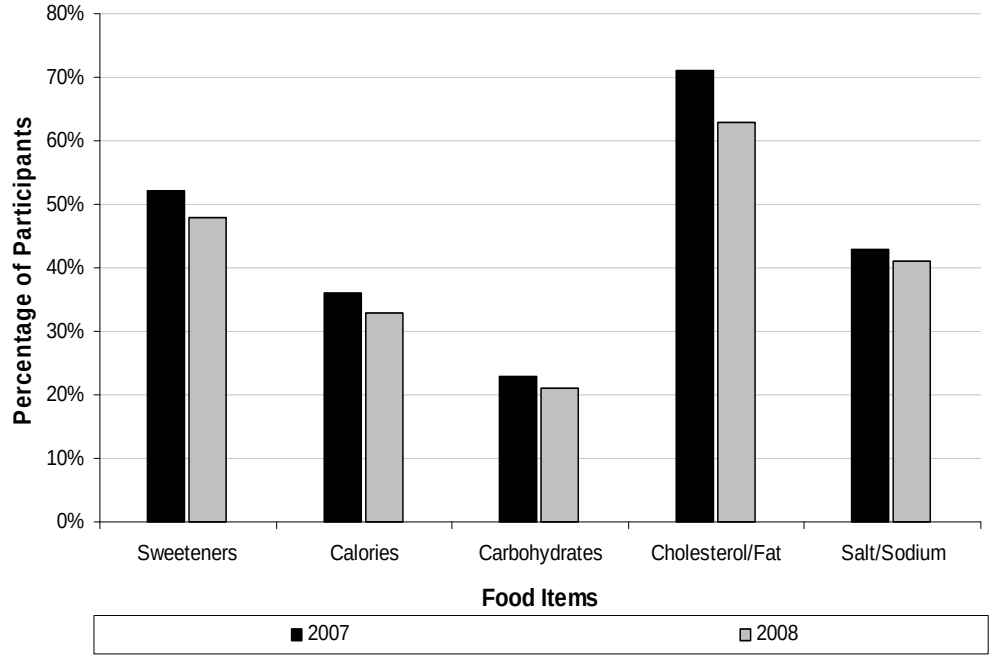
Source: Nielsen Health and Wellness Survey 2007 and 2008.

According to figure 4.5, a large percentage of respondents indicated that they had consciously increased the amount of fortified foods with vitamins and minerals, fruits and vegetables in their households' diet. However, the data reveals only minor differences in responses from 2007 to 2008. Unfortunately, the survey provides no additional information about the households that had changed their diet in 2007 and hence did not report further dietary changes in the 2008 survey version.

In addition to the increase in consumption of those food components presented in figure 4.5, the Nielsen survey reports data on the reduction of other food components and ingredients Canadians have limited in their diets which is illustrated in figure 4.6. Figure 4.6 illustrates conscious decreases in the

consumption of sweeteners, calories, carbohydrates, cholesterol, and fats in the three months prior to August 2007 and June 2008. The data suggests that a small share of participants has adopted healthier eating patterns and reduced consumption levels of selected unhealthy ingredients. Consequently, the reported percentages in figure 4.6 are lower in 2008 than in 2007.

Figure 4.6 Households' Stated Reduction in the Consumption of Unhealthy Food Ingredients



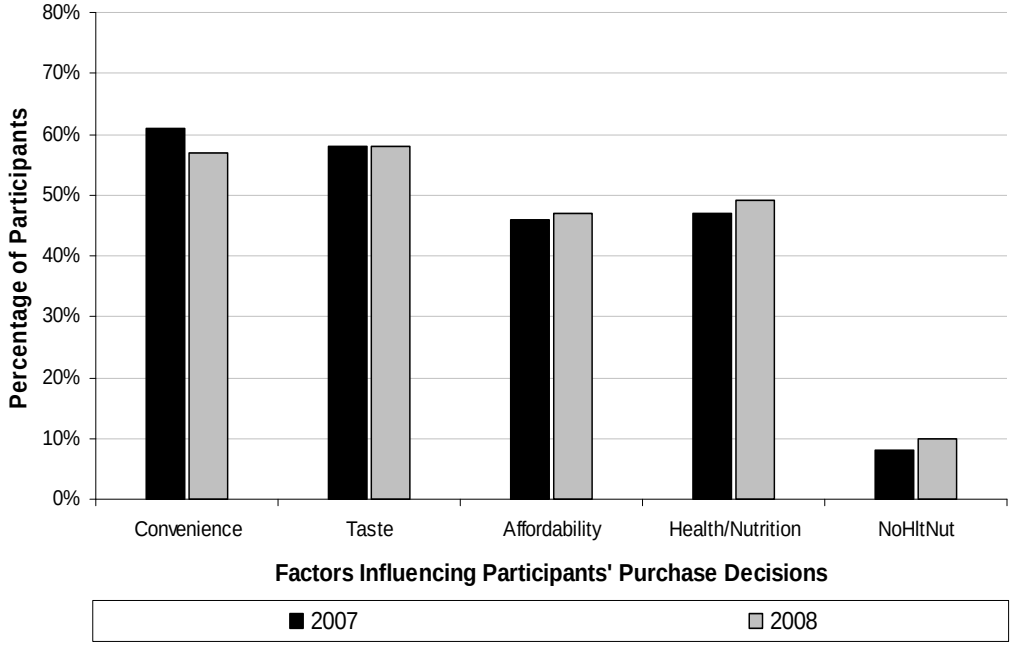
Source: Nielsen Health and Wellness Survey 2007 and 2008.

4.2.5 Purchase Decision Factors

Figure 4.7 presents several factors that may be important to respondents when purchasing healthy foods. Convenience is clearly number one as consumers' value portability and easy-to-prepare healthy meal options. Taste ranks second and is more important to respondents' choice of healthy foods than affordability or a

product's actual perceived health and nutrition value. In this context, health and nutrition value is defined as foods that are approved by a nutritionist or medical professional or foods that have been proven to help reduce the risk of nutrition-related diseases. Only about 10% of the respondents stated to purchase foods based on factors other than health or nutrition values (NoHltNut).

Figure 4.7 Decision Factors when Grocery Shopping for Healthy Foods

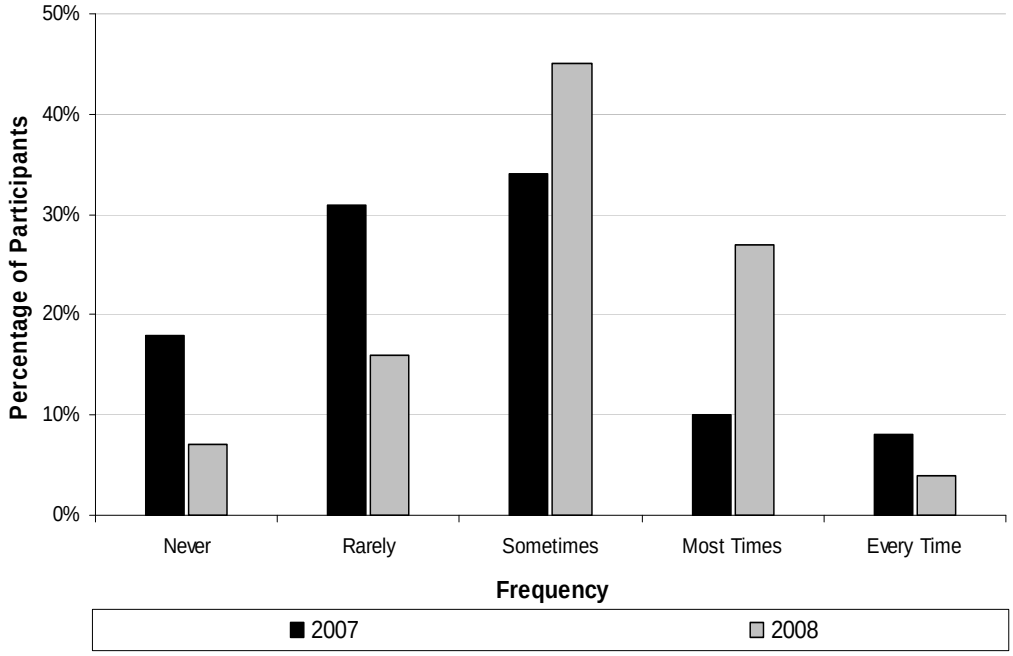


Source: Nielsen Health and Wellness Survey 2007 and 2008.

4.2.6 Substitution of Food Ingredients for Healthier Alternatives

Concerning the use of healthier ingredients in home meal cooking the data in Figure 4.8 shows that Canadian consumers increasingly try to integrate healthier choices.

Figure 4.8 Frequency of Substitution of Ingredients for Healthier Alternatives when Cooking



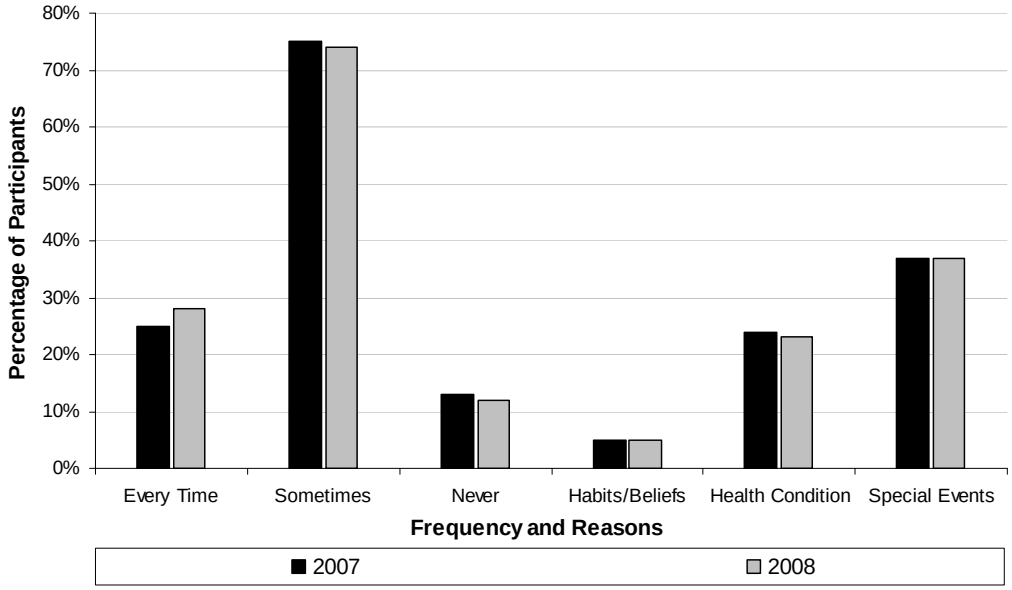
Source: Nielsen Health and Wellness Survey 2007 and 2008.

While fewer responses stated to never or rarely use healthy ingredients in 2008, the shares of occasional and frequent users of healthy ingredients increased considerably from 2007 to 2008. The frequency result for the category "every time" users of healthy ingredients is at a low level and even decreases in 2008. This finding may reflect the still limited availability of healthier product choices in some food categories, limiting consumer's choices of healthy ingredients. In spite of a decrease in the "every time" healthy cooking category, Canadians seem to cook healthier in general in 2008 compared to a year earlier.

4.2.7 Usage and Reasons for Consulting Nutrition Facts Tables

Nutritional information and nutrition labelling play an important role in Canadian consumer food purchase decisions. Cowburn et al. (2004) indicate that improvements in nutrition labelling, although very small, help consumers to make healthier food choices. Figure 4.10 compares different reasons and frequencies for referring to Nutrition Facts information on food packages.

Figure 4.10 Frequency and the Reasons for Referring to the Nutrition Facts Table on Packaged Foods



Source: Nielsen Health and Wellness Survey 2007 and 2008.

The share of consumers who refer to Nutrition Facts tables on packaged foods/beverages every time when shopping for household groceries is still relatively small, but shows an increasing trend. The largest group of respondents stated that they sometimes refer to Nutrition Facts tables. This is specifically the case when respondents were thinking of buying a product for the first time, were

on a diet or trying to lose weight, when buying certain foods or as a final decision criteria in choosing between two brands. Interestingly, respondents in this category also include consumers that stated that they were consulting Nutrition Facts tables when they had the time to do so.

Only 5% of respondents stated to refer to Nutrition Facts tables on packaged foods/beverages when considering customary eating or dietary habits (e.g., vegetarian, Kosher, Halal). A much larger share, however, stated to use Nutrition Facts information to make purchase decisions taking into account specific health conditions and related dietary needs. As well respondents used Nutrition Facts information when buying foods for special events, such as for children or dessert, snacks, or special meal occasions.

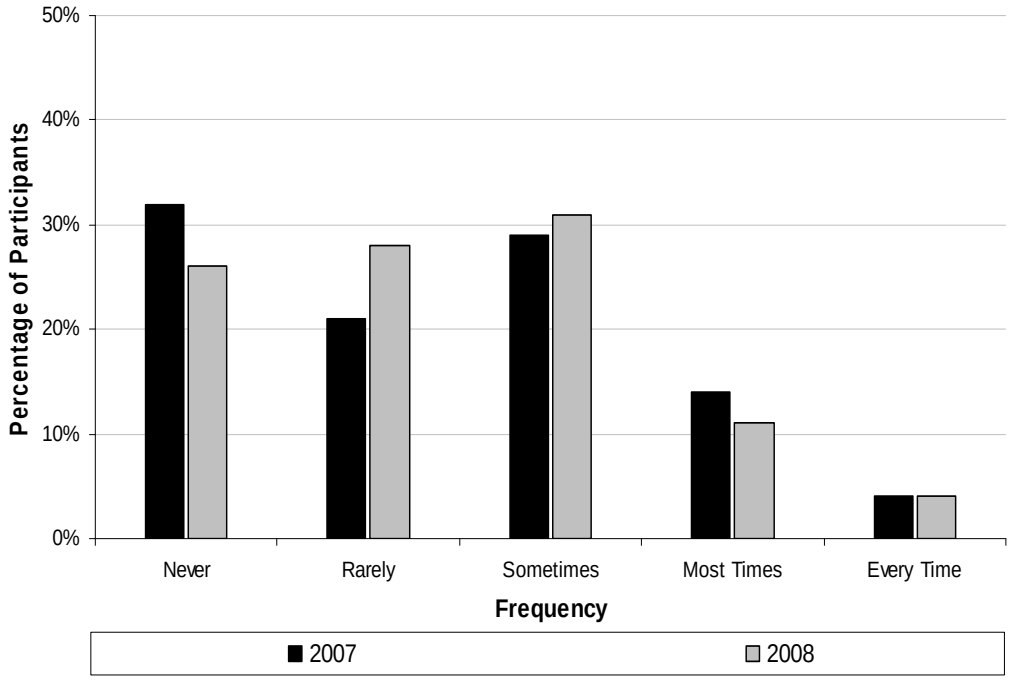
Only about 10% of respondents said they never use Nutrition Facts tables as part of their food purchase decision.

4.2.8 Usage of Dietary Symbols, Logos, and Endorsements

According to figure 4.11 an increasing share of Canadians are aware of and pay attention to dietary symbols and company health claims on food packages other than Nutrition Facts tables. The percentage of participants that stated to never pay attention to the dietary symbols and logos on food packages decreases by about 7% between 2007 and 2008. At the same time, the share of consumers that rarely or sometimes uses such information increases by about 10%. This result is interesting from the perspective of food marketing strategists and food

labelling policy makers. Overall figure 4.11 shows a positive trend with people showing more and more interest in dietary symbols and logos.

Figure 4.11 Frequency of Looking for Dietary Symbols and Logos on Food Packages



Source: Nielsen Health and Wellness Survey 2007 and 2008.

Knowing that nutritional labelling helps consumers to establish healthier food habits (Cowburn et al., 2004), it is important to identify those presentation strategies that attract the attention of more consumers from different socio-economic backgrounds. For example, Nayga (1998b) argues that standardizing health claims on food packages, as it was in the case of the Nutritional Labelling and Education Act, has been an effective strategy to improve consumers' perception of the reliability of labels and health claims on food packages.

Taken together figures 4.10 and 4.11 show that Canadian consumers increasingly use health and nutrition information in everyday food purchase decisions. However, the data also reveals that voluntary company health claims are as important as mandatory food-health regulation such as in the case of Nutrition Facts tables.

Chapter 5

Logistic Regression Analysis and Model Selection

5.1 Introduction

This chapter introduces the concept of logistic regression analysis and specifically logit models as the analytical tool used in this thesis. One of the objectives of this study is to analyse Canadian consumers' attitudes, perceptions, and behaviours towards health and diet. Based on this objective, ordered logit and binary logit models are used to estimate how Canadian consumer's socio-demographic factors, food purchase patterns, knowledge and usage of food labelling affect their concern levels about the following diet-health related issues:

- future health status,
- healthy food choices,
- obesity problems in their household.

The Nielsen Health and Wellness survey data set includes participants' socio-demographic attributes, (healthy) eating habits, and some information on grocery shopping patterns. The available data enables us to estimate, the relationship between participant's characteristics and other variables in relation to the choice probabilities regarding the different dependent variables outlined above.

The logit model approach is a branch of Stated Choice Methods (SCM) which are based on the random utility theory concepts.

The first assumption based on random utility theory in choice modeling is that the respondents are rational and, among a set of alternatives, will choose the

alternative which maximizes their utility (the decision makers are maximizing utility):

$$U_{in} > U_{jn} \qquad (5.1),$$

where (U) represents the respondent's utility, (i) and (j) are two alternatives, and (n) is the decision maker.

The utility function is also presented below in equation (5.2), where (**Z**) is a vector of the attributes of alternatives (i), (**S**) is a vector of the decision maker's characteristics (socio-demographic factors), and (ε) is a random variable across observations and represents unobservable attributes:

$$U_{in} = V_i (\mathbf{Z}_{in}, \mathbf{S}_n) + \varepsilon_{in} \qquad (5.2).$$

In a binary choice scenario the probability function of a preference for i over j is:

$$P_{in} = \text{prob} (U_{in} > U_{jn}) \qquad (5.3)$$

$$P_{in} = \text{prob} (\varepsilon_{jn} - \varepsilon_{in} < V_{in} - V_{jn}) \qquad (5.4).$$

Unlike the binary choice scenario that there are only two choices available for the responders, in multinomial and conditional logit scenarios the dependent variable has more than two choices. Also, if any of the random error terms in a random utility model across all alternatives or observations are assumed to be consistent with the extreme value type I (EV1) distribution and are independently and identically distributed (IID), the model is a multinomial or conditional logit model (McFadden 1974). Given the nature of the dependent variables using the analysis Binary and Ordered Logit model are more appropriate and are expected to produce reliable results.

Table 5.1 includes a short summary of past studies on consumer behaviour and preferences of food products with different attributes. Logistic models are typically to estimate the relationship between the food attributes and consumer behaviour change, changing policies towards health and diet issue and consumers' reaction, consumers' characteristics (e.g., socio-demographic) and their behaviour and preferences towards health and diet, based on the conducted surveys.

5.2 Binary Logit Model

A Binary Logit model specification was chosen for the case where the dependent variable is a simple "Yes = 1 / No = 0" question: a respondent either eats healthy or not. The vector of explanatory variables, X, includes factors such as participant's socio-demographic characteristics, eating habits and consumption behaviours. The vector of estimated coefficients, β, shows the impact of changes in (**x**) on the probability of (*Y)* (Greene, 2003).

Prob ($Y = 1 \mid \mathbf{x}$) = F (x, β)

Prob ($Y = 0 \mid \mathbf{x}$) = 1 - F (x, β) (5.5).

The Latent Regression model for an unobserved variable (y^*), assuming an error term (ε) with zero mean and standardized logistic distribution with known variance ($\pi^2/3$) and ($x' \beta$) to be the index function, would be (Greene, 2003):

$y^* = x' \beta + \varepsilon$ (5.6).

And our observation would be:

$y = 1$ if $y^* > 0$

$y = 0$ if $y^* \leq 0$ (5.7)

Following the above example, if a respondent is concerned about eating healthy, the variable (y) is one (y =1 if y* > 0), otherwise it is zero. The Binary Logit model in case of participants being concerned with eating at least one healthy meal a day is:

$$y = \beta_1 + \beta_2 x + \varepsilon_1 \qquad (5.8).$$

5.3 Ordered Logit Model

Unlike the Binary Logit model where participant's choices are limited to two alternatives, an Ordered Logit model is more appropriate when participants make decisions where two or more alternatives are present. Since some of the questions chosen from the Nielsen survey present ordered alternatives of the dependent variable (e.g., respondents are very concerned, somewhat concerned, not very concerned, or not concerned at all with a health issues), the ordered logit model was chosen to estimate the impact of various explanatory variables on respondent's probability of falling into a specific concern level group.

Hence, the latent regression model in (5.6) for an unobserved variable (y*), is assumed to have an error term (ε) and normal distribution across observations with a normalized zero mean and variance of (1). Assuming (μs) to be unknown parameters estimated with (β), our observation would be (Greene, 2003):

$y = 0 \quad$ if $y^* \leq 0$

$y = 1 \quad$ if $0 < y^* \leq \mu_1$

$y = 2 \quad$ if $\mu_1 < y^* \leq \mu_2$

. . .

$$y = J \quad \text{if } \mu_{J-1} \leq y^* \qquad (5.9).$$

Based on explanatory variables (**x**) and unobserved factors (ε), the probability of occurrence of each ordered segment (y) is defined as (Greene, 2003):

$$\text{Prob } (y = 0 \mid \mathbf{x}) = \Phi (-x'\beta)$$

$$\text{Prob } (y = 1 \mid \mathbf{x}) = \Phi (\mu_1 - x'\beta) - \Phi (-x'\beta)$$

$$\text{Prob } (y = 2 \mid \mathbf{x}) = \Phi (\mu_2 - x'\beta) - \Phi (\mu_1 - x'\beta)$$

…

$$\text{Prob } (y = J \mid \mathbf{x}) = 1 - \Phi (\mu_{J-1} - x'\beta) \qquad (5.10),$$

where $0 < \mu_1 < \mu_2 < \ldots < \mu_{J-1}$ have positive probabilities.

Following the above example of healthy eating with four categories (very concerned, somewhat concerned, not very concerned, or not concerned at all), the four probability outcomes would be (Greene, 2003):

$$\text{Prob } (y = 0 \mid \mathbf{x}) = \Phi (-x'\beta)$$

$$\text{Prob } (y = 1 \mid \mathbf{x}) = \Phi (\mu_1 - x'\beta) - \Phi (-x'\beta)$$

$$\text{Prob } (y = 2 \mid \mathbf{x}) = \Phi (\mu_2 - x'\beta) - \Phi (\mu_1 - x'\beta)$$

$$\text{Prob } (y = 3 \mid \mathbf{x}) = 1 - \Phi (\mu_2 - x'\beta) \qquad (5.12).$$

Following the specific thesis objectives outlined in chapter 1 and taking into account the conditions for using binary and ordered logit regression three empirical models were specified. In order to estimate which factors influence Canadian consumers' level of concern about their future health status, following empirical ordered logistic regression model:

CHealth = f (HHHED, URBRUR, REGM, REGQ, REGON, REGMS, REGBC, INC, LSTYLEF, LSTYLEC, LSTYLEE, GEND, AGE3, AGE4, AGE5, AGE6, Rsweet, Rcal, Rcarb, Rfat, Rsalt, ADDvit, ADDfib, ADDfv, ADDwm, HLTNUT, NFTeve, NFTnev, Dietsymb)

The description of the variables can be found in Chapter 4, table 4.1, pages 48, 49, and 50. CHealth is the stated level of concern about future health problems, HHHED is household head education, URBRUR is urban vs. rural residence, REGM, REGQ, REGON, REGMS, and REGBC are regional dummy variables. INC stands for income, LSTYLEF, LSTYLEC, and LSTYLEE, are different lifestyle categories, GEND is gender, and AGE3, AGE4, AGE5, AGE6 are age categories. Rsweet, Rcal, Rcarb, Rfat, Rsalt are stated reductions in the intake of ingredients, and ADDvit, ADDfib, ADDfv, ADDwm are stated increased intakes of ingredients. HLTNUT, NFTeve, NFTnev, Dietsymb are usage and frequency of different forms of nutrition labelling.

To address the second specific thesis objective of estimating the impact of socio-economic and other factors on Canadian consumer's decision about following healthier diet (eat healthier) the following binary logistic model was specified:

CHFood = f (HHHED, URBRUR, REGM, REGQ, REGON, REGMS, REGBC, INC, LSTYLEF, LSTYLEC, LSTYLEE, GEND, AGE3, AGE4, AGE5, AGE6, Rsweet, Rcal, Rcarb, Rfat, Rsalt, ADDvit, ADDfib, ADDfv, ADDwm, CONV,

TASTE, AFFORD, HLTNUT, NoHLTNUT, WTPfort, WTPhlt, NFTeve, NFTsmt, NFThb, NFThc, NFTsp, NFTnev, Dietsymb)

CHFood is the stated concern about eating healthy, HHHED is household head education, URBRUR is urban vs. rural residence, REGM, REGQ, REGON, REGMS, and REGBC are regional dummy variables. INC stands for income, LSTYLEF, LSTYLEC, and LSTYLEE, are different lifestyle categories, GEND is gender, and AGE3, AGE4, AGE5, AGE6 are age categories. Rsweet, Rcal, Rcarb, Rfat, Rsalt are stated reductions in the intake of ingredients, and ADDvit, ADDfib, ADDfv, ADDwm are stated increased intakes of ingredients. CONV, TASTE, AFFORD, HLTNUT, NoHLTNUT, WTPfort, WTPhlt, NFTeve, NFTsmt, NFThb, NFThc, NFTsp, NFTnev, Dietsymb are usage and frequency of different forms of nutrition labelling.

And finally in order to estimate which factors influence Canadian consumers' level of concern about obesity in their household the following empirical ordered logistic regression model was specified:

CObesity = f (HHHED, URBRUR, REGM, REGQ, REGON, REGMS, REGBC, INC, LSTYLEF, LSTYLEC, LSTYLEE, GEND, AGE3, AGE4, AGE5, AGE6, Rsweet, Rcal, Rcarb, Rfat, Rsalt, CONV, TASTE, AFFORD, HLTNUT, NoHLTNUT, HLTalt, NFTeve, NFTnev, Dietsymb)

CObesity is the stated level of concern about obesity, HHHED is household head education, URBRUR is urban vs. rural residence, REGM, REGQ, REGON, REGMS, and REGBC are regional dummy variables. INC stands for income, LSTYLEF, LSTYLEC, and LSTYLEE, are different lifestyle categories, GEND is gender, and AGE3, AGE4, AGE5, AGE6 are age categories. Rsweet, Rcal, Rcarb, Rfat, Rsalt are stated reductions in the intake of ingredients. CONV, TASTE, AFFORD, HLTNUT, NoHLTNUT, WTPfort, WTPhlt, NFTeve, NFTsmt, NFThb, NFThc, NFTsp, NFTnev, Dietsymb are usage and frequency of different forms of nutrition labelling.

Table 5.1 summarizes selected empirical studies that have used logistical regression and similar techniques to estimate the impact of socio-demographic, economic, and other factors on consumer's food and health behaviour. For instance, several studies have estimated the relationship between consumer's socio-demographic factors and their probability of using food-health and nutrition information to improve dietary outcomes.

First, the table 5.1 shows the studies on the impact of information and labelling on consumer food-health behaviour (Bayar et al., 2008; Nayga et al., 1998). Second, the table 5.1 presents the studies on the relationship between consumer characteristics (e.g., socio-demographic and economic characteristics) and their preference for certain food attributes (Cranfield et al., 2003; Kizilaslan et al., 2008; Nayga 1997; Nayga, 1998b; Peng et al., 2006; Quagrainie et al., 1998). Cash et al. (2008) studied the implications of a fat tax on consumer's food choices. The last group of studies mentioned in table 5.1 are studies on the impact of the

threat of future health complications on consumers' propensity to change dietary behaviour (Cranfield et al., 2007).

Table 5.1 Summary of logistic Models Used for Food Marketing and Consumer Behaviour Studies

Citation	Objective	Method	Model	Result(s)
Bayar, E., S. Saghaian, and W. Hu. 2008.	To determine the relationship between the demographics, particular health problems like overweight, obesity, and heart disease with nutritional information and label use.	A web survey was designed to determine the label usage of the consumers in Kentuky, between Dec. 2007 and Feb. 2008.	Ordered logit analysis was used to identify the demographic segments considering nutritional labels to be most important.	Participants who watch their serving size and calories intake, the person who does the grocery shopping for the household and the respondents who have heart disease problems are more likely to use nutritional labels and serving size information.
Cash S. B. (PI), with Ryan Lacanilao, 2008.	To investigate on how food taxes may affect consumer behaviour.	A purchase simulation survey in the form of choice experiments.	logit analysis and multinomial logit model.	Stigmatizing warning label on food packages is effective on not choosing less healthy food products.
Cranfield, J. A., and Erik Magnusson. 2003.	To measure and model WTP for pesticide free certified products.	A contingent valuation survey was sent to households in three Canadian cities.	Ordered probit model	…
Cranfield, J. A., A. Boecker, G. Hailu, S. Henson, D. Herath, and M. Annou, 2007.	To explore the factors that might influence broad dietary change by adult Canadians under the premise that such change will improve health and/or reduce risk of disease. An adaptive behaviour to negative health outcomes related to diet based on Protection Motivation Theory.	Agriculture and Agri-Food Canada survey on Canadians' Demand for Food Products Supporting Health and Wellness in Spring of 2004 among 2,012 randomly-selected individuals.	Probit model to explain consumer's choice to modify their diets in a manner which they believe improves health and/or reduced risk of disease	Lack of interest in learning about foods with health benefits has a significant and negative impact not only in the incidence if dietary change, but also the intensity.

Citation	Objective	Method	Model	Result(s)
Kizilaslan, H., Z. Gokalp Goktolga, N. Kisilaslan, 2008.	To determine the socio-economic factors affecting meat sales outlets, as preferred by the consumers of the city of Tokat, Turkey.	A survey of direct interviews from the decision makers of the households' food purchase.	Multinomial logit model	Age, household size, place of residence, status of the mother, income, price difference, quality difference, hygiene, freshness and the seller's image are important in consumers' meat outlet preferences.
Nayga, R. M. JR., D. Lipinski, N. Savur. Consumers' use of nutritional labels while food shopping and at home. 1998.	To examine the impact of socio-demographic and nutrition/health related factors on consumers' use of nutritional labels while food shopping, at home, and when comparing nutrients for different brands of the same food.	A survey with a sample of 200 consumers from a combination of four supermarkets in different socio-economic areas of Middlesex County, New Jersey during the first and second quarter of 1996 was conducted.	Ordered logit	Unemployed individuals and those who place greater importance on nutrition while shopping and following the dietary guidelines are more likely to use nutritional labels.
Nayga, R. M. JR. 1997.	To examine how the perception of a household main meal planner about the importance of nutrition in food shopping is related to the person's socio-demographic characteristics.	DHKS from the U.S. Department of Agriculture. Computer assisted telephone interviews which targeted main meal preparers or planners in households in the 48 conterminous states who participated in 1991 Continuing Survey of Food Intake by Individuals.	Ordered logit	Results of this study suggest that black, female, higher educated, and nonworking main meal planners generally perceive nutrition as more important in food shopping than do others. Findings also suggest that nutrition is more important to main meal planners who reside in cities and in the South.

Citation	Objective	Method	Model	Result(s)
Nayga, R. M. Jr. 1998a.	To identify characteristics of the individuals who are more likely to try low-fat, low-cholesterol foods	1994 Diet and Health Knowledge Survey (DHKS) from the U.S. Department of Agriculture targeting randomly selected individuals participated in 1994 Continuing Survey of Food Intakes by Individuals (CSFII).	Logit analysis	high income, whites compare to blacks, females, smaller households, high BMI people, health conscious people, non-smokers are the ones who are more likely to try low-fat, low cholesterol foods.
Peng, Y., G. E. West, C. Wang, 2006.	To investigate consumer attitudes toward and purchase intentions for CLA-enriched dairy products.	A consumer telephone survey in Alberta and BC in March 2004, using a contingent valuation method.	Ordered probit model	Health conscious, middle-aged consumers who already believe in the healthiness of conventional milk products are interested in the new CLA-enriched dairy products.
Quagrainie K. K., J. Unterschultz, and M. Veeman, 1998.	To examine the potential effect of identified product and consumer characteristics on the probability of a fresh meat product being purchased.	Stated preference questionnaire with randomly selected households in major cities in Western Canada.	Multinomial nonlinear nested logit model	The results support origin branding of Alberta beef, but not Alberta pork. Consumer age, household income and family size all have an effect on meat choices.

Chapter 6

Model Results

6.1 Introduction

As described in Chapter 5, the ordered logit and binary logit models are used to estimate the impact of different socio-demographic, food purchase, and behavioural characteristics of participants on their probability of concern with future health problems, healthy eating, and obesity.

The first model is an ordered logit with the dependent variable "Level of Concern about Potential Future Health Problems (CHealth)". Since the dependent variable is expressed in 4 levels of "not at all concerned", "not very concerned", "somewhat concerned", and "very concerned", the ordered logit model was chosen to explain the impact of the explanatory variables on each level of concern.

The second model is a binary logit with the dependent variable "Level of Concern about Eating Healthy at least One Meal a Day (CHFood)". The binary logit model was chosen because of the binary nature of the dependent variable (Yes = 1 / No = 0).

The third model is also an ordered logit with the dependent variable "Level of Concern with Obesity in the Household (CObesity)". The dependent variable is coded in three levels of "not at all concerned", "somewhat concerned", and "very concerned".

6.2 Levels of Concern with Minimizing Future Health Problems

Tables 6.1 and 6.2 show the estimated coefficients and marginal effects of socio-demographic, healthy eating and nutrition labelling variables on the probability of each of the levels of concern with potential future health problems (model CHealth, p.70). Using the ordered logit model specification, Table 6.1 presents the results of the analysis using the 2007 survey data and Table 6.2 presents the results based on the 2008 data. Both regression models are highly significant, as is evident from their Chi-squared values. Considering the McFadden Pseudo R-squared values, 12% of the variation in the dependent variable is explained by the regression in 2007 and 10% in 2008.

Table 6.1 Factors Influencing the Probability of Concern about Minimizing Future Health Problems (2007)

Variables (Y=CHealth)	Coefficients	Marginal Effects			
		Y = 0	Y = 1	Y = 2	Y = 3
Constant	2.61434*** (.18258145)	0	0	0	0
HHHED	-0.0211 (.01456002)	0.00014	0.00097	0.00395	-0.00505
URBRUR	-0.00032 (.05007960)	0	0.00001	0.00006	-0.00008
REGM	.26718*** (.09864457)	-0.00157	-0.01126	-0.05224	0.06508
REGQ	0.09361 (.08638352)	-0.00059	-0.00421	-0.01773	0.02253
REGON	.17648** (.08132355)	-0.00111	-0.00789	-0.03351	0.04252
REGMS	.24269** (.09887298)	-0.00144	-0.01028	-0.04735	0.05907
REGBC	-0.02881 (.09956198)	0.00019	0.00134	0.00536	-0.00688
INC	0.00232 (.00213823)	-0.00002	-0.00011	-0.00043	0.00055
LSTYLEF	-0.00127 (.08066163)	0.00001	0.00006	0.00024	-0.0003
LSTYLEC	-0.07505 (.08238922)	0.0005	0.00352	0.01387	-0.01789
LSTYLEE	-0.07402 (.06958023)	0.00049	0.00344	0.01375	-0.01768
GEND	.51106*** (.05351250)	-0.00371	-0.02585	-0.08949	0.11905
AGE3	.19882** (.10082459)	-0.00122	-0.00869	-0.0382	0.04812
AGE4	.34471*** (.09930596)	-0.00207	-0.01478	-0.0668	0.08365
AGE5	.35073*** (.11276391)	-0.00209	-0.0149	-0.06826	0.08525
AGE6	0.04322 (.11662383)	-0.00028	-0.00197	-0.00814	0.01038
Rsweet	.17397*** (.05280103)	-0.00113	-0.00802	-0.03247	0.04163
Rcal	.26082*** (.05346389)	-0.00164	-0.01163	-0.04958	0.06285
Rcarb	.24066*** (.06052605)	-0.00147	-0.01046	-0.04637	0.0583
Rfat	.62124*** (.06259142)	-0.00465	-0.03225	-0.10655	0.14344
Rsalt	.14535***	-0.00093	-0.00662	-0.02732	0.03488

Variables (Y=CHealth)	Coefficients	Marginal Effects			
		Y = 0	Y = 1	Y = 2	Y = 3
	(.05270645)				
ADDvit	.24415*** (.05149137)	-0.00158	-0.0112	-0.04568	0.05847
ADDfib	.39580*** (.06008373)	-0.00281	-0.01966	-0.07031	0.09278
ADDfv	.26279*** (.05979261)	-0.00181	-0.01275	-0.04748	0.06205
ADDwm	.17531*** (.05212950)	-0.00115	-0.00815	-0.03256	0.04187
HLTNUT	.51228*** (.04995313)	-0.0033	-0.02337	-0.09586	0.12253
NFTeve	.53426*** (.05882250)	-0.00307	-0.02199	-0.10519	0.13024
NFTnev	-.73427*** (.07756355)	0.00637	0.04317	0.11268	-0.16222
Dietsymb	0.01603 (.01973408)	-0.0001	-0.00074	-0.003	0.00384
Mu(1)	2.19129*** (.04735133)				
Mu(2)	5.43997*** (.05255962)				

***, **, * = Significance at 1%, 5%, 10% levels.
N = 7630
Log Likelihood function = -6390.100
Number of parameters = 32
McFadden Pseudo R-squared = .1237951
Chi squared = 1805.657
Degrees of freedom = 29

Table 6.2 Factors Influencing the Probability of Concern about Minimizing Future Health Problems (2008)

Variables (Y=CHealth)	Coefficients	Marginal Effects			
		Y = 0	Y = 1	Y = 2	Y = 3
Constant	7.03793*** (.20161531)	0	0	0	0
HHHED	-0.00032 (.01404534)	0	0.00002	0.00006	-0.00008
URBRUR	-.11693** (.04752311)	0.00103	0.00573	0.02213	-0.02889
REGM	.22770** (.09464378)	-0.00183	-0.01027	-0.04458	0.05667
REGQ	-0.09392 (.08341283)	0.00084	0.00466	0.01767	-0.02317
REGON	.14384* (.07911514)	-0.00122	-0.00683	-0.02761	0.03566
REGMS	0.07706 (.09491070)	-0.00065	-0.00365	-0.01482	0.01912
REGBC	0.13323 (.09581637)	-0.00111	-0.00619	-0.02581	0.03311
INC	-0.00223 (.00204601)	0.00002	0.00011	0.00042	-0.00055
LSTYLEF	.49652*** (.08127610)	-0.00382	-0.02153	-0.09801	0.12336
LSTYLEC	.34052*** (.08059570)	-0.00269	-0.01514	-0.06689	0.08472
LSTYLEE	-0.03787 (.06549982)	0.00033	0.00185	0.00718	-0.00936
GEND	0.01164 (.05000425)	-0.0001	-0.00057	-0.00221	0.00288
AGE3	-1.97761*** (.15176777)	0.03588	0.16405	0.20286	-0.40278
AGE4	-2.67716*** (.14907330)	0.05504	0.23	0.23744	-0.52249
AGE5	-2.73687*** (.15638148)	0.06323	0.25109	0.2008	-0.51512
AGE6	-3.40052*** (.15933646)	0.10631	0.34018	0.13474	-0.58123
Rsweet	0.02709 (.05367333)	-0.00024	-0.00131	-0.00515	0.0067
Rcal	0.06164 (.05444577)	-0.00053	-0.00297	-0.01177	0.01527
Rcarb	-0.0595 (.06023234)	0.00053	0.00293	0.01124	-0.01469
Rfat	-0.02682 (.05957057)	0.00023	0.0013	0.00511	-0.00664
Rsalt	-0.05183 (.05340538)	0.00045	0.00253	0.00984	-0.01282

Variables (Y=CHealth)	Coefficients	Marginal Effects			
		Y = 0	Y = 1	Y = 2	Y = 3
ADDvit	.08768* (.04989632)	-0.00076	-0.00425	-0.01669	0.0217
ADDfib	-0.01507 (.05922777)	0.00013	0.00073	0.00287	-0.00373
ADDfv	0.06984 (.05614745)	-0.00062	-0.00343	-0.01321	0.01726
ADDwm	0.03401 (.05087841)	-0.0003	-0.00165	-0.00647	0.00842
HLTNUT	-0.04078 (.04784669)	0.00036	0.00198	0.00775	-0.01009
NFTeve	0.01587 (.05402687)	-0.00014	-0.00077	-0.00302	0.00393
NFTnev	0.01942 (.07544249)	-0.00017	-0.00094	-0.0037	0.00481
Dietsymb	-0.01048 (.02257909)	0.00009	0.00051	0.00199	-0.00259
Mu(1)	1.98980*** (.04078624)				
Mu(2)	4.92714*** (.04465614)				

*, **, *** = Significance at 1%, 5%, 10% levels.
N = 8115
Log Likelihood function = -6981.391
Number of parameters = 32
McFadden Pseudo R-squared = .0986245
Chi squared = 1527.745
Degrees of freedom = 29

6.2.1 Socio-Demographic Variables

Of the included variables, region, gender, and age are influential in terms of increasing the probability of being very concerned about future health problems among 2007 participants. However, we find strong regional differences among participants in the 2007 survey. Alberta was left out of the estimation as the base region so that all other regions' marginal effects are relative to Alberta. Out of all Canadian provinces, the coefficients for the Maritimes, Ontario, and Manitoba/Saskatchewan are statistically significant meaning that living in any of

these provinces increases the probability of being very concerned about future health problems in year 2007.

We also find gender (female) to play an important role (the coefficient is statically significant) in increasing the probability of being very concerned about future health problems by almost 12%.

Age is also an important factor influencing the level of concern about future health problems among the participants. Age2 (participants being between 25 and 34) has been left out as the base case and all other marginal effects are relative to Age2. The model shows that the age range of 45 to 64 has the highest probability of being very concerned about future health problems in 2007 (8%). Interestingly, participants older than 65 (Age 6) do not seem to be concerned about their future health, as is indicated by an insignificant parameter estimate. The results of the study by Bogue (2005) that the age group of 35 – 54 has been most concerned about health promotion campaigns and health-enhancing food advertisements compared to younger (18-34) and older age groups (55+) supports this finding. Also, the annual report of the Heart and Stroke Foundation (2006) supports this study, reporting that compared to 10 years ago, the rate of obesity, physical inactivity, and lack of knowledge about health related issues, has increased among those Canadians that constitute today's Baby Boomer generation.

The model results for 2008 are considerably different from those of 2007. Factors such as living in rural or urban areas and different lifestyles turned out to be significant in contrast to the 2007 model specification. The results show that

participants living in rural areas are less likely to be very concerned about minimizing future health problems.

Interestingly, among all Region variables, living in the Maritimes still is the most influential variable on the occurrence of the dependent variable.

It seems that the participants living as a family are more likely to be very concerned with their food, nutrition, and future health problems. New or maturing families (LSTYLEF) have the highest likelihood of being very concerned with potential health problems. Young, middle-aged, and older single participants is chosen as the base category.

Coefficients Age3, Age4, Age5, and Age6 are highly significant and compared to the age group of 25 to 34 year old participants, all show a lower probability of being very concerned with future health problems. This is strong contrast to the positive relationship in 2007.

6.2.2 Healthy Eating Variables

All coefficients of healthy eating variables are statically significant and all marginal effects are positive in 2007. The results indicate that participants who reduced the intake of fat, cholesterol, and trans-fatty acids during the past three months, as well as those who responded "Thinking about healthy eating, health and nutrition is the most important in my purchase decision" are most likely to be very concerned about potential future health problems. This finding supports one of the hypotheses in this thesis that consumers tend to connect issues of healthy eating with the potential of future health complications. The strongest impact

seems to come from reducing fat intake (Rfat) and participants that claimed health and nutrition are most important to their food purchase decisions (HLTNUT) increasing the occurrence of the dependent variable by 14% and 12%, respectively.

To our own surprise, in 2008, the only statistically significant variable is "increasing the intake of vitamins and minerals during the past 3 months". Increasing the consumption of vitamins and minerals increases the probability of being very concerned by over 2%.

6.2.3 Nutrition Labelling Variables

The 2007 survey analysis results suggest that participants who referred to the Nutrition Facts table every time shopping for household groceries are significantly more likely to be very concerned about potential future health problems (13%), compared to those who never check the Nutrition Facts table (-16%). Other dietary symbols on food packages do not seem to play a major role in participants' healthy food choices. None of the coefficients of nutrition labelling variables are statistically significant in the 2008 analysis.

6.2.4 Summary and Discussion

"Females", participants that are "reducing the intake of fat, or cholesterol, or trans-fatty acids during the past 3 months", also the ones that stated "health and nutrition are the most important factors in purchase decision when thinking about healthy eating", and "checking the Nutrition Facts tables" are the typical Canadian consumers in 2007 that their food purchase behaviour and their

characteristics have a positive influence on their concern level about potential future health problems. The results by Bogue et al. (2005) support our findings, indicating that females are the most concerned group about health and following recommended dietary guidelines. Also, Nayga (1998a) indicates that females, individuals with better knowledge of their own diet and health status, and those that are more aware of the link between diet and disease, are more likely to try health enhancing foods and show a better dietary health preventive behaviour.

Against the common prediction in the literature the variables HHHED (Household Head Education), URBRUR (Living in Rural), and INC (Income) do not play a significant role in connection with Canadians concerns about future health problems. However, living in Eastern Canada positively affects concerns about future health problems.

Surprisingly, the regression results reported for the 2008 survey are rather different from those for 2007. While the variables of "family lifestyle" are prominent factors that positively influences the probability of being concerned about potential health problems in 2008, many other results from 2007 cannot be confirmed. Especially, the change of sign for all age-group variables has no plausible explanation. The same is true for the insignificant results on all healthy eating and nutrition labelling variables in 2008.

We have two possible explanations for the discrepancies between the 2007 and 2008 results. First, the survey was conducted on a largely similar sample population in both years. Respondents therefore, may have answered the same questions in 2008 compared to the previous year. For instance, the answer to

whether a participant had changed the intake of fat in the last three months may have been positive in 2007, and perceived to be redundant in 2008. Second, issues other than food and health may have become more important to participants between 2007 and 2008. Changes in the overall Canadian economy and/or other issues of general interest to consumers may have influenced the way participants responded to the survey questionnaire in 2008. For example, reports by Food and Agriculture Organization of United Nations (FAO) show that from 2007 to 2008 there was significant food price increases (FAO, 2010).

To check the robustness of the above findings I re-estimated the above model (CHealth) using a logit model on a combined panel dataset. The panel model results largely confirm the findings of the 2007 sample ordered logit model. Both, the direction of influence and magnitude of the explanatory variables were very close to the estimates presented in table 6.1. A noticeable difference, however, is that income does have a positive and significant effect on the probability of the level of concern about minimising future health problems.

From these two regression analyses (tables 6.1 and 6.2) the recommendation to policy makers and food industry would be to invest more on research and innovation of healthier food options in food market (e.g., reduced fat, sodium, and sugar products, fortified with vitamins, minerals, fibre, and probiotics food products) and provide easier to understand, and more accessible information on Nutrition Facts Tables on food packages. Also, they might need to target females and families, since those are the consumers who show concerns about health and diet.

6.3 Levels of Concern about Eating One Healthy Meal a Day

Tables 6.3 and 6.4 show the estimated coefficients and marginal effects of socio-demographic, healthy eating, organic, and nutrition labelling variables on the probability of being concerned with eating at least one healthy meal a day (Being concerned about eating one healthy meal a day = 1, not concerned about eating one healthy meal a day = 0). Using a binary logit model, table 6.3 presents the results of the analysis using the 2007 survey data and table 6.4 presents the same analysis based on the 2008 data. Both models are statistically significant, as is evident from their Chi-squared values.

Considering the McFadden Pseudo R-squared values, 23% of the variation of the dependent variable is explained by the regression in 2007 and 2% in 2008.

Table 6.3 Factors Influencing Probability of Concerns about Eating One Healthy Meal a Day (2007)

Variables (Y=CHFood)	Coefficients	Marginal Effects
		Y = 1
Constant	.74570* (.38207339)	.04114*
HHHED	-.06442** (.02681497)	-.00355**
URBRUR	-0.03235 (.09236324)	-0.00179
REGM	0.12633 (.19073435)	0.00669
REGQ	0.04561 (.15875812)	0.00249
REGON	-0.00276 (.15229921)	-0.00015
REGMS	-0.13841 (.18093035)	-0.00801
REGBC	-0.166 (.17937656)	-0.00971
INC	0.00427 (.00402796)	0.00024
LSTYLEF	.27177* (.15215338)	.01408*
LSTYLEC	0.09761 (.14756375)	0.00525

Variables (Y=CHFood)	Coefficients	Marginal Effects
		Y = 1
LSTYLEE	0.01165 (.12230589)	0.00064
GEND	0.10065 (.09390087)	0.00565
AGE3	0.21863 (.20308457)	0.01142
AGE4	-0.151 (.19357505)	-0.00861
AGE5	-0.1995 (.21675266)	-0.01154
AGE6	-.43769** (.22073073)	-.02698*
Rsweet	.28062*** (.10574645)	.01558***
Rcal	.41498*** (.12250281)	.02185***
Rcarb	0.15387 (.13991619)	0.00819
Rfat	.51572*** (.10637932)	.03148***
Rsalt	.18742* (.11016639)	.01023*
ADDvit	.31248*** (.10236356)	.01721***
ADDfib	.26718*** (.10355684)	.01553**
ADDfv	.56792*** (.10028689)	.03542***
ADDwm	0.04388 (.09872253)	0.00243
CONV	.46376*** (.10607107)	.02690***
TASTE	.19600* (.10467974)	.01097*
AFFORD	.19781* (.10270473)	.01086*
HLTNUT	.21267* (.10986744)	.01168*
NoHLTNUT	-.95685*** (.16941890)	-.07606***
WTPfort	0.05928 (.10597853)	0.00327
WTPhlt	.31689*** (.09768082)	.01793***
NFTeve	-0.2045 (.14138445)	-0.01182
NFTsmt	-0.27232 (.17720329)	-0.01417
NFThb	-.47173** (.21660033)	-.03154*
NFThc	0.08216	0.00445

Variables (Y=CHFood)	Coefficients	Marginal Effects
		Y = 1
	(.12864359)	
NFTsp	.48548*** (.11796644)	.02550***
NFTnev	-.35741* (.20243736)	-0.02223
Dietsymb	0.02131 (.03603084)	0.00118

*, **, *** = Significance at 10%, 5%, 1% levels.
N = 7630
Log Likelihood function =-1919.090
Number of parameters = 40
McFadden Pseudo R-squared = .2343990
Chi squared = 1175.110
Degrees of freedom = 39

Table 6.4 Factors Influencing Probability of Eating One Healthy Meal a Day (2008)

Variables (Y=CHFood)	Coefficients	Marginal Effects
		Y = 1
Constant	2.97128*** (.32982795)	.26160***
HHHED	-0.01001 (.02249424)	-0.00088
URBRUR	0.09345 (.07719427)	0.00817
REGM	.67775*** (.16497379)	.04876***
REGQ	0.08 (.12645163)	0.00692
REGON	.26671** (.12271950)	.02262**
REGMS	0.13668 (.14672871)	0.01154
REGBC	0.13279 (.14718490)	0.01122
INC	-0.00116 (.00328812)	-0.0001
LSTYLEF	-.22930* (.13418676)	-0.02126
LSTYLEC	-0.1335 (.13489007)	-0.01215
LSTYLEE	0.0018 (.10524133)	0.00016
GEND	0.09719 (.07955896)	0.00869
AGE3	-.60549*** (.20659685)	-.06205**
AGE4	-.93484*** (.19861640)	-.09891***
AGE5	-1.04500*** (.21601239)	-.11624***
AGE6	-1.35047*** (.21776209)	-.16163***
Rsweet	0.14219 (.08660562)	.01249*
Rcal	0.02471 (.08771499)	0.00217
Rcarb	-0.00975 (.09686898)	-0.00086
Rfat	-0.04238 (.09619801)	-0.00371
Rsalt	-0.0992 (.08608373)	-0.0088
ADDvit	0.07835 (.08035158)	0.00688
ADDfib	-0.11882 (.09711007)	-0.01026
ADDfv	-0.11853	-0.01026

Variables (Y=CHFood)	Coefficients	Marginal Effects
		Y = 1
	(.09168977)	
ADDwm	0.06688 (.08138781)	0.00589
CONV	.17829** (.08287546)	.01586**
TASTE	-.18557** (.08411504)	-.01617**
AFFORD	0.05748 (.08016276)	0.00506
HLTNUT	-0.08794 (.08473216)	-0.00776
NoHLTNUT	-0.04113 (.16914634)	-0.00367
WTPfort	0.04651 (.09083225)	0.00406
WTPhlt	0.09755 (.08170728)	0.00863
NFTeve	0.00686 (.09880567)	0.0006
NFTsmt	-0.00881 (.12705620)	-0.00077
NFThb	0.08858 (.18184224)	0.00755
NFThc	.23835** (.09827336)	.01993**
NFTsp	0.00057 (.08423904)	.50087D-04
NFTnev	0.14879 (.17371332)	0.01253
Dietsymb	-0.01292 (.03657853)	-0.00114

*, **, *** = Significance at 1%, 5%, 10% levels.
N = 8115
Log Likelihood function = -2646.260
Number of parameters = 40
McFadden Pseudo R-squared = .0222501
Chi squared = 120.4388
Degrees of freedom = 39

6.3.1 Socio-Demographic Variables

Among the statistically significant socio-demographic variables in 2007 are participants who are more educated and the ones who are in the age group of 65 years and older. Although very small, both groups are less likely to be concerned with healthy eating on a daily basis. On the contrary, living a family lifestyle

increases the probability of eating healthy at least one meal a day by 1.4%, compared to a single lifestyle as the base category. Our finding for the age group of 65+ participants confirms previous findings (Bogue, 2005) that older consumers tend to be less concerned with healthy eating issues. Surprisingly, no regional differences seem to exist, nor does income or gender play a significant role in this model. Again, the results for 2008 are very different. In 2008 regional differences and all age groups are highly influential factors impacting the probability of the dependent variable. For example, participants in the Maritimes and Ontario (compared to living in Alberta as the base region) tend to be more concerned with eating one healthy meal a day. In comparison to the results for 2007, concerns for healthy eating are decreasing with increasing age in 2008. Lifestyle does not seem to influence healthy eating concerns according to the 2008 data.

6.3.2 Healthy Eating Variables

Overall, the results suggest that consumers that are actively changing their diet and food purchasing behaviour towards healthier eating, as can be expected, tend to also be more concerned about healthy eating on a daily basis. Particularly, reducing the intake of sweeteners (artificial or sugar), calories, fat, cholesterol, or trans-fatty acids, and salt/sodium positively influence the probability of eating one healthy meal a day in 2007. Also, participants who are consciously incorporating vitamins or minerals, fibre, omega 3, organics, probiotic active culture or whole

grains, and fruits or vegetables into their diet are significantly more likely to be concerned with healthy eating.

In 2007, people who are considering convenience, taste, affordability, and health when thinking about healthy eating, are more likely to eat healthier during the day. Recall, participants where asked "Thinking about healthy eating, convenience (taste, affordability, health and nutrition) is the most important in my purchase decision". This implies that the above attributes positively contribute to buying healthy foods and, hence, positively affect those consumers concerns over healthy eating. As expected, the variable "I don't choose foods for health or nutritious purposes" significantly decreases the probability of eating at least one healthy meal a day.

There are significant differences between the 2007 and the 2008 model. Almost all food purchase factors lose their significance in 2008. The variable TASTE even changes sign in 2008. This means, while taste positively impacted the probability of the dependent variable in 2007, it has the opposite effect in 2008.

6.3.3 Organic Variables

In 2007 respondents who stated to be willing to pay more for healthier types of foods (WTPhlt) tend to have a higher probability of being concerned about healthy eating on a daily basis. This does not hold in the case of consumer's willingness to pay for fortified foods including organic foods (WTPfort). None of the two coefficients and their marginal effects is statically significant in 2008.

6.3.4 Nutrition Labelling Variables

We found that participants who refer to the Nutrition Facts tables based on habits and beliefs (NFThb) are less likely to eat a healthy meal a day in 2007. This means, consumers with specific eating traditions (e.g., Halal, Kosher, vegetarian) tend to be less concerned about healthy eating in general. This maybe due to certain constrains these consumers face when making food choice decisions in line with their beliefs and habits. On the other hand, participants who refer to the Nutrition Facts tables only for special occasions (NFTsp) are more likely to be concerned about healthy eating.

In 2008, the variable NFThc, which represents participants who refer to Nutrition Facts Tables in case of a health condition, is statically significant. This means that consumers that considered a health condition, when referring to the Nutrition Facts tables were more likely to also be concerned about eating healthy on a daily basis.

6.3.5 Summary and Discussion

Against our expectation none of the traditional socio-economic variables that have been found to play a role in explaining food purchase behaviour in previous studies turn out to be significant. Income, household education, urban-rural, or gender seems to not influence Canadian consumers concerns about eating healthy on a daily basis significantly. Household size and presence of children were captured by different lifestyle variables (LSTYLE-X) and therefore did not enter

the model explicitly. Only family lifestyle turned out to positively affect healthy eating behaviour.

An important finding in this model is that increasing age does not necessarily mean that a household cares more about a healthier diet. Especially, the results for the year 2008 show a sudden shift towards a lower degree of concern over healthy eating. The annual report of the Heart and Stroke Foundation (2006) supports this study, reporting that compared to 10 years ago, the rate of obesity, physical inactivity, and lack of knowledge about health related issues, has increased among those Canadians that constitute today's Baby Boomer generation. A similar shift in responses and results is obvious from the findings on participant's reductions and increases in the intake of the ingredients related to healthy eating concerns. A strong positive causal relationship in 2007 disappears almost completely in 2008. However, with the given data it is not possible to explore which factors have triggered these shifts in consumer's perceptions between 2007 and 2008.

An interesting finding is the positive coefficient for the variable NFThc (Referring to the Nutrition Facts table on packaged foods/beverages when considering health conditions). This variable shows that Canadian consumers do use nutrition information particularly when considering health conditions (e.g., diabetes), with a direct positive linkage to healthy diet concerns. Previous research by Drichoutis et al. (2009), Kim et al. (2000), Teisl et al. (2001), and Variyam et al. (1996), have confirmed that use of nutrition labels can lead to better food choices and improve overall diet qualities.

Overall, this model confirms the conclusion made with the previous model regarding the discrepancies between 2007 and 2008. The results suggest that Canadian consumers have adopted several health and healthy eating behaviours that may have influenced the way participants responded to this questionnaire in its second year 2008.

To check the robustness of the above findings I re-estimated the above model (CHFood) using a logit model on a combined panel dataset. The panel model results largely confirm the findings of the 2007 sample ordered logit model. Both, the direction of influence and magnitude of the explanatory variables were very close to the estimates presented in table 6.3.

Based on the significant factors described in model results analyses (tables 6.3 and 6.4), the typical consumer most concerned about healthy eating is characterized as a person who lives in a family, pays attention to the nutritional components of his diet, and seeks information on food packages, especially when he has an existing health condition. Information on consumer profiles could be valuable to policy makers for identifying target populations.

From these two regression analyses and the general profile of the participants of both surveys, the recommendation to policy makers and food industry would be to invest more on research and innovation for healthier food options in the food market (e.g., reduced fat, sodium, and sugar products, fortified with vitamins, minerals, fibre, and probiotics food products) and provide easier to understand, and more accessible information on Nutrition Facts Tables, especially for

consumers who have existing health conditions. Also, policy makers may want to target families, since those are show the greatest concerns about health and diet.

6.4 Levels of Concern with Obesity

Tables 6.5 and 6.6 present estimated coefficients and marginal effects of socio-demographic, healthy eating, and nutrition labelling variables on the probability of levels of concern with obesity. Using an ordered logit model, table 6.5 presents the results of the analysis of the 2007 survey data and table 6.6 presents the same analysis based on the 2008 data. Both models are statistically significant, as evident from their Chi-squared values. Considering the McFadden Pseudo R-squared values, 7% of the variation in the dependent variable is explained by the regression in 2007 and 1% in 2008.

Table 6.5 Factors Influencing the Probability of Levels of Concern with Obesity (2007)

Variables (Y=CObesity)	Coefficients	Marginal Effects		
		Y = 00	Y = 01	Y = 02
Constant	.46480** (.20469223)	0	0	0
HHHED	-.04191*** (.01354624)	0.00763	0.00118	-0.00881
URBRUR	-0.02546 (.04651375)	0.00464	0.00071	-0.00535
REGM	.15405* (.09205215)	-0.0272	-0.00593	0.03312
REGQ	.18884** (.08121878)	-0.03346	-0.00704	0.0405
REGON	0.1243 (.07623098)	-0.02236	-0.00401	0.02638
REGMS	.23127** (.09228256)	-0.04012	-0.01018	0.05029
REGBC	0.05727 (.09354066)	-0.0103	-0.00185	0.01215
INC	-.00648*** (.00200094)	0.00118	0.00018	-0.00136
LSTYLEF	0.02124 (.07575454)	-0.00386	-0.00062	0.00448
LSTYLEC	0.08466 (.07725054)	-0.0152	-0.00279	0.01799
LSTYLEE	0.06297 (.06503754)	-0.0114	-0.00191	0.0133
GEND	.09801** (.04979440)	-0.01803	-0.00242	0.02045
AGE3	0.07659 (.09545312)	-0.01378	-0.00247	0.01625
AGE4	0.03663 (.09396769)	-0.00664	-0.00109	0.00773
AGE5	0.08737 (.10641985)	-0.01571	-0.00283	0.01854
AGE6	-.20987* (.11013533)	0.03935	0.00374	-0.04309
Rsweet	.33546*** (.04900896)	-0.06122	-0.0091	0.07032
Rcal	.66897*** (.04988594)	-0.11571	-0.02925	0.14496
Rcarb	.30174*** (.05593354)	-0.05257	-0.01282	0.0654
Rfat	.49871*** (.05641003)	-0.09551	-0.0047	0.10021
Rsalt	0.0072	-0.00131	-0.0002	0.00151

Variables (Y=CObesity)	Coefficients	Marginal Effects		
		Y = 00	Y = 01	Y = 02
	(.04896506)			
CONV	.17410*** (.05184177)	-0.03201	-0.00432	0.03633
TASTE	-0.05454 (.04995945)	0.00991	0.00158	-0.01149
AFFORD	0.05581 (.04782110)	-0.01015	-0.0016	0.01175
HLTNUT	.16696*** (.05169594)	-0.03031	-0.00487	0.03518
NoHLTNUT	-.30903*** (.11565761)	0.05998	0.00148	-0.06146
HLTalt	-.10956*** (.02748751)	0.01995	0.0031	-0.02304
NFTeve	.30023*** (.05504743)	-0.05249	-0.01244	0.06493
NFTnev	-.28363*** (.07411349)	0.05442	0.00261	-0.05703
Dietsymb	.03225* (.01837546)	-0.00587	-0.00091	0.00678
Mu(1)	1.99947*** (.03193682)			

*, **, *** = Significance at 1%, 5%, 10% levels.
N = 7630
Log Likelihood function = -7626.754
Number of parameters = 32
McFadden Pseudo R-squared = .0771609
Chi squared = 1275.384
Degrees of freedom = 30

Table 6.6 Factors Influencing the Probability of Levels of Concern with Obesity (2008)

Variables (Y=CObesity)	Coefficients	Marginal Effects		
		Y = 00	Y = 01	Y = 02
Constant	1.42317*** (.16907356)	0	0	0
HHHED	-.02953** (.01275085)	0.00574	0.00056	-0.0063
URBRUR	0.02368 (.04323023)	-0.0046	-0.00046	0.00506
REGM	.24751*** (.08637126)	-0.04596	-0.00867	0.05463
REGQ	.21674*** (.07600954)	-0.04093	-0.00635	0.04728
REGON	0.1003 (.07232605)	-0.01934	-0.00222	0.02156
REGMS	0.11709 (.08642384)	-0.02228	-0.00313	0.02541
REGBC	0.06245 (.08778080)	-0.01201	-0.00145	0.01345
INC	0.00164 (.00184540)	-0.00032	-0.00003	0.00035
LSTYLEF	0.08575 (.07222178)	-0.01649	-0.00198	0.01847
LSTYLEC	0.10887 (.07241831)	-0.02083	-0.0027	0.02353
LSTYLEE	-0.06131 (.06086745)	0.01198	0.00105	-0.01304
GEND	-0.05011 (.04557915)	0.0097	0.00104	-0.01074
AGE3	-.51860*** (.08865666)	0.10785	-0.00443	-0.10342
AGE4	-.69830*** (.08558106)	0.14509	-0.00631	-0.13878
AGE5	-.64631*** (.09691443)	0.135	-0.00714	-0.12786
AGE6	-.91511*** (.09924235)	0.19584	-0.02167	-0.17417
Rsweet	-0.0257 (.04866554)	0.005	0.00049	-0.00548
Rcal	0.02465 (.04920353)	-0.00478	-0.00049	0.00527
Rcarb	0.02441 (.05474706)	-0.00473	-0.00049	0.00523
Rfat	0.02884 (.05304465)	-0.00562	-0.00053	0.00615
Rsalt	-0.07411	0.01446	0.00132	-0.01578

Variables (Y=CObesity)	Coefficients	Marginal Effects		
		Y = 00	Y = 01	Y = 02
	(.04834445)			
CONV	0.03813 (.04688162)	-0.00742	-0.00071	0.00813
TASTE	-0.01306 (.04663895)	0.00254	0.00025	-0.00279
AFFORD	0.05246 (.04499084)	-0.0102	-0.001	0.0112
HLTNUT	0.03483 (.04769247)	-0.00677	-0.00067	0.00744
NoHLTNUT	0.0779 (.09539146)	-0.01493	-0.0019	0.01683
HLTalt	.04378* (.02488644)	-0.00852	-0.00083	0.00935
NFTeve	0.00376 (.04960298)	-0.00073	-0.00007	0.0008
NFTnev	0.08243 (.07059280)	-0.0158	-0.00201	0.0178
Dietsymb	0.00476 (.02047286)	-0.00093	-0.00009	0.00102
Mu(1)	1.82847*** (.02729863)			

*, **, *** = Significance at 1%, 5%, 10% levels.
N = 8114
Log Likelihood function = -8674.651
Number of parameters = 32
McFadden Pseudo R-squared = .0108255
Chi squared = 189.8699
Degrees of freedom = 30

6.4.1 Socio-Demographic Variables

Household head education, living in the Maritimes, Quebec, or Manitoba/Saskatchewan, income, gender, and Age6 (65 and older) are statistically significant in 2007. Household education, income, and Age6 negatively impact the probability of being very concerned with obesity in the household. However, the latter group of variables have marginal effects that are of a very small magnitude. Living in the Maritimes, Quebec, and Manitoba/Saskatchewan

(compared to living in Alberta) increases the probability of occurrence of the dependent variable. An important finding that confirms previous studies is that women tend to be more concerned about diet-health related issues such as obesity (Nayga, 1998a; Bogue et al., 2005). However, being female increases the probability of obesity concerns by only 2%. Also of importance are the results for the impact of education and income. Both marginal effects are negative, indicating that more educated and wealthier consumers are less concerned about obesity in their households. Better education and higher income may directly related to knowledge levels of obesity, hence mitigating concern levels of these consumers (Nayga, 1998a; Mancino et al., 2004). As was found in previous models consumers age 65 and older (Age6) tend to be less concerned about obesity.

In 2008, household head education, living in the Maritimes and Quebec, Age3, Age4, Age5, and Age6 are statistically significant. Marginal effects of all of these variables have similar signs compared to 2007. One of the few variables that produces similar results in 2008 is education. Also, the regional differences in obesity concerns still exist in 2008, indicating that continuous media attention to the North American obesity epidemic influences people's perceptions and concerns over this diet-health issue. Moreover, similar to the findings in the previous models we find a strong negative relationship between age and concern levels for health, diet, and in this case obesity. This result is contrary to the common hypothesis that concerns over health and diet matters increase with increasing age. As was found in previous models many of the significant variables

in 2007 are insignificant in 2008 (gender, income, healthy eating, labelling). Given the limitations of the available data it is difficult if not impossible to determine what led participants to change their answers in such a significant way in 2008. Recall respondents in both years to a very large extent overlap, which means that almost each individual participated in the Nielsen Health and Wellness survey in two consecutive years.

6.4.2 Healthy Eating and Nutrition Labelling Variables

The results presented in table 6.5 supports many of the common assumptions about the relationship between diet-health perceptions, behaviours, and concerns such as obesity. For instance, participants who in 2007 had lowered their intake of sweeteners, calories, carbohydrates, cholesterol, fat, or trans-fatty acids during the past three months, are more likely to be very concerned about obesity in their households. The model also confirms that consumers who pay more attention to health and nutrition in their daily food shopping and all claimed to always to nutrition labels state to be more concerned about obesity. On the contrary, people that do not consider health and nutrition at all when purchasing food and never read food labels do also seem to not care about obesity. Interestingly, we find that a higher valuation of convenience in healthy foods positively affects the obesity concern level among survey participants.

In 2008, the probability of being very concerned with obesity is only affected by the variable “substituting ingredients for healthier alternatives when cooking”. However, its marginal effect is very small.

6.4.3 Summary and discussion

In contrast to the many previous studies exploring socio-economic factors and their relation to obesity, the above analysis produces none of the common significant variables: income, gender, education, household size (family lifestyle in our model), etc. However, the results emphasise an interesting positive relationship between participant's awareness, healthy eating behaviour, and obesity concerns. In contrast, participants who do not follow healthy eating guidelines and do not use any nutrition labelling information also do not care about obesity.

The key factors in 2007 with the highest positive influence on the probability of being very concerned with obesity in household are decreasing the intake of sweeteners, calories, carbohydrates, cholesterol, fat, and trans-fatty acids in their diet during the past three months and checking the Nutrition Fact table on food packages every time shopping for household grocery.

Food ingredients and their nutrition level play a significant role in people's perception of obesity and their food purchase behaviour in 2007. However, the same attributes are not as influential in 2008. There is a possible explanation that the 2008 survey responses were influenced by the 2007 ones. Meaning that even the respondents that were not that concerned about health and diet, might started researching and caring more about it after participating in survey 2007 and it impacted their responses in 2008 in a way that when they were participating in survey 2008, they have already taken a healthier lifestyle. It might was not captured because of two separate models for each year.

To check the robustness of the above findings I re-estimated the above model (CObesity) using a logit model on a combined panel dataset. The panel model results largely confirm the findings of the 2007 sample ordered logit model. Both, the direction of influence and magnitude of the explanatory variables were very close to the estimates presented in table 6.5.

Based on the significant factors described in model results analyses (tables 6.5 and 6.6), the typical consumer most concerned about obesity can be described as a person who lives in eastern Canada, pays attention to the nutrimental quality and healthy attributes in his diet, shows a preference for convenience in healthy food options, and actively seeks information on food packages. Information on different consumer profiles could be valuable input into health and nutrition policy making process. Knowledge about different consumer profiles could also assist more targeted investment decisions in terms of research and development of healthier food options for the Canadian food market (e.g., healthier convenience food products, reduced fat, sodium, and sugar products, fortified with vitamins, minerals, fibre, and probiotics food products) and provide easier to understand, and more accessible information on Nutrition Facts Tables and Dietary Symbols on food packages. Also, policy makers may want to target more eastern provinces of Canada, since those are the consumers who show concerns about obesity and diet.

6.5 Conclusion

Tables 6.1 to 6.6 represent the results of the binary and ordered logit models based on the 2007 and 2008 Nielsen Health and Wellness surveys. The three dependent variables are: level of concern with potential future health problems, being concerned with eating one healthy meal a day, and the level of concern with obesity in the household.

The above analyses have shown that the classic socio-economic variables often discussed in the context of consumer behaviour and health, do not explain health, diet, and obesity concern levels among participants of the Nielsen Health and Wellness survey. However, the analyses do show that healthy eating behaviour, use of food labelling information, and preferences for specific foods or nutrition do significantly influence people's awareness and concerns about diet and health. Both sets of conclusions are interesting from a policy and also industry perspective. The lack of significant results for income, education, and other economic factors suggests that a simple segmentation of Canadian consumers by income or education will not allow policy makers to reach those households that need to be supported to achieve better nutrition and health outcomes. For instance, a recent news series and study initiated by the Canadian Broadcasting Corporation (CBC) labelled "Live Right Now" found that the majority of Canadians have reasons other than income or education that prevent them from exercising regularly and eating a healthier diet (CBC, 2011). In order to reach many Canadians and specially those that need to change diet behaviour the most, policy makers may need to adopt other instruments targeted more at

differences in preferences, food shopping habits, and usage of food labelling information among Canadian consumers. For instance, in the case of convenience being the most important factor in consumer healthy food purchase decision, all the effort of policy makers and food industry innovation should be towards provision of healthier convenient food options.

In terms of industry relevant findings the above results show that especially consumers who already have adopted more healthy eating patterns are often those more concerned about diet and health. Product innovations targeted at health conscious consumers are likely to be successful in the marketplace. The above analyses has shown that concerned consumers are those who tend to actively seek healthy food options, search for and use nutrition relevant information through labelling signals and other information.

One limitation of these analyses was the stark differences in the significance of variables between 2007 and 2008. We believe that the fact that almost all respondents participated in both survey years largely affected the quality of the survey results in the year 2008 and because of two separate models for each year the influence is not captured. Unfortunately, this limitation prevents us from making any further conclusions on changes in healthy eating behaviours from 2007 to 2008.

Chapter 7

Stated and Revealed Purchase Behaviours

7.1 Introduction

Stated preference models are a survey-based economic technique to evaluate participants' willingness to pay for something that does not have a market price and is not being sold directly, such as environmental factors, or health. In contrast, revealed preference models measure the utility people receive from a good which has a market price and is being sold directly. Revealed preference theory, pioneered by Samuelson in 1938, indicates that consumer preferences can be directly revealed from observing their purchasing habits.

The analyses in the previous chapter were based on respondent's stated attitudes, perceptions, preferences, and recent changes in their dietary behaviour. As with many consumer surveys, response to stated preference surveys can not be taken as a true predictor of consumer's actual behaviour. Participants in stated preference research tend to over or under state their true beliefs and/or behaviours.

Because of these limitations the above analysis may not reflect Canadian consumers' actual attitudes towards healthy eating, their consumption of specific healthy and/or unhealthy foods, and diet-health related concerns. In order to get a better understanding of consumers actual healthy eating behaviour, we need to analyse their revealed preferences that can only be obtained from real market data. The Nielsen Homescan panel tracks the meat purchases of individual households

across all Canadian provinces. The dataset records all meat purchases for 16,515 Canadian households over the period 2002 to 2008.

In this chapter, the meat purchases from the Homescan data for 2008 and the Health and Wellness Survey responses for 2008 are linked together by those households that participated in both surveys. In total, 7,056 households participated in both Nielsen surveys in 2008. The objective for this analysis is to investigate differences between the stated food-health perceptions and behaviours and participating household's revealed food preferences in terms of their meat product purchases in 2008. This way we are able to check whether the level of Canadian consumer's stated health concerns is reflected to some extend in their households' meat expenditure.

7.2 Overview of the Homescan Panel Dataset

The Nielsen Homscan dataset includes individual purchases of all meat categories including fresh and frozen meat cuts, by random weight and UPC coded products. The dataset also records household demographics such as age and gender of the primary shopper, income, region, presence of children, household size, etc. The individual purchase records provide information on meat products by processing type (PRTYP) and product form (PRFRM) to identify fresh meat products or processed meats. The classification and definition of processing levels used in the following analyses are based on a previous study by Zhang (2010).

This analysis considers all meat purchases by product type (PRTYP) and product form (PRFRM) for all participating consumers that have spent at least $1

to purchase meat in 2008. We classify a meat product as “fresh” if neither “PRTYP” or “PRFRM” category information suggests any processing. In addition, each meat category, except for UPC products, is divided into beef, pork, poultry, and other meat products.

Tables 7.1 and 7.2 summarize household meat expenditures, in dollars, in 2008 by product form (PRFRM) and product type (PRTYP). Both tables indicate that a large number of products are not identifiable by product type or product form. With regards to product form, ground meat is clearly the most important product form in consumer meat demand, followed by steak and other popular meat cuts. Sausages are the most preferred processed product form. There is no dominant fresh or processed meat type.

Table 7.1 Nielsen Homescan Meat Processing Form (PRFRM) and Expenditure

Code	Meat Form	Expenditure / Package
Fresh Meat		
129239	NOT APPLICABLE	$1,353.88
129261	GROUND	$751.82
340512	STEAK	$555.74
340506	CHOPS	$363.05
340507	ROAST	$292.67
340518	RIBS	$110.85
317632	CUBES	$88.48
340516	SPLIT	$16.73
340513	FILLETS	$12.54
340533	CUT UP	$10.60
340561	ALL TYPES	$10.27
340539	MEDALLIONS	$10.02
340560	MINCED	$7.92
350888	PORTION	$7.10
345031	RIBLETS	$5.75
353574	SLAB	$4.21
129263	MINI	$3.20
353256	FLAP	$2.00
356409	ROSETTE	$1.35
317578	PIECES	$1.29
Processed Meat		
340748	SAUSAGES	$178.01
340509	KABOBS	$62.25
129260	STRIPS	$26.83
340515	TOURNEDOS	$25.34
340508	CUTLETS	$25.22
344949	PATTIES	$20.07
340537	SCALLOPINI	$14.74
129242	SLICED	$13.10
317447	SLICES	$9.53
340524	SCHNITZEL	$6.78
340555	COTTAGE ROLL	$4.56
340526	ROULADEN	$4.47
340536	MEATBALLS	$1.81
357815	TENDERS	$1.54
340563	BURGERS	$1.34
340562	MEATLOAF	$1.21

Source: Based on Nielsen Homescan Data, period week 01 of 2008 until week 52 of 2008.

Table 7.2 Nielsen Homescan Meat Processing Type (PRTYP) and Expenditure

Code	Meat Type	Expenditure / Package
Fresh Meat		
344945	NOT APPLICABLE	$3,333.44
344953	GRADE A	$39.36
139654	FAST FRY	$32.66
347426	FRENCH STYLE	$20.89
343210	MILK FED	$18.64
139655	FRYER	$17.58
344954	FRYER GRADE A	$17.42
345502	ANGUS	$15.39
343879	GRAIN FED	$13.65
139653	ROASTER	$10.28
345012	MINUTE	$9.46
345015	SIMMERING	$8.40
354334	FRENCHED/GRILLING	$5.81
360470	GRILLING/ANGUS	$4.28
139688	FRYING	$3.37
345063	ROASTER GRADE A	$1.67
346193	SIMMERING/FAST FRY	$1.61
354339	GRADE AAA	$1.48
139662	FRENCHED	$1.22
Processed Meat		
045311	SEASONED	$120.83
344950	GRILLING	$111.44
139671	SMOKED	$60.52
344974	MARINATING	$30.03
139661	UTILITY	$15.36
139663	TENDERIZED	$15.19
110376	BLACK FOREST	$11.60
340868	BREADED	$9.43
139660	MARINATED	$9.32
139673	CORNMEALED	$9.29
099965	STUFFED	$8.18
345004	SALTED	$6.44
346196	VERMONT	$5.44
352675	CRISPY	$5.02
345098	ROASTED/SEASONED	$4.78
346197	PEAMEAL	$3.92
139689	COUNTRY STYLE	$3.21
368387	FRENCHED/BREADED	$2.60

Code	Meat Type	Expenditure / Package
350881	DOUBLE SMOKED	$2.23
314401	ST LOUIS STYLE	$1.64
345060	CORNED	$1.30
350884	MECHOUI	$1.29
353577	BREADED/TENDERIZED	$1.26
374025	QUICK	$1.15
345028	SEASONED/BREADED	$1.07

Source: Based on Nielsen Homescan Data, period week 01 of 2008 until week 52 of 2008.

7.3 Hypothesis

Much of the debate over healthy eating in Canada is related to unbalanced diets and over-consumption of saturated and trans-fats, salt and sugar. High consumption levels for meat and meat products have been noted to be a major contributor to consumer's fat and sodium intake.

Among all meat types, beef and pork are known to have higher levels of saturated fat relative to poultry meat. In addition, processed meats often contain additives such as preservatives, added sodium, sugar, bread crumbs, fat, etc., that may make such products even less healthy options. Based on Canadian's stated concerns over diet and health, reviewed in chapter 4, I expect a direct relationship between expressed health concerns and participants meat purchase decisions observed through their expenditure patterns across all meat types and processing categories:

1- Households that are more concerned about health will purchase less processed meats than not concerned households.

2- Households that are more concerned about health will have lower total meat expenditures than not concerned households.

3- Households that are more concerned about health will purchase less beef and pork and more poultry than not concerned households.

7.4 Illustration of the Revealed and Stated Purchase Behaviour

Figures 7.1 to 7.24 illustrate the number of households that participated in 2008 Nielsen survey, which provides us with detailed information about their meat purchases of products of different processing levels, as well as their total household expenditure for meat in 2008 in Canadian dollars. To investigate whether households with different levels of concern for health, healthy eating, or obesity differ in their annual expenditure levels for meat products, we calculated the average household's meat expenditure across different concern levels (the dataset, however, does not allow us to perform the same analyses for the quantity of meat products purchased or the average price paid for meat). Figure 7.1 shows the total number of households who have purchased different meat products grouped by their level of concern about future health problems. Figure 7.2 illustrates the average household expenditure levels for different concern levels about future health problems as stated by respondents in the Nielsen Health and Wellness survey.

Figure 7.1 Number of Households Purchasing Meat Products by Concern Levels about Future Health Problems, 2008

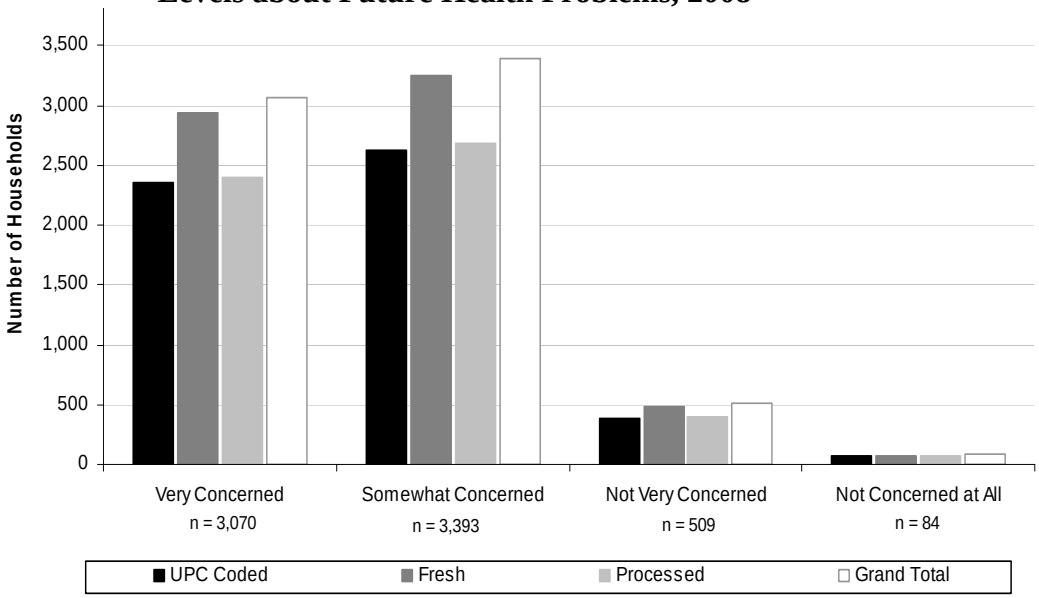
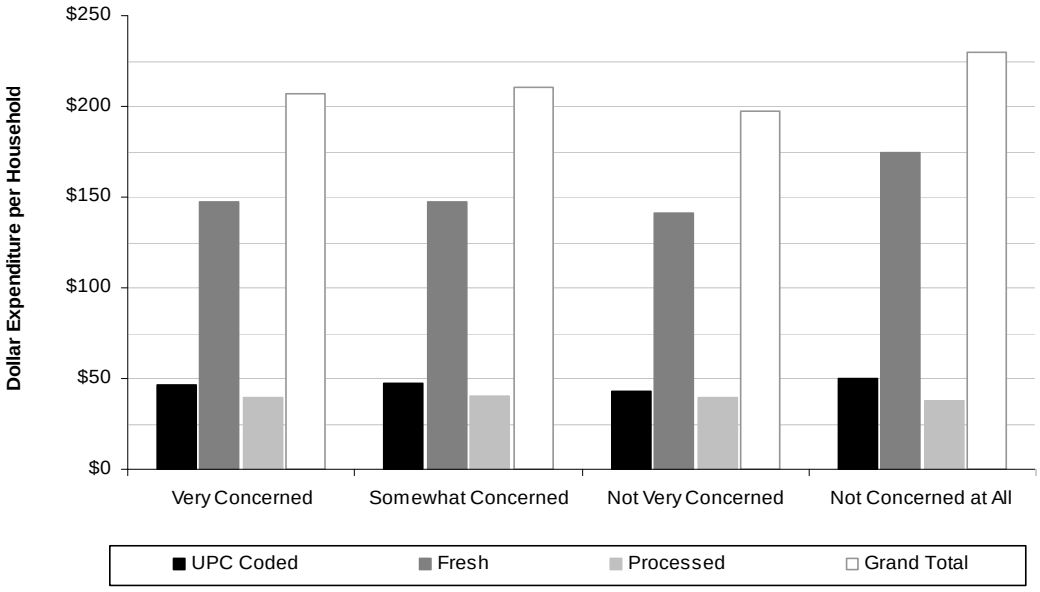


Figure 7.2 Average Household Expenditures for Meat Products by Concern Levels about Future Health Problems, 2008



As shown in figure 7.1, the majority of households consider themselves as very or somewhat concerned about potential future health problems. A very small group of participants stated they are not very concerned or not concerned at all. Fresh meat is the most popular meat type among all groups of households. Shown in figure 7.2, all three groups of very, somewhat, and not very concerned households show similar meat expenditure patterns for all three meat categories. The "not concerned at all" participants, as expected, have the highest total meat expenditure per household, especially on the fresh and UPC coded types of meat.

A t-test has been used to test the null hypothesis that total processed meat expenditures are the same between "not concerned at all" and "very concerned" participants. The result of the t-test fails to reject the null hypothesis. Also, because UPC is considered as a processed product, a t-test has been used to test the null hypothesis that total UPC expenditures are the same between "not concerned at all" and "very concerned" participants. The result of the t-test fails to reject the hypothesis. To test the null hypothesis that the total meat expenditures are the same between "not concerned at all" and the "very concerned" participants another t-test was used and the result of the t-test fails to reject the null hypothesis. Note: All t-tests are only between the "very concerned" and "not concerned at all" participants.

Figure 7.3 shows the number of households who have purchased a specific meat type with different processing levels grouped by their concern levels about future health problems. Figure 7.4 illustrates the average household expenditure

level for different meat types and processing levels grouped by household's concern levels about future health problems.

Figure 7.3 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Future Health Problems, 2008

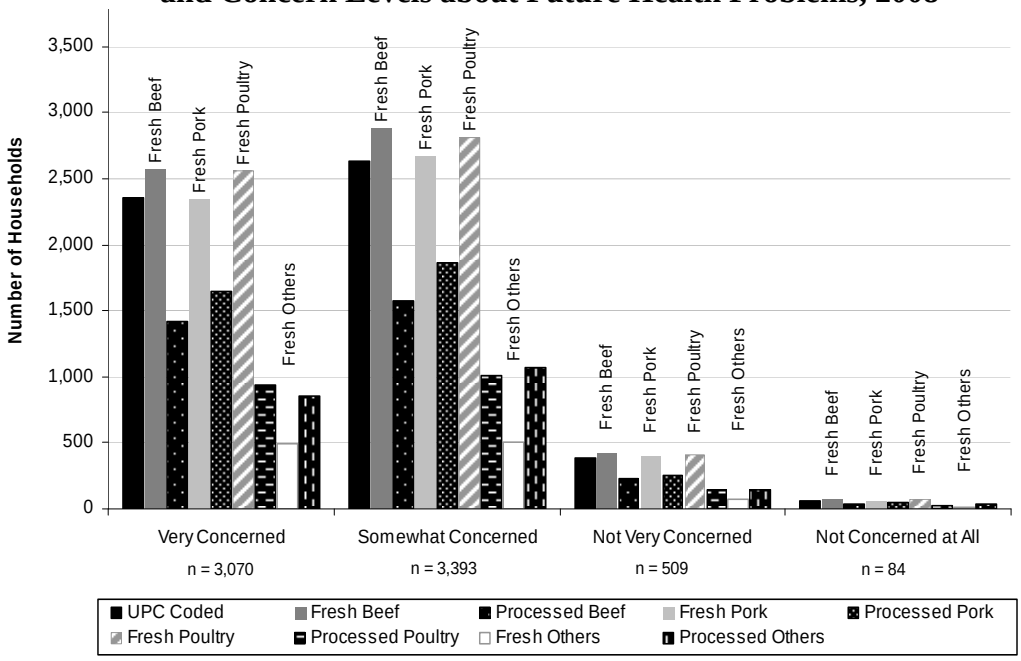
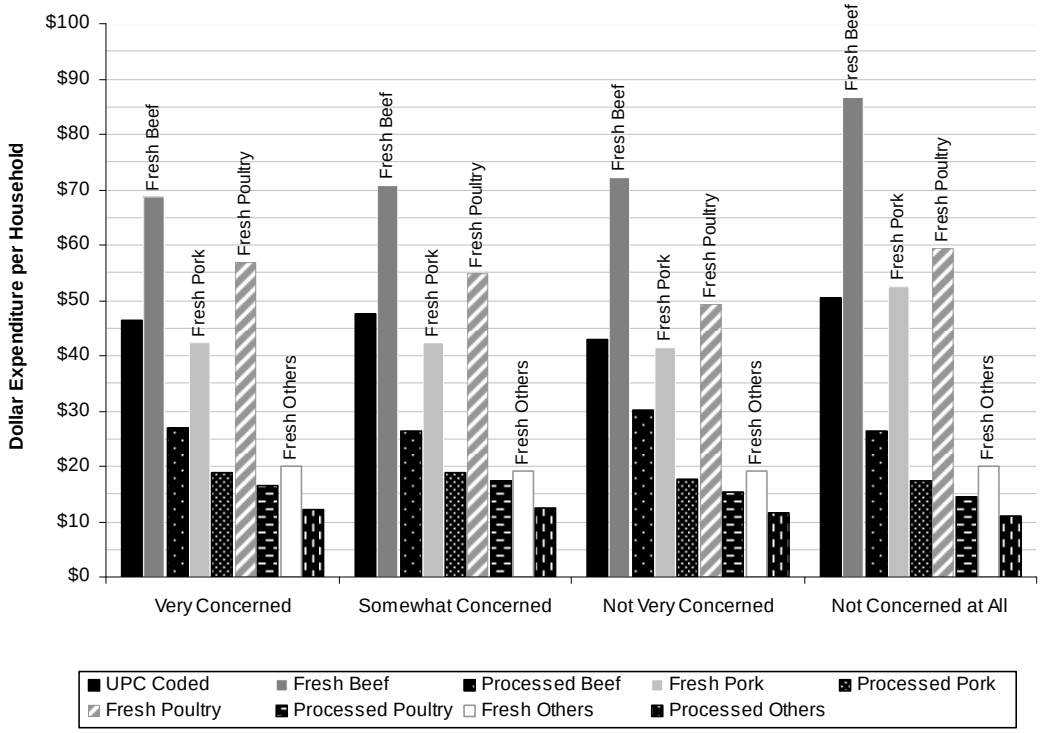


Figure 7.3 shows a similar distribution of household numbers as figure 7.1. Fresh meat products and UPC coded packaged meat products are consumed by the majority of the households. Figure 7.4, however shows a more interesting picture. While fresh beef expenditure decreases with increasing health concern levels, fresh poultry expenditure is higher for very concerned households when compared to not very concerned households. Fresh pork expenditure does not seem to vary with health concern level. Households that are not concerned at all about their future health status show the highest meat expenditure levels overall.

Figure 7.4 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Future Health Problems, 2008



The three groups of very, somewhat, and not very concerned do not show significant differences in meat expenditure across all meat product categories. Based on the figure, it can be concluded that households with different levels of concerns with general personal health status do not differ significantly in their meat product expenditure across fresh and processed product categories.

Figure 7.5 shows the total number of households who have purchased a specific level of processed meat products grouped by different concern levels about eating at least one healthy meal a day. Figure 7.6 shows the total meat expenditure of the same households.

Figure 7.5 Number of Households Purchasing Meat Products by Different Concern levels about Eating at Least One Healthy Meal a Day, 2008

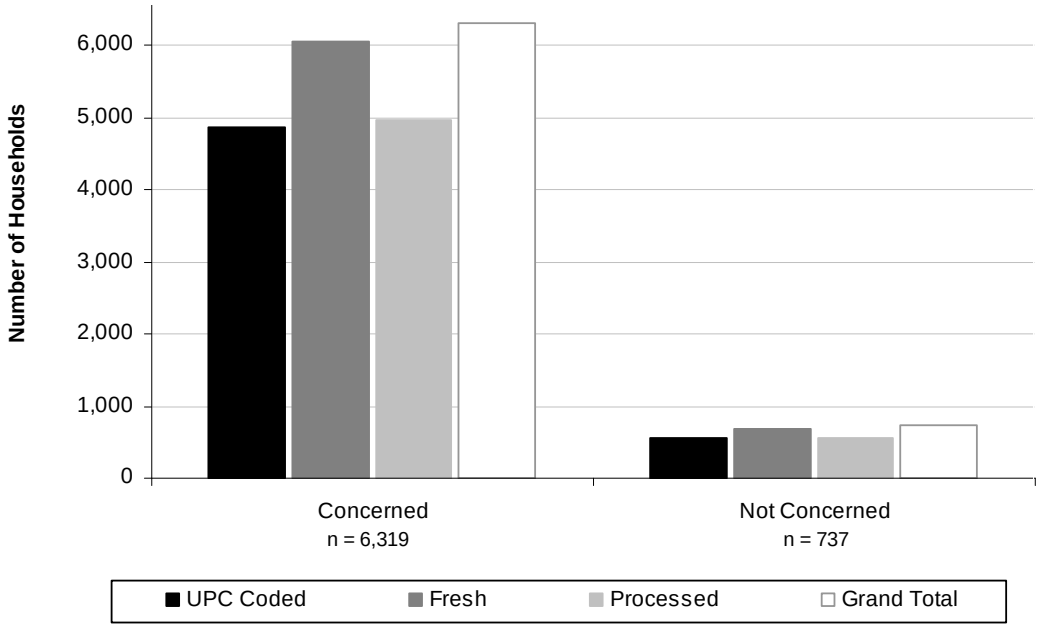
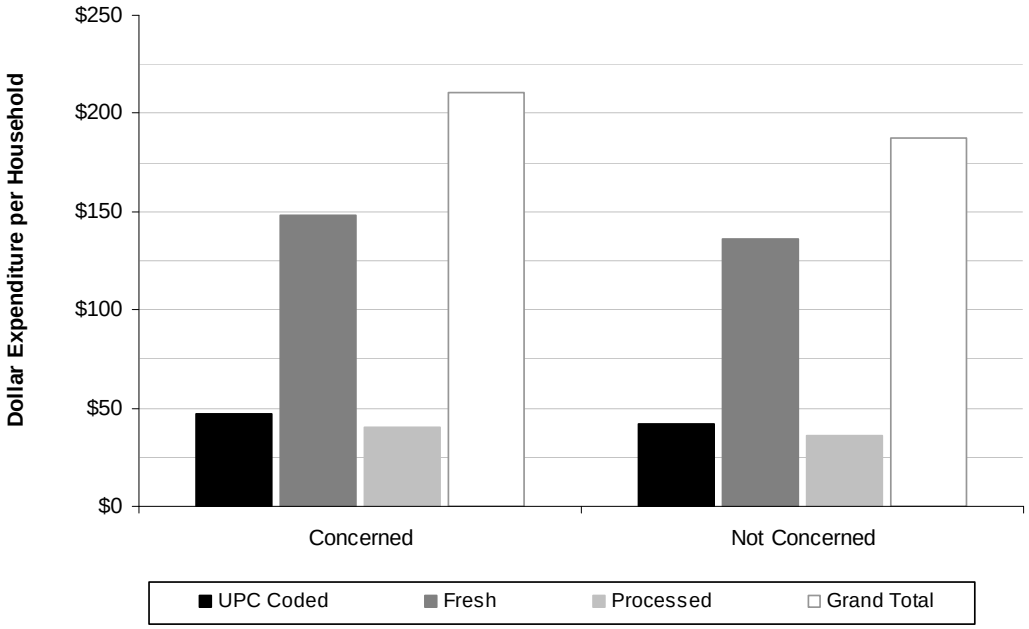


Figure 7.6 Average Household Expenditure for Meat Products by Concern Levels about Eating at Least one Healthy Meal a Day, 2008



Although the number of households "concerned with healthy eating" is significantly higher than the share of "not concerned" ones, there seem no significant differences in the total meat expenditures between these two groups for any of the meat product categories in the graph (UPC coded, fresh, and processed). A t-test has been used to test the null hypothesis that the total processed meat expenditures are the same between "concerned" and "not concerned" participants and the result of the t-test rejects the null hypothesis. Also, the result of the t-test to test the null hypothesis that the UPC (considered as processed) products expenditures are the same between "not concerned" and "concerned" participants rejects the null hypothesis. To test the null hypothesis that the total meat expenditures is the same between the "not concerned" and "concerned" participants, a t-test has been used and the t-test result rejects the null hypothesis. Note: All three t-tests are only between the "not concerned" and "concerned" groups.

Figure 7.7 illustrates the number of households that are "concerned" or "not concerned" with eating one healthy meal a day, and their meat consumption of different types and forms. Figure 7.8 shows each household's expenditure on the same meat products.

Figure 7.7 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Eating at Least one Healthy Meal a Day, 2008

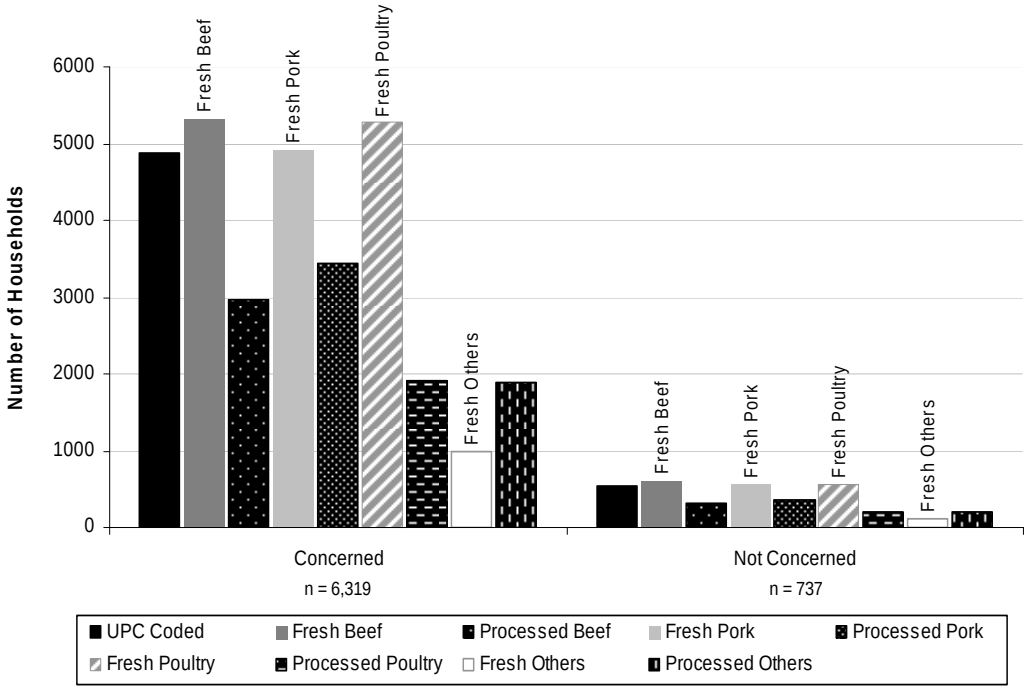
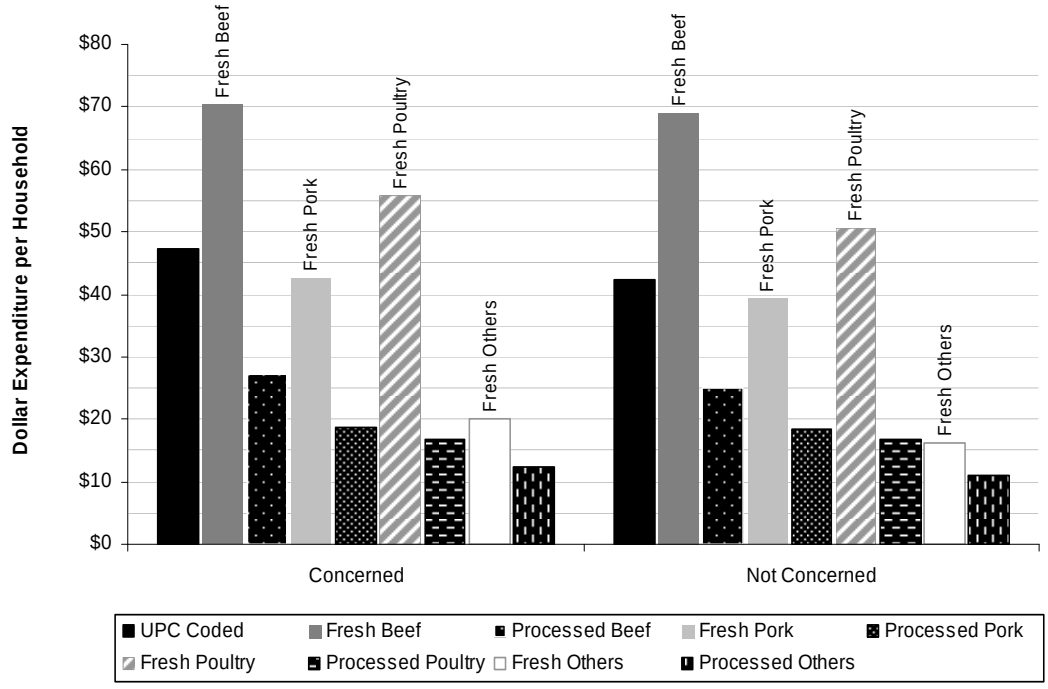


Figure 7.8 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Eating at Least one Healthy Meal a Day, 2008



The majority of surveyed households stated that they are concerned with the issue of healthy eating. Despite the stated concerns with diet and health, "concerned" households do not have lower total expenditure levels on meat products compared to households that seem to be not particularly concerned with eating healthy. "Concerned" households not only spent more on fresh meats, they also spent slightly more on some of the processed and UPC coded products. One plausible explanation for these higher meat expenditures could be that health concerned households buy meat products of higher quality or specific products only, therefore showing higher expenditures, but not higher quantities overall. Unfortunately, the lack of quantity and price information in the Nielsen Homescan data prevents us from further analysing this aspect.

Figure 7.9 shows the total number of participants that are "very", "somewhat", and "not at all" concerned about saturated fats in their diet and their meat consumption. Figure 7.10 shows household's average meat expenditures.

Figure 7.9 Number of Households purchasing Meat Products by Concern Levels about Saturated fats in Household's Diet , 2008

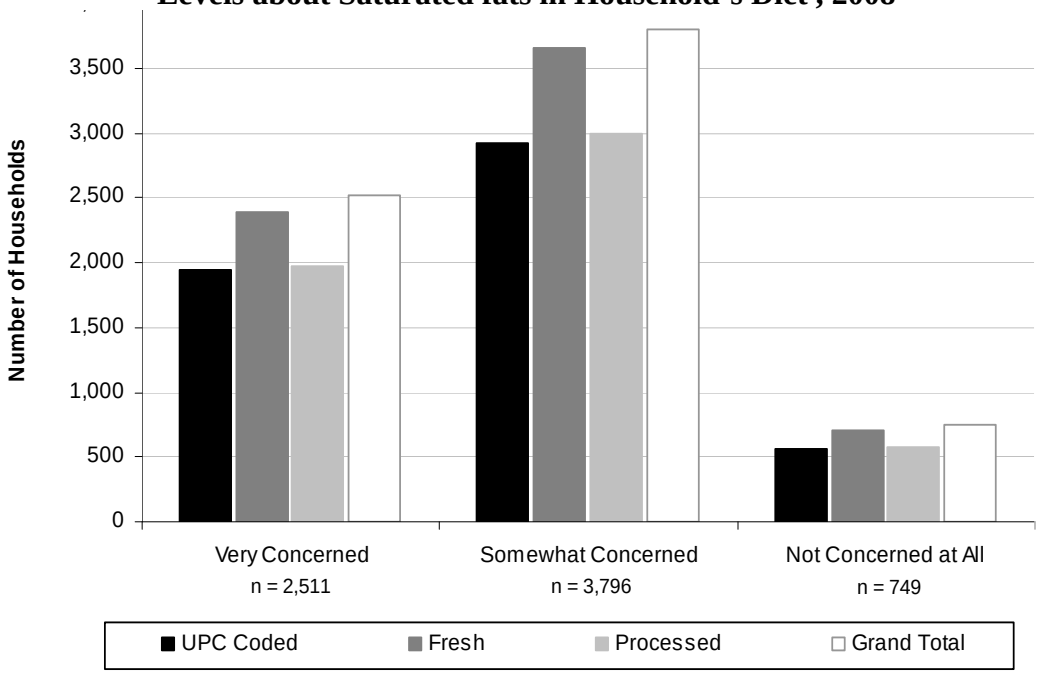


Figure 7.10 Average Household Expenditure for Meat Products by Concern Levels about Saturated fats in Household's Diet, 2008

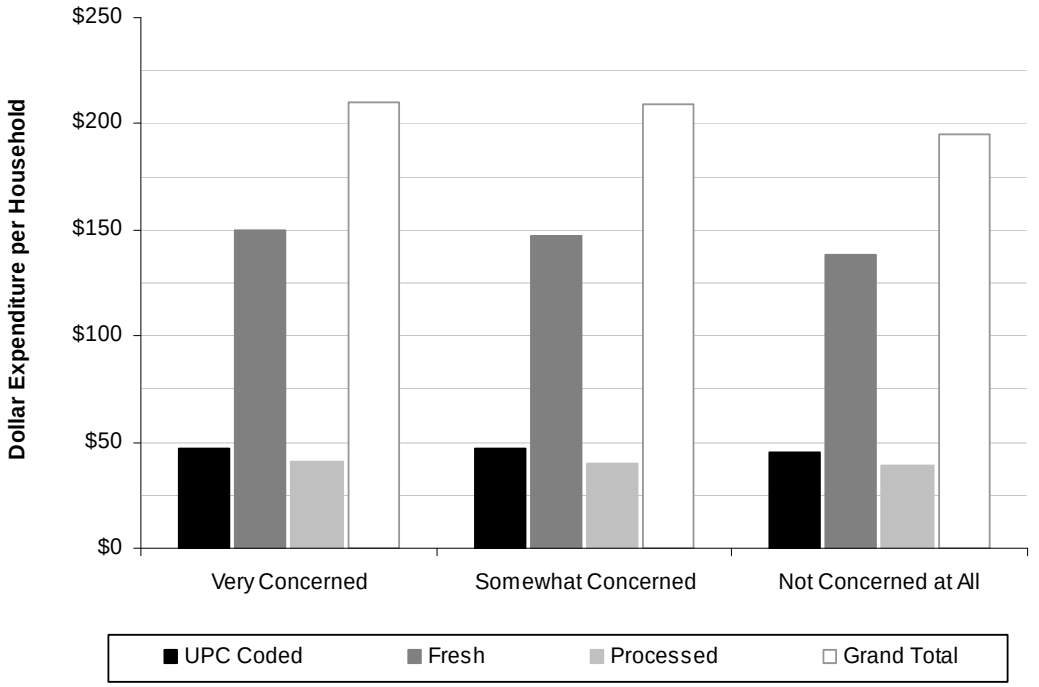


Figure 7.9 shows that the majority of participants are only somewhat concerned about the level of saturated fat in their diet and according to figure 7.10, there is no major variation in household's expenditure for various processed meats across different concern levels. A t-test was used to test the null hypothesis that the total processed meat products expenditures are the same for "very concerned" and "not concerned at all" participants. The result of the t-test fails to reject the null hypothesis. Another t-test was used to test the null hypothesis that the total expenditures of UPC products are the same for the "very concerned" and "not concerned at all" participants. The result of this t-test also fails to reject the null hypothesis. A t-test was used to test the null hypothesis that the total meat expenditures are the same for "not concerned at all" and "very concerned" participants. The result of the t-test rejects the null hypothesis. Note: All three t-tests are only between the "very concerned" and "not concerned" groups.

Figures 7.11 and 7.12 below present household numbers and their expenditure levels relative to their concerns about saturated fats in their diet.

Figure 7.11 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Saturated Fat in Household's Diet, 2008

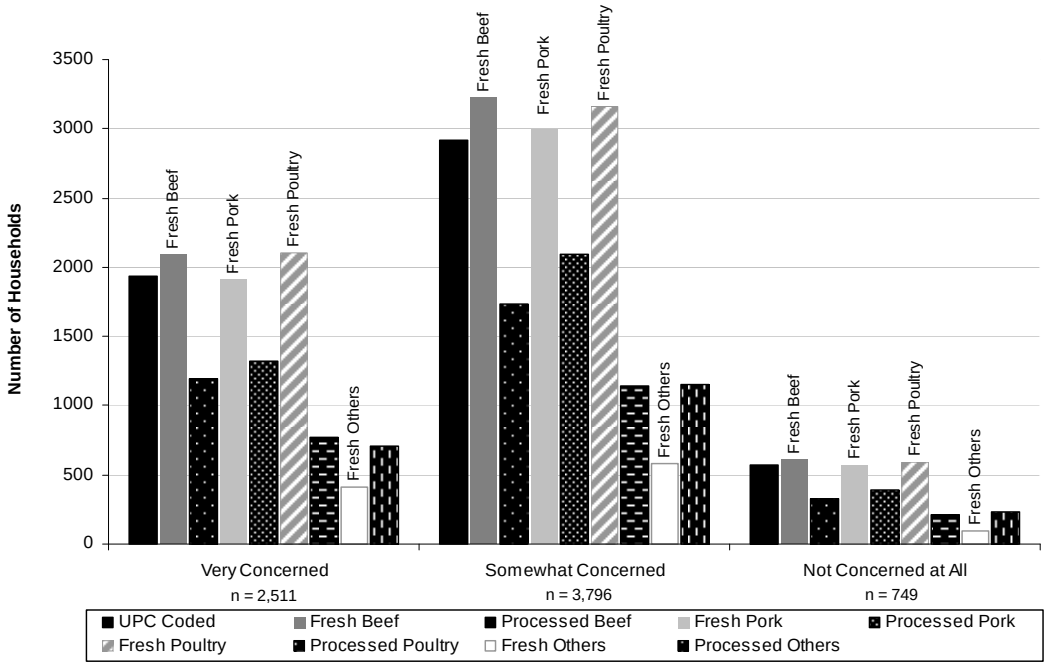
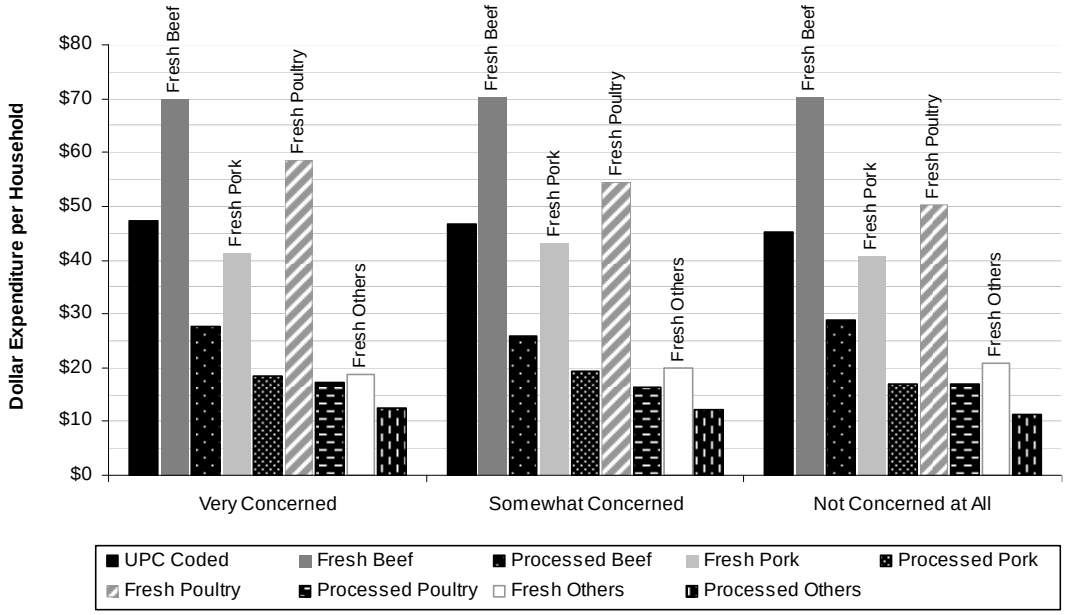


Figure 7.12 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Saturated Fat in their Household's Diet, 2008



Again, fresh meats are favourite product form among households. As concern levels increase, so does household expenditure on fresh poultry. This could mean that more concerned households spend more on poultry products that are well known to be a lower fat meat product option. Other than that, there are no significant differences in overall meat expenditure across products or concern categories.

Figures 7.13 and 7.14 relate household numbers and meat expenditures to participants stated concern levels about obesity in their household.

Figure 7.13 Number of Households purchasing Meat Products by Concern Levels about Obesity in their Households, 2008

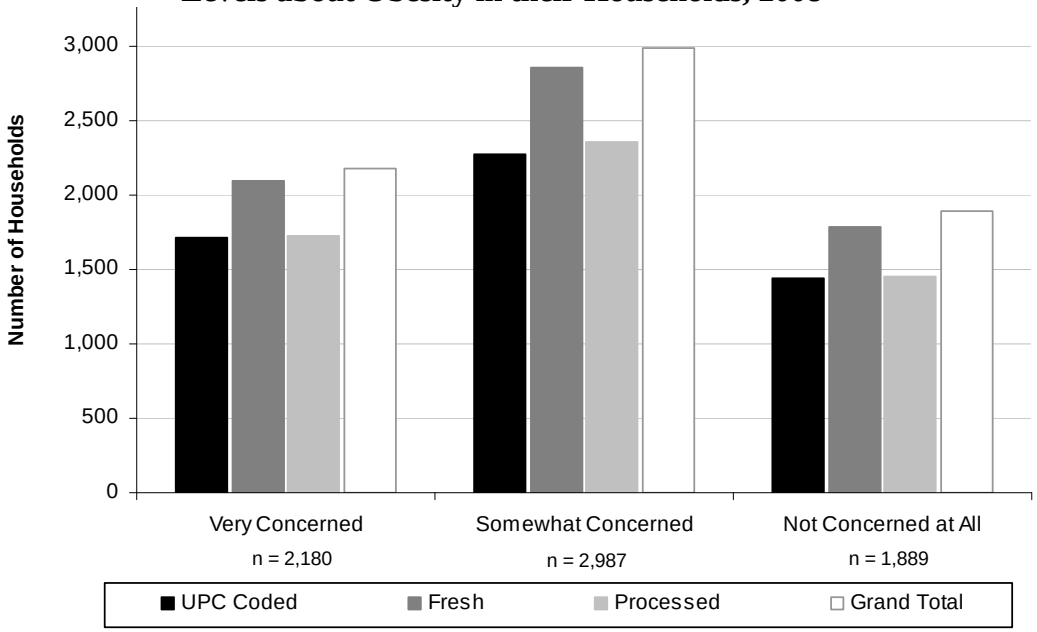


Figure 7.14 Average Household Expenditure for Meat Products by Concern Levels about Obesity in their Households, 2008

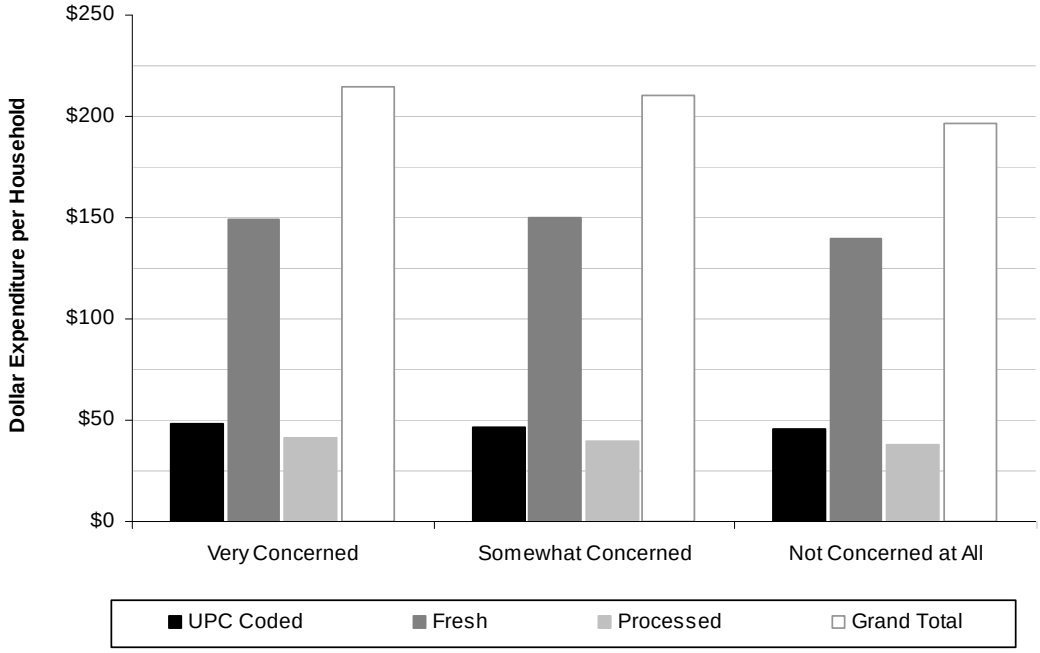


Figure 7.13 shows that similar to saturated fats, the people who are "somewhat concerned" about obesity represents the largest group and could be thought of not being a significant concern to consumers. In contrast to the previous distributions of household numbers for different concern categories, we find a much more balanced distribution with regards to obesity concerns. 26% of respondents said they were not at all concerned about obesity. To reinforce this finding, the total meat consumption of the very concerned participants is slightly higher than the "not at all concerned" ones. The household expenditure patterns in figure 7.14 are also similar to those for saturated fats, with fresh products being the most popular choice among consumers. One interesting finding is that the "very concerned" participants are spending more on UPC products compared to the other groups.

Although this difference is marginal, it means that even consumers who are "very concerned" about obesity prefer convenience and "ready-to-eat" meat product.

A t-test was used to test the null hypothesis that the total expenditures on processed meat products are the same for "very concerned" and the "not concerned at all" participants. The result of the t-test rejects the null hypothesis. Another t-test was used to test the null hypothesis that the total expenditures on UPC products are the same for "very concerned" and "not concerned at all" participants and the result of the t-test fails to reject the hypothesis. To test the null hypothesis that the total meat expenditures are the same for "not concerned at all" and "very concerned" participants a t-test was used and the result of the t-test rejects the null hypothesis. Note: All three t-tests are only between the "very concerned" and "not concerned at all" participants.

Figures 7.15 and 7.16 below present household numbers and their expenditure levels relative to their concerns about obesity in their household.

Figure 7.15 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Obesity in their Household's Diet, 2008

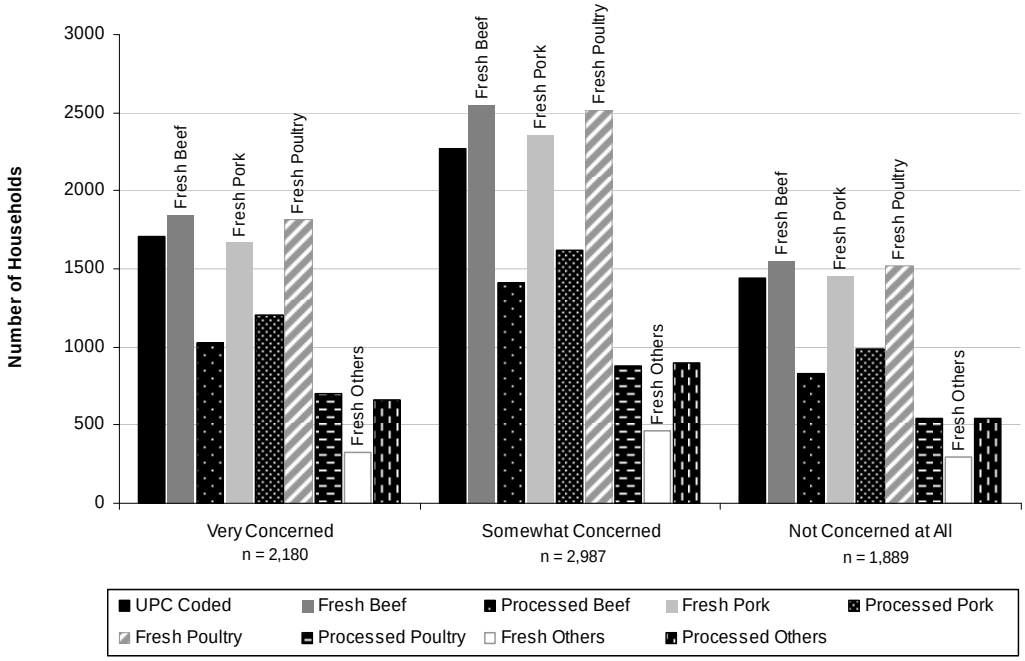
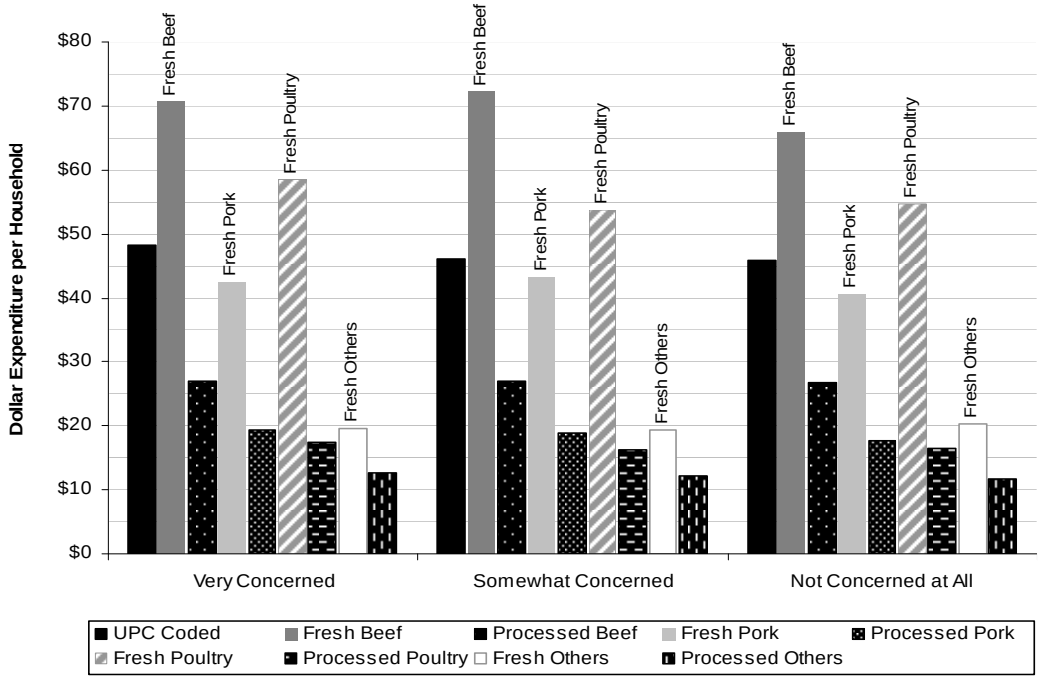


Figure 7.16 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Obesity in their Households, 2008



In Figure 7.15 the majority of households claim to be somewhat concerned with obesity, but yet again, it is not necessarily a significant concern to them.

Although expenditure per household for most meat types and different processing levels are very similar across concern levels, the expenditure on the fresh poultry and UPC coded products are the highest among very concerned households. Given the high expenditure rates for UPC coded products associated with higher levels of processing, across all three groups, it appears that even those who are "very concerned" with obesity prefer convenience over healthier options.

Figure 7.17 shows the total number of households who have purchased different meat products grouped by their level of concern about future health problems. Figure 7.18 illustrates the average household expenditure levels for different concern levels about future health problems as stated by respondents in the Nielsen Health and Wellness survey.

Figure 7.17 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Potential Future Health Problems, 2008

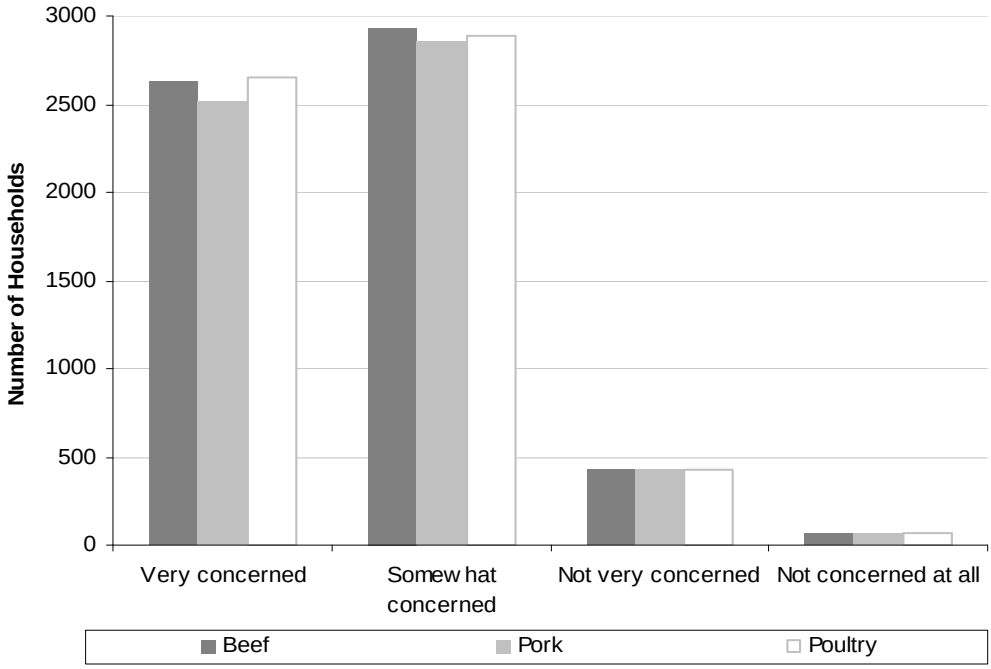
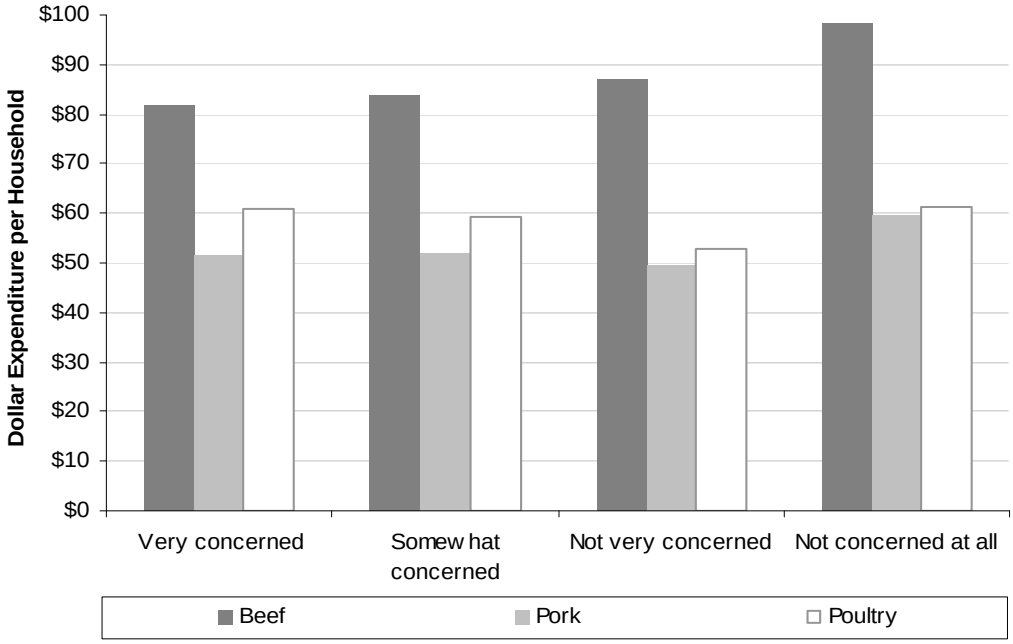


Figure 7.18 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Potential Future Health Problems, 2008



As shown in figure 7.17, the majority of households consider themselves as very or somewhat concerned about potential future health problems. A very small group of participants stated they are “not very concerned” or “not concerned at all”. In figure 7.18, all three groups of “very”, “somewhat”, and “not very” concerned households show similar meat expenditure patterns for all three meat categories, with beef being the most popular, then poultry, and lastly pork. Furthermore, the “not concerned at all” participants have the highest total beef and pork expenditure per household.

A t-test was used to test the null hypothesis that the total beef expenditures are the same between “not concerned at all” and “very concerned” participants and the result of the t-test fails to reject the null hypothesis. Another t-test was used to test the null hypothesis that total pork expenditures are the same between “not concerned at all” and “very concerned” participants and the result of the t-test fails to reject the null hypothesis as well. The last t-test was used to test the null hypothesis that total expenditures of poultry are the same between “very concerned” and “not concerned at all” participants and the result of this t-test also fails to reject the null hypothesis. Note: All three t-tests are only between “very concerned” and “not at all concerned” participants.

Figure 7.19 illustrates the number of households that are “concerned” or “not concerned” with eating one healthy meal a day, and their different types of meat consumption. Figure 7.20 shows each household’s expenditure on the same meat products.

Figure 7.19 Number of Households purchasing Meat Products by Meat Type and Concerns about Eating at Least one Healthy Meal a Day, 2008

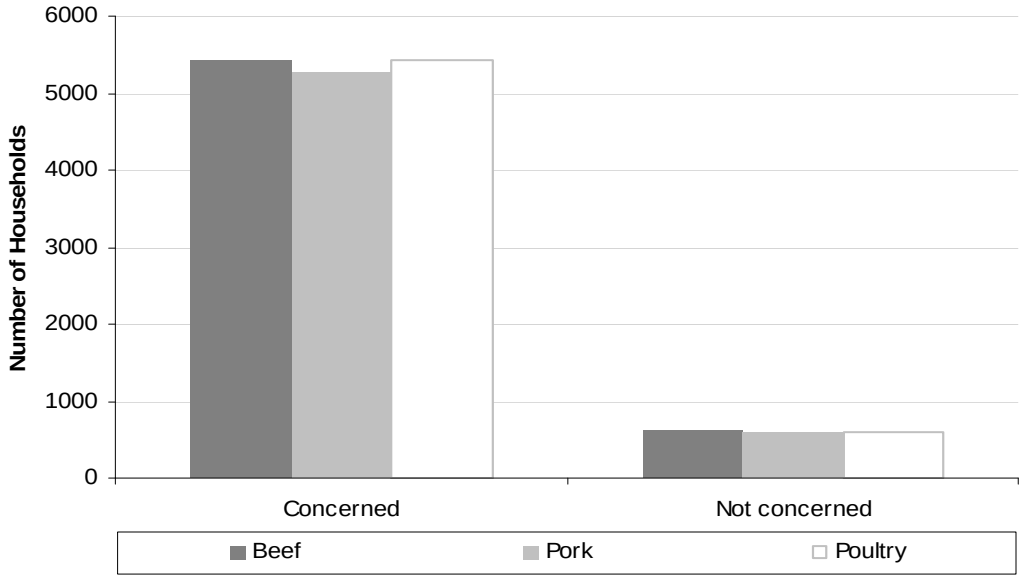
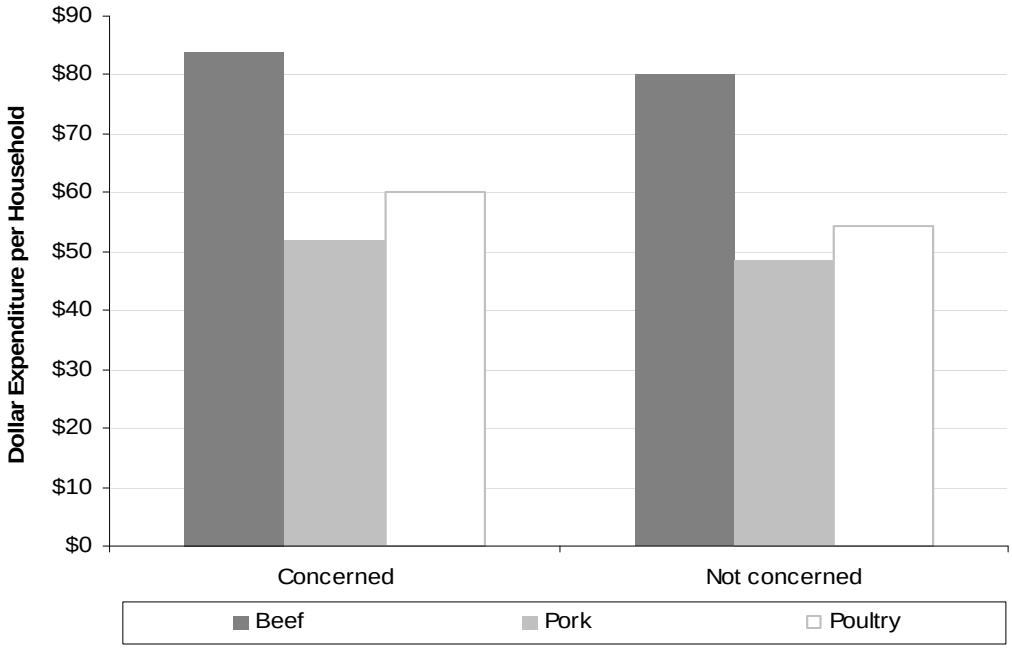


Figure 7.20 Average Household Expenditure for Meat Products by Meat Type and Concerns about Eating at Least one Healthy Meal a Day, 2008



Although the number of households “concerned with healthy eating” is significantly higher than the share of “not concerned” ones, there seem, the “concerned” households have slightly higher expenditure of all three groups of meat than the “not concerned” ones.

To test the null hypothesis that the total beef expenditures are the same between “concerned” and “not concerned” participants a t-test was used and the result of it fails to reject the null hypothesis. The second t-test was used to test the null hypothesis that the total pork expenditures are the same between “concerned” and “not concerned” participants and the result of it fails to reject the null hypothesis. The final t-test was used to test the null hypothesis that the total poultry expenditures are the same between “concerned” and “not concerned” participants and the result of it rejects the null hypothesis. Note: All three t-tests are only between the “concerned” and “not concerned” participants.

Figure 7.21 shows the total number of participants that are “very”, “somewhat”, and “not at all” concerned about saturated fats in their diet and their meat consumption. Figure 7.22 shows household’s average meat expenditures.

Figure 7.21 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Saturated fats in Household's Diet, 2008

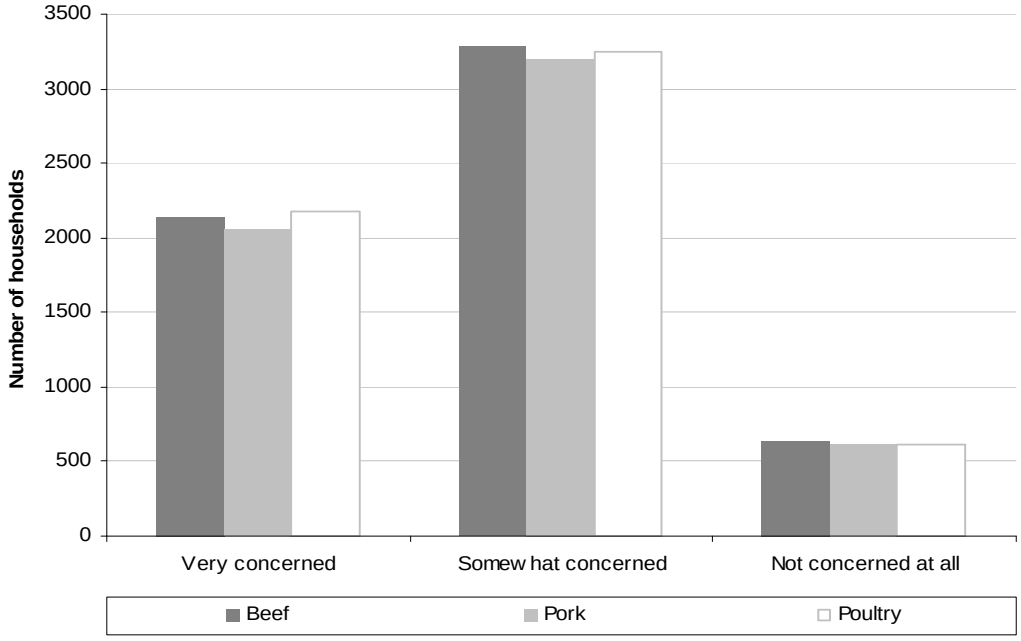


Figure 7.22 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Saturated fats in Household's Diet, 2008

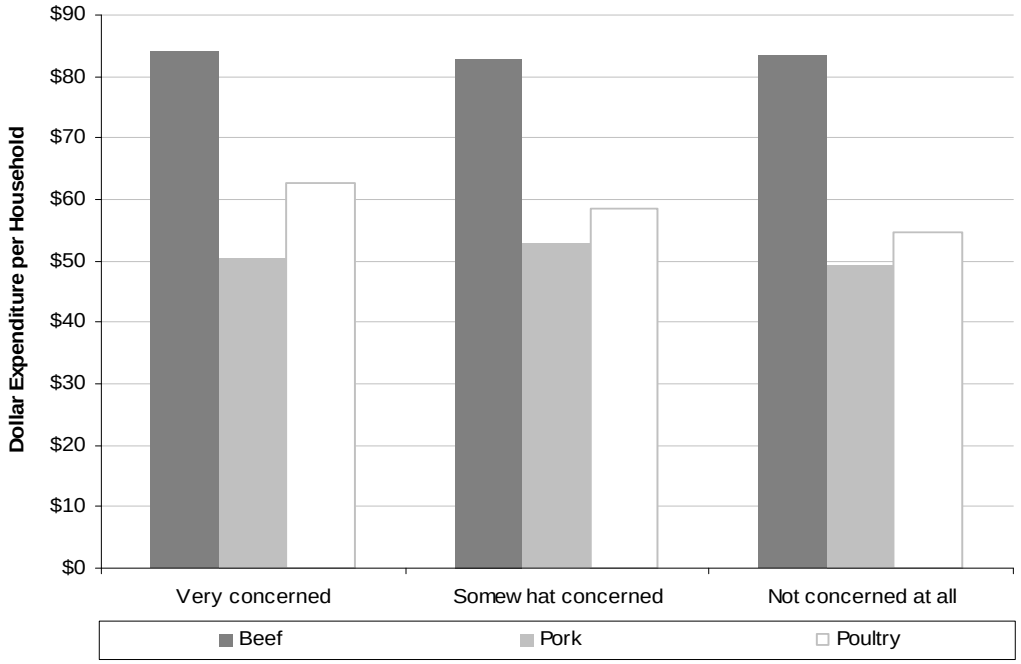


Figure 7.21 shows that the majority of participants are only somewhat concerned about the level of saturated fat in their diet and according to figure 7.22, there is no major variation in household's expenditure for beef and pork across different concern levels. To test the null hypothesis that total beef expenditures are the same between the "very concerned" and "not at all concerned" participants a t-test was used and the result of it failed to reject the null hypothesis. Another t-test was used to test the null hypothesis that total pork expenditures are the same between the "very concerned" and "not at all concerned" participants and the result of it fails to reject the null hypothesis.

Total expenditure of poultry, however, seem slightly higher in the "very" concerned group, as opposed to the "not at all" ones. The t-test was used to test the null hypothesis that total poultry expenditures are the same between the "very concerned" and "not at all concerned" participants and the result of the test rejects the null hypothesis. Note: All three t-tests are only between the "very concerned" and "not at all concerned" participants.

Figures 7.23 and 7.24 relate household numbers and average meat expenditures to participants stated their concern levels about obesity in their household.

Figure 7.23 Number of Households purchasing Meat Products by Meat Type and Concern Levels about Obesity in their Households, 2008

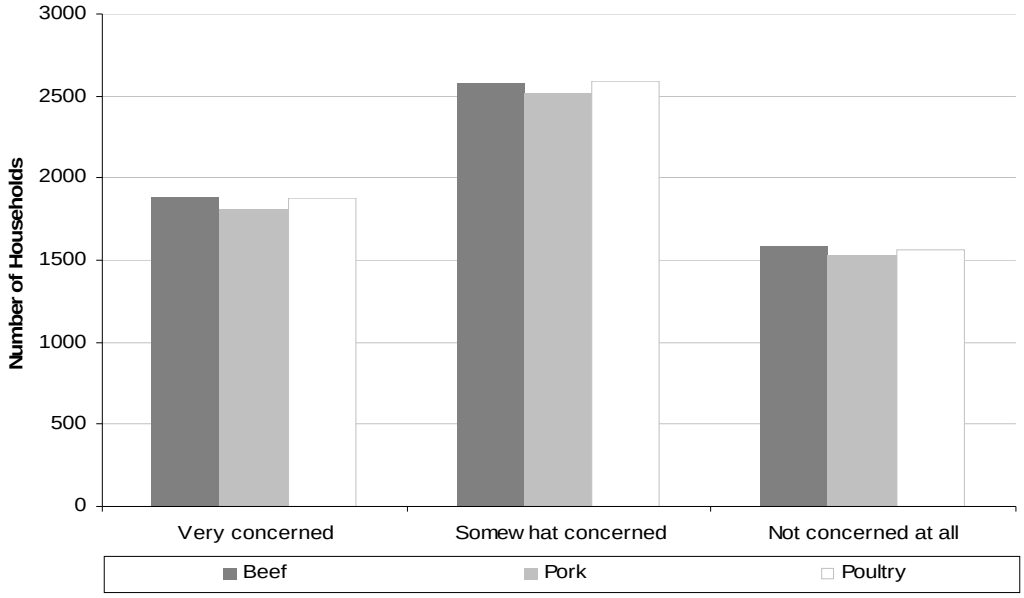


Figure 7.24 Average Household Expenditure for Meat Products by Meat Type and Concern Levels about Obesity in their Households, 2008

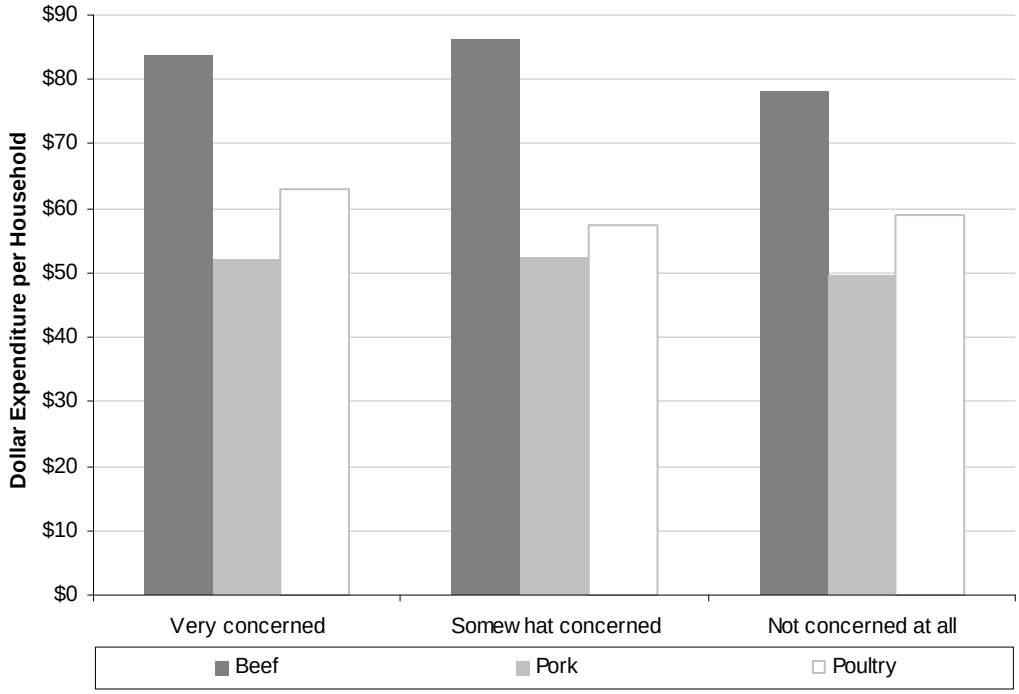


Figure 7.23 shows that similar to saturated fats, respondents who are "somewhat concerned" about obesity represent the largest group, which suggest that obesity can be thought of as not being a significant concern to consumers. In contrast to the previous distributions of household numbers for different concern categories, we find a much more balanced distribution with regards to obesity concerns. Beef and poultry are the most popular types of meat in all three groups; however, the "very" and "somewhat" concerned participants have higher total beef expenditure than the "not at all" concerned ones. The household expenditure patterns in figure 7.24 are also similar to those for saturated fats, with beef products being the most popular choice among consumers. One interesting finding is that the "very" and "somewhat" concerned participants are even spending more on beef products compared to the "not at all" concerned group.

To test the null hypothesis that the total beef expenditures are the same between the "very" and "not at all concerned" respondents a t-test was used and the result of it fails to reject the null hypothesis. The second t-test was used to test the null hypothesis that total pork expenditure are the same between the "very" and "not at all concerned" participants and the result of the test fails to reject the null hypothesis. The last t-test was used to test the null hypothesis that the total poultry expenditures are the same between the "very" and "not at all concerned" respondents and the result of it fails to reject the null hypothesis. Note: All three t-tests are only between the "very" and "not at all" concerned respondents.

7.5 Discussion

In general, fresh meat products are much more popular among all households, regardless of their level of concern, when compared to expenditures for UPC coded and other processed products. Only in the case of future health problems do "concerned" and "very concerned" households show a lower level of total expenditure on meat (figure 7.2). Overall, we can conclude that the stated health and diet concerns identified in chapter 6 do not, as expected, translate into changing household behaviour with regards to selecting and purchasing healthier meat options.

Additives and preservatives used in meat processing and ingredients in UPC coded and processed meats will make these products less healthy options compared to many fresh meat cuts. Sodium, sugar, saturated and trans-fats are examples of such additives in meat processing that have been associated with the increasing incidence of hypertension, obesity, diabetes, etc. among consumers. Although many consumers are increasingly concerned with their health and diet, their busy lifestyle and the growing selection of easy-to-prepare (and sometimes cheaper) products make these attractive and convenient options despite being generally less healthy.

Another plausible explanation in the context of the protection motivation theory is the potential lack of information on health and diet. As a consequence, consumers are not motivated enough to change their behaviour towards a healthier lifestyle. The results show that most consumers fall into the category of "somewhat" concerned which may underline their limited willingness or in other

words “motivation” to change their dietary behaviour. Despite the similarities in the distribution of households across concern levels and apparently very similar expenditure levels for meat types and degrees of processing, I still can not conclude with certainty whether participant’s actual meat consumption differs with their stated health and diet concerns. The Nielsen Homescan household meat purchase data does not report the actual quantities of products purchased, nor prices paid. This lack of information limits my ability to investigate the true meat choice pattern of households in different concern categories. For example, households that are very concerned about healthy eating may have strong preferences for specific, higher value meat cuts and processed meats, thus reporting high levels of meat expenditures relative to households with lower health concern levels. Regardless of these limitations the above analysis clearly shows that meat expenditure is indifferent to health and diet concern levels. The analyses suggest that there is a significant discrepancy between Canadian consumers’ stated diet and health concerns and their revealed meat purchase behaviour.

Chapter 8

Summary and Conclusion

The increasing incidence of diet-related health problems in Canada has caused growing concerns among Canadian consumers. Rising direct and indirect healthcare costs associated with poor diets and negative impacts of diet-related diseases on Canadian economy (e.g., productivity losses) have gained the attention of policy makers and researchers alike. Insufficient food labelling information, consumer nutrition-health education, and food industry regulations (e.g., trans-fat ban) have resulted in consumption decisions that led to suboptimal consumer's utility. Consequently, demand of unhealthy foods is still dominant impacting social welfare in a negative way.

However, emerging trends in consumer food purchase decisions, such as growing food-health concerns and positive attitudes towards healthy eating, have initiated a structural change in the Canadian food sector. The first objective of this thesis is to analyse Canadian consumers' attitudes, perceptions, and behaviours towards health and diet. The objective one in more details is, first, to investigate the impact of consumer characteristics such as socio-demographic factors, food purchase patterns, knowledge and usage of food labelling, on consumer's concerns about their future health status; second, to analyze the impact of the same factors on consumer's probability of making healthier food choices; and third, to analyse the influence of the above variables on household's obesity concerns.

The second objective of the thesis is to investigate the implications of diet-health preferences on Canadian consumers' meat purchases in order to determine to what extent the stated diet-health concerns from the first objective affect Canadian consumers' actual meat purchase decisions.

This study of consumer's consumption behaviour and linkages to health were imbedded into a social cognitive model framework, especially the Protection Motivation Theory (PMT) (Rogers, 1983). The PMT framework provided the basis for explaining how consumers perceive health threat related to food, their consumption decisions, and the mechanisms behind their motivation to change dietary behaviour in order to improve future diet-health status and minimize potential negative health outcome (Weinstein, 1993). The analyses in this thesis included a series of behavioural factors besides respondents numerous demographic characteristics to test whether these factors have any impact on Canadian consumer's stated level of concern about selected health and diet measures. The inclusion of these factors was aimed at testing whether potential coping strategies, for instance reducing fat, sugar, and salt intake to reduce the risk of cardiovascular diseases, diabetes, and high blood pressure influence respondents' motivation to adopt favourable dietary behaviour. Also, the inclusion of nutrition information variables was aimed at testing whether the provision of information has an impact on Canadian consumer's health concerns and motivation to initiate changes in their diets and food purchasing behaviour.

To address the objectives, this thesis uses two market research datasets provided by Nielsen Canada. The first dataset is the Nielsen Health and Wellness

survey with 7,630 and 8,114 participants in 2007 and 2008, respectively. The questionnaire includes a total of 70 questions about consumers' socio-demographic characteristics, healthy eating behaviour, and their concerns with the organic food, fat and saturated fat, obesity, and food package labelling. This data is used to estimate the impact of Canadian consumers' attitudes, perceptions, and behaviours on stated health, diet, and obesity concerns.

The second dataset used in this thesis is the 2008 Nielsen "Homescan" panel. The available "Homescan" panel dataset tracks all meat purchases of participating households across all Canadian provinces. One specific feature of the data is a large overlap in participating households between the two Nielsen datasets which allows us to directly link consumer stated concerns and their actual meat purchases.

Regarding the first objective, ordered logit and binary logit models were used to estimate how Canadian consumer's socio-demographic factors, food purchase patterns, knowledge and usage of food labelling affect their concern levels about their diet-health related issues. Since, it is common in stated preference research for participants to tend to over or under state their true believes and/or behaviours, the above analysis may not reflect Canadian consumers' actual attitudes towards healthy eating, their consumption of specific healthy and/or unhealthy foods, and diet-health related concerns. In order to get a better understanding of consumer's actual healthy eating behaviour, I analysed their revealed preferences (obtained from real market data) as well. The meat purchases from the Homescan data for 2008 and the Health and Wellness Survey responses for 2008 are linked together

for all those households that participated in both surveys. This way I was able to check the extension of Canadian consumer's stated health concern levels reflection in their households' meat expenditure.

8.1 Research Results

The results of the binary and ordered logit models (with the three dependent variables of level of concern with potential future health problems, being concerned with eating one healthy meal a day, and the level of concern with obesity in the household) have shown that the classic socio-economic variables do not explain much the above concern levels among participants of the Nielsen Health and Wellness survey. However, the analyses do show that healthy eating behaviour, use of food labelling information, and preferences for specific foods or nutrition do significantly influence people's awareness and concerns about diet and health (e.g., healthier convenient food options, healthier food options based on consumers beliefs and habits).

The results from the analysing the second objective have shown that the stated health and diet concerns identified in the first research objective do not directly translate into household behaviour with regards to selecting and purchasing healthier meat options. Although many consumers are increasingly concerned with their health and diet, their busy lifestyle and the growing selection of easy-to-prepare (and sometimes cheaper) products make these attractive and convenient options despite being often less healthy options.

8.2 Study Limitations

The analyses regarding the first research objective identified considerable differences in the significance of variables between 2007 and 2008. I believe that the fact that almost all respondents participated in both survey years largely affected the quality of the survey results in the year 2008. Unfortunately, this limitation prevents me from making any further conclusions on changes in healthy eating behaviours from 2007 to 2008.

Limitations of the second research objective analyses is caused by the lack of actual quantities of products purchased and prices paid in the Nielsen Homescan household meat purchase data. Therefore, I was not able to investigate the true meat choice pattern of households in different concern categories.

8.3 Policy Recommendations

From the first research objective results, specifically the lack of significant results for income, education, and other socio-economic factors suggests that a simple segmentation of Canadian consumers by income or education will not allow policy makers to reach those households that need to be supported to achieve better nutrition and health outcomes. In order to reach many Canadians and specially those that need to change diet behaviour the most, policy makers may need to adopt other instruments targeted more at differences in preferences, food shopping habits, and usage of food labelling information among Canadian consumers.

In terms of industry relevant findings the above results show that especially consumers who already have adopted more healthy eating patterns are often those more concerned about diet and health. Product innovations targeted at health conscious consumers are likely to be successful in the marketplace. The above analyses have shown that concerned consumers are those who tend to actively seek healthy food options, search for and use nutrition relevant information through labelling signals and other information.

However, based on the second set of analyses using the Homescan meat purchase data, the results show that meat expenditure is indifferent to health and diet concern levels among the participating households. The analyses further suggest that there is a significant discrepancy between Canadian consumers' stated diet and health concerns and their revealed meat purchase behaviour.

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Appendix A Percentages of Responses, August 2007 Health and Wellness Survey (N=7630)

Socio-Economics and Demographic Factors

Household Head Education		**Participant's Age**		**Region**	
Elementary School	3%	18-24	0%	The Maritimes	12%
Some High School	11%	25-34	7%	Quebec	23%
Completed High School	17%	35-44	21%	Ontario	32%
Some Technical or College	13%	45-54	26%	Manitoba/Saskatchew	11%
Completed Technical or College	23%	55-64	23%	Alberta	11%
Some University	9%	65+	22%	BC	11%
Completed University	23%				
Lifestyle		**National Urban vs. Rural**		**Gender**	
Single	26%	Rural	41%	Female	70%
Family	23%	Urban	59%	Male	30%
Childless	19%				
Empty Nesters	32%				
		Household Head Age			
Household Size				**Language**	
1 Member	26%	<35	6%	English	79%
2 Members	42%	35-44	21%	French	21%
3 Members	12%	45-54	25%		
4 Members	13%	55-64	23%		
5 Members	5%	65+	25%		
6 Members	1%				
7 Members	0%				
8 Members	0%				
9+ Members	0%				

Levels of Concern about Different Health Matters

	Very concerned	Somewhat concerned	Not very concerned	Not at all concerned
Losing weight	24%	49%	19%	8%
Improving body image	17%	54%	24%	5%
Minimizing potential future health problems	43%	49%	7%	1%
Minimizing signs of aging (e.g., wrinkles, etc.)	13%	42%	36%	9%
Reducing stress	29%	46%	21%	4%
Increasing energy levels	30%	53%	15%	2%

Healthy Eating Variables

The food group which the intake of it was reduced during the past 3 months		**Consciously was tried to incorporate into the diet/was increased during the past 3 months**	
Artificial sweeteners/sugar substitutes/sugar	52%	Vitamins and minerals	48%
Caffeine	21%	Fibre/ Omega 3/ Organic foods/Probiotic Active Culture/ Whole grain	71%
Calories	36%	Fruits and vegetables	73%
Carbohydrates	23%	Water/Milk	57%
Cholesterol/Fat/Trans fatty acids	71%		
Salt/Sodium	43%		
Most important factors in purchase decision when thinking about healthy food		**The importance level of food and beverage products being low in sugar or sugar-free**	
Convenience	61%	Not at all important	18%
Taste	58%	Not very important	31%
Affordability	46%	Somewhat important	34%
Health related purchase decisions	47%	Very Important	10%
I don't choose foods for health or nutritious purposes	8%	Extremely important	8%
Substituting ingredient(s) for more healthy alternatives when cooking		**Being very careful about eating and serving nutritious foods**	
Never	4%	Disagree Completely	17%
Rarely	28%	Agree Completely	4%
Sometimes	45%		
Most of the time	16%		
Every time	8%		
Reading the ingredient labels on food products very carefully		**Working hard at limiting the amount of fat and cholesterol in diet**	
Disagree Completely	24%	Disagree Completely	25%
Agree Completely	6%	Agree Completely	4%
Concerned about eating healthy at least for one meal a day	90%		

Exercise Variables

The frequency of physical activity for the purpose of maintaining/improving overall fitness level		**Exercising habits**	
More than 3 times a week	29%	To lose/maintain weight	18%
2 to 3 times a week	28%	To look good	2%
Once a week	13%	To keep in shape	14%
Less often than once a week	18%	To stay healthy	29%
Never	11%	To feel healthier	13%
		To reduce stress	4%
		Don't exercise	21%

Weight loss programs/strategies		**The weight loss programs currently participating**	
Normal diet with smaller portions	30%	Atkins Diet	1%
A low-fat diet	13%	Carbohydrate Addict's Diet	0%
A diet where calories are counted	4%	Cereal Diet	0%
A diet where points are counted	4%	Diet of own design	11%
A diet that limits carbohydrates	7%	Diet program affiliated with a doctor, hospital, medical group	2%
A 40/30/30 balance of carbohydrates, protein, and fat	2%	Fit for Life	0%
A high fibre diet	11%	GI (Glycemic or Index) Diet	1%
A low sugar diet	12%	Jenny Craig	0%
A meal replacement diet (liquid or bar)	3%	Personal Trainer/Health Club Program	1%
Have not followed a weight loss program/strategy during past 6 months	52%	Slim-Fast Program	1%
		South Beach Diet	1%
		The Zone	0%
		Weight Watchers	3%
		Not currently participating in a weight loss program	78%

Trans Fats, Saturated Fats, Obesity Variables

Levels of concern about trans fatty acids		**Levels of concern about saturated fats**	
Not at all concerned	47%	Not at all concerned	52%
Somewhat concerned	42%	Somewhat concerned	37%
Very concerned	0%	Very concerned	0%
Levels of concern about obesity		**Being concerned about Omega 3 in household's diet**	
Not at all concerned	41%	Yes	75%
Somewhat concerned	32%	Don't know	0%
Very concerned	0%	No	15%

Organics Variables

Concerned about organically grown or produced foods		**Levels of concern about the safety of the food supply in Canada**	
Yes	59%	Not concerned at all	28%
Have never purchased organic foods	33%	Somewhat concerned	52%
		Very concerned	20%
The importance of food/beverages been fortified with additional vitamins/minerals		**Types of foods/beverages would be willing to pay more for**	
Not at all important	3%	Organics/fortified with vitamins and minerals	26%
Not very important	13%	Good for health	58%
Somewhat important	49%	Nut-free/Decaffeinated	10%
Very important	24%	none	37%
Extremely important	12%		

Nutrition Labelling Variables

Referring to the Nutrition Facts tables on packaged foods and/or beverages when grocery shopping		**The factors considered when deciding to buy packaged food/beverages when reading product labels/packaging**	
Every time	25%	Vitamins and minerals	37%
Sometimes	75%	Salt and sodium/sugar/artificial sweeteners/preservatives	71%
When considering customary eating/dietary habits and believes (vegetarian, kosher, halal, etc.)	5%	Cholesterol/Fat/Saturated fat/Trans fat	76%
When considering health conditions	24%	Calories/Carbohydrates/Fibre/Health Claims/Probiotic Active Culture/Servings/Glycemic index/dietary restrictions	79%
For some special events of occasions	37%	Ingredient list to identify allergens	13%
Never	13%	None	8%
Seen, read/heard of any dietary/nutrition-related symbols/logos/endorsements (other than the nutrition Facts tables) on any packaged food/beverages products		**Frequency of looking for dietary/nutrition-related symbols/logos/endorsements**	
Yes	47%	Never	4%
No	53%	Rarely	14%
		Sometimes	29%
		Most of the time	21%
		Every time I (we) shop	32%
The importance level of food/beverage packages have dietary symbols/logos/endorsements		**TOP 3 sources of information on the topic of healthy eating**	
Not at all important	5%	Media	57%
Not very important	12%	More reliable sources (Canada's food guide, medical doctor, nutritionist, dieticians, nutrition facts tables, personal/fitness trainer, pharmacist, etc.)	66%
Somewhat important	32%	Family member/friends, flyers, health claims, health symbols/logo on food packages, holistic specialist/naturopath/homeopath, word of mouth	47%
Very Important	27%	Don't use any sources of information on the topic of healthy eating	9%
Extremely important	23%		

Appendix B Percentages of Responses, June 2008 Health and Wellness Survey (N=8114)

Socio-Demographic Factors

Household Head Education		**Participant's Age**		**Region**	
Elementary School	3%	18-24	1%	The Maritimes	12%
Some High School	11%	25-34	8%	Quebec	22%
Completed High School	18%	35-44	19%	Ontario	32%
Some Technical or College	14%	45-54	27%	Manitoba/Saskatchewan	12%
Completed Technical or College	23%	55-64	23%	Alberta	11%
Some University	9%	65+	22%	BC	11%
Completed University	23%				
Lifestyle		**National Urban vs. Rural**		**Gender**	
Single	26%	Rural	41%	Female	69%
Family	22%	Urban	59%	Male	31%
Childless	19%				
Empty Nesters	33%				
Household Size		**Language**			
1 Member	26%	English	80%		
2 Members	43%	French	20%		
3 Members	13%				
4 Members	13%				
5 Members	4%				
6 Members	1%				
7 Members	0%				
8 Members	0%				
9+ Members	0%				

Levels of Concern about Different Health Matters

	Very concerned	Somewhat concerned	Not very concerned	Not at all concerned
Losing weight	23%	47%	19%	11%
Improving body image	16%	52%	25%	7%
Minimizing potential future health problems	44%	48%	7%	1%
Minimizing signs of aging (e.g., wrinkles, etc.)	12%	40%	37%	11%
Reducing stress	29%	43%	23%	5%
Increasing energy levels	28%	52%	17%	3%

Healthy Eating Variables

The food group which the intake of it was reduced during the past 3 months		**Consciously was tried to incorporate into the diet/was increased during the past 3 months**	
Artificial sweeteners/sugar substitutes/sugar	48%	Vitamins and minerals	47%
Caffeine	19%	Fibre/ Omega 3/ Organic foods/Probiotic Active Culture/ Whole grain	71%
Calories	33%	Fruits and vegetables	68%
Carbohydrates	21%	Water/Milk	52%
Cholesterol/Fat/Trans fatty acids	63%		
Salt/Sodium	41%		
Most important factors in purchase decision when thinking about healthy food		**The importance level of food and beverage products being low in sugar or sugar-free**	
Convenience	57%	Not at all important	8%
Taste	58%	Not very important	10%
Affordability	47%	Somewhat important	35%
Health related purchase decisions	49%	Very Important	30%
I don't choose foods for health or nutritious purposes	10%	Extremely important	17%
Substituting ingredient(s) for more healthy alternatives when cooking		**Being very careful about eating and serving foods that have a good about of nutrients**	
Never	7%	Disagree Completely	3%
Rarely	16%	Agree Completely	19%
Sometimes	45%		
Most of the time	27%		
Every time	4%		
Reading the ingredient labels on food products very carefully		**Working hard at limiting the amount of fat and cholesterol in diet**	
Disagree Completely	6%	Disagree Completely	4%
Agree Completely	26%	Agree Completely	23%
Concerned about eating healthy at least for one meal a day	90%		

Exercise Variables

The frequency of physical activity for the purpose of maintaining/improving overall fitness level		**Exercising habits**	
More than 3 times a week	29%	To lose/maintain weight	18%
2 to 3 times a week	28%	To look good	2%
Once a week	13%	To keep in shape	11%
Less often than once a week	17%	To stay healthy	30%
Never	13%	To feel healthier	13%
		To reduce stress	5%
		Don't exercise	21%
Weight loss programs/strategies		**The weight loss programs currently participating**	
Normal diet with smaller portions	30%	Atkins Diet	0%
A low-fat diet	15%	Carbohydrate Addict's Diet	0%
A diet where calories are counted	5%	Cereal Diet	0%
A diet where points are counted	4%	Diet of own design	11%
A diet that limits carbohydrates	7%	Diet program affiliated with a doctor, hospital, medical group	2%
A 40/30/30 balance of carbohydrates, protein, and fat	2%	Fit for Life	0%
A high fibre diet	13%	GI (Glycemic or Index) Diet	1%
A low sugar diet	14%	Jenny Craig	0%
A meal replacement diet (liquid or bar)	3%	Personal Trainer/Health Club Program	1%
Have not followed a weight loss program/strategy during past 6 months	52%	Slim-Fast Program	0%
		South Beach Diet	0%
		The Zone	0%
		Weight Watchers	3%
		Not currently participating in a weight loss program	78%

Trans Fats, Saturated Fats, Obesity Variables

Levels of concern about obesity		**Levels of concern about saturated fats**	
Not at all concerned	27%	Not at all concerned	11%
Somewhat concerned	42%	Somewhat concerned	54%
Very concerned	42%	Very concerned	54%

Being concerned about Omega 3 in household's diet	
Yes	79%
No	14%

Organics Variables

Concerned about organically grown or produced foods		**Levels of concern about the safety of the food supply in Canada**	
Yes	61%	Not concerned at all	19%
Have never purchased organic foods	31%	Somewhat concerned	54%
		Very concerned	27%
The importance of food/beverages been fortified with additional vitamins/minerals		**Types of foods/beverages would be willing to pay more for**	
Not at all important	14%	Organics/fortified with vitamins and minerals	26%
Not very important	22%	Good for health	56%
Somewhat important	48%	Nut-free/Decaffeinated	11%
Very important	13%	none	39%
Extremely important	3%		

Nutrition Labelling Variables

Referring to the Nutrition Facts tables on packaged foods and/or beverages when grocery shopping		**The factors considered when deciding to buy packaged food/beverages when reading product labels/packaging**	
Every time	28%	Vitamins and minerals	35%
Sometimes	74%	Salt and sodium/sugar/artificial sweeteners/preservatives/	70%
When considering customary eating/dietary habits and believes (vegetarian, kosher, halal, etc.)	5%	Cholesterol/Fat/Saturated fat/Trans fat	73%
When considering health conditions	23%	Calories/Carbohydrates/Fibre/Health Claims/Probiotic Active Culture/Servings/Glycemic index/dietary restrictions	76%
For some special events of occasions	37%	Ingredient list to identify allergens	28%
Never	12%	None	10%
Seen, read/heard of any dietary/nutrition-related symbols/logos/endorsements (other than the nutritic Facts tables) on any packaged food/beverages products		**Frequency of looking for dietary/nutrition-related symbols/logos/endorsements**	
Yes	55%	Never	31%
		Rarely	22%
		Sometimes	28%
		Most of the time	14%
		Every time I (we) shop	5%
The importance level of food/beverage packages have dietary symbols/logos/endorsements		**TOP 3 sources of information on the topic of healthy eating**	
Not at all important	26%	Media	59%
Not very important	28%	More reliable sources (Canada's food guide, medical doctor, nutritionist, dieticians, nutrition facts tables, personal/fitness trainer, pharmacist, etc.)	65%
Somewhat important	31%	Family member/friends, flyers, health claims, health symbols/logo o food packages, holistic specialist/naturopath/homeopath, word of mouth	48%
Very Important	11%	Don't use any sources of information on the topic of healthy eating	8%
Extremely important	4%		

Appendix C ONLINE Canadian August 2007 Health and Wellness Survey

Outgoing sample: 7,987 (English version) and 1,992 (French version) = 9979 households
Complete Respondents: 7630 households
Fielded date: 8/6/2007
Closeout date: 9/1/2007
Final response rate: 76.5%

	Column location, length
Household Id number	**1,8**
Survey number (570801)	**10,6**
Blanks	**16,4**
Household Head Education	**20,1**
1=Elementary School	
2=Some High School	
3=Completed High School	
4=Some Technical or College	
5=Completed Technical or College	
6=Some University	
7=Completed University	
National Urban vs Rural	**21,1**
1=urban	
2=rural	
Standard demo breaks:	
Sub-Division/(region)	**22,1**
1=Maritimes	**5=Rem. Ontario**
2=Montreal	**6=Man/Sask**
3=Rem. Quebec	**7=Alberta**
4=Tornoto	**8=BC**
Region:	
Maritimes=1	**Ontario =4/5**
Quebec=2/3	**Total West=6,7,8**
Income	**23,2**
03/11 = under $20k	**18/19 = $40-$49k**
13/15 = $20-$29k	**21/23 = $50-$69k**
16/17 = $30-$39k	**26/99 = $70K+**
Age and Presence of Children	**25,1**
9=adult	**2,4,6,7 = any 6 to 12**
1/7=with kids	**3,5,6,7 = any 13 to 17**
1,4,5,7 = any under 6	
1=under 6 only	**4=under 6 and 6 to 12**
2=6 to 12 only	**5=under 6 and 13 to 17**
3=13 to 17 only	**6=6 to 12 and 13 to 17**

7= under 6, 6 to 12 and 13 to 17

9= no child in the household

HHLD age **26,1**
1/3 = <35
4/5 = 35/44
6/7 = 45/54
8 = 55/64
9 = 65+

Lifestyle **27,1**
1=Young Singles
2=Middle Aged Singles
3=Older Singles
4=New Families
5=Established Families
6=Maturing Familes
7=Childless Younger Couples
8=Middle Aged Childless Couples
9=Empty Nesters

Household Size **28,1**
1=1 member
2=2 members
3=3 members
4=4 members
5=5 members
6=6 members
7=7 members
8=8 members
9=9+ members

Language **29,1**
1,3=English
2=French

1. What is your gender? 30,1
   1=Male
   2=Female

2. What is your age? 31,1
   1=18-24
   2=25-34
   3=35-44
   4=45-54
   5=55-64
   6=65 and older

blanks **32, 7**

How concerned are you about each of the following health matters? Please scan only one response option for EACH health matter.

Use this scale for Qn#10 thru #15:
1=Very concerned
2=Somewhat concerned
3=Not very concerned
4=Not at all concerned

10. How concerned are you about losing weight? 39,1
11. How concerned are you about improving body image? 40,1
12. How concerned are you about minimizing potential future health problems? 41,1
13. How concerned are you about minimizing signs of aging (e.g., wrinkles, etc.)? 42,1
14. How concerned are you about reducing stress? 43,1
15. How concerned are you about increasing energy levels? 44,1

Healthy Eating

16. Which of the following food items, if any, have you, yourself, been reducing the intake of during the past 3 months? Please **scan all that apply**, then scan 'No more selections apply' when you are done.

1= Artificial sweeteners/ sugar substitutes	45,1
2= Caffeine	46,1
3= Calories	47,1
4= Carbohydrates	48,1
5= Cholesterol	49,1
6= Fat	50,1
7= Salt/Sodium	51,1
8= Sugar	52,1
9= Trans fatty acids	53,1
A= Other	54,1
B= None, have not been reducing intake of any food items during the past 3 months	55,1
Z= No more selections apply	56,1

17. Which one of the following food items do you find to be the most challenging to reduce in your household's diet? Please **scan one response only**. 57,1

1= Artificial sweeteners/ sugar substitutes
2= Caffeine
3= Calories
4= Carbohydrates
5= Cholesterol
6= Fat
7= Salt/Sodium
8= Sugar
9= Trans fatty acids
A= Other
B= None, have not been reducing intake of any food items during the past 3 months

18. Which, if any, of the following have you consciously tried to incorporate into your diet or increase your intake of during the past 3 months? Please **scan all that apply**, then scan 'No more selections apply' when you are done.

1= Calcium	58,1
2= Fibre	59,1
3= Folic Acid	60,1
4= Fruits	61,1
5= Iron	62,1
6= Magnesium	63,1
7= Milk	64,1
8= Omega 3	65,1
9= Organic Foods	66,1
A= Potassium	67,1
B= Probiotic Active Culture	68,1
C= Soy or soy-based foods	69,1
D= Vegetables	70,1
E= Vitamin A including Beta Carotene	71,1
F= Vitamin B	72,1
G= Vitamin D	73,1
H= Vitamin E	74,1
J= Water	75,1
K= Whole Grains	76,1
L= Other	77,1

M= None, have not been trying to incorporate or increase intake of any food tems during the past 3 months 78,1

Z= No more selections apply 79,1

19. Thinking about healthy foods, which of the following factors are most important in your purchase decision? Please **scan the TOP 3 factors**, then scan 'No more selections apply' when you are done.

1=Portable healthy options	80,1
2=Easy to prepare healthy options	81,1
3=Ready to eat healthy options	82,1
4=Tasty healthy alternatives	83,1
5=Foods approved by a nutritionist/medical association/medical professional	84,1
6=Affordable healthy alternatives	85,1
7=Variety of healthy alternatives	86,1
8=Foods that help reduce the risk of (nutrition-related) disease	87,1
9=Healthy-sized portions	88,1
A=Other	89,1
B=I do not choose foods for health or nutritious purposes	90,1
Z=No more selections apply	91,1

20. At what meal time are you most concerned about eating healthy? 92,1

1 = Breakfast
2 = Lunch
3 = Dinner
4 = Snack time/between meals
5 = None of the above

21. Which of the following statements best describes your breakfast routine in an average week? 93,1

1= I do not typically eat breakfast
2= I eat breakfast on the go (e.g., on the way to work, school, etc.)
3= I eat a sit-down breakfast

22. Which of the following best describes your eating habits? 94,1

1= I try to have three 'square' meals a day
2= I eat many small meals throughout the day
3= I often skip meals

23. When cooking, how often do you substitute ingredient(s) for more healthy alternatives? 95,1

1= Every time
2= Most of the time
3= Sometimes
4 = Rarely
5 = Never

24. How does the presence of artificial sweeteners/sugar substitutes (e.g., Aspartame) affect your food and beverage purchase decisions for your household? 96,1

1= I choose food and beverageproducts because they contain artificial sweeteners/sugar substitutes
2= I avoid food and beverage products because they contain artificial sweeteners/sugar substitutes
3= The presence/absence of artificial sweeteners/sugar substitutes does not affect my purchase decisions

25. How important it is that food and beverage products are naturally sweetened? 97,1

1= Extremely important
2= Very important
3= Somewhat important
4= Not very important
5= Not at all important

26. How important it is that food and beverage products are sweetened with artificial sweetener? 98,1

1= Extremely important
2= Very important
3= Somewhat important
4= Not very important
5= Not at all important

27. How important it is that food and beverage products are low in sugar or sugar-free? 99,1

1= Extremely important
2= Very important
3= Somewhat important
4= Not very important
5= Not at all important

28. When buying beverages for your household, which of the following factors do you look for? Please **scan all that apply**, then scan 'No more selections apply' when you are done.

1=Reduced Sugar 100,1
2=Sugar-free 101,1
3=Low calorie 102,1
4=Diet 103,1
5=Sweetened with Artificial Sweetener (e.g., Aspartame, Splenda) 104,1

6=100% Juice/Juice blend 105,1
7=Other 106,1
8=None of the above 107,1
Z=No more selections apply 108,1

29. Which of the following non-alcoholic beverage products do the adult members (18 years old or older) of your household drink? Please **scan all that apply.**

1 = Coffee/Tea	109,1
2 = Flavoured Soft Drinks	110,1
3 = Diet Soft Drinks	111,1
4 = Ready-to-drink Juices/Drinks/Nectars	112,1
5 = Ready-to-drink Milk (including Soya and Rice milk)	113,1
6 = Bottled Water	114,1
7 = Tap Water	115,1
8 = Filtered Water (from water cooler or at-home filtering system)	116,1
9 = Drink Mixes (e.g., powders, syrups)	117,1
A = Diet Drink Mixes (e.g., powders, syrups)	118,1
B = Juices/Drinks/Nectars made from frozen concentrate	119,1
C = Drinkable Yogurt	120,1
D = Energy Drinks	121,1
E = Sports Drinks	122,1
F = Other	123,1
G = None of the above	124,1
Z = No more selections apply	125,1

30. Which of the following beverage products do the members of your household who are under 18 years old drink? Please **scan all that apply**

1 = Coffee/Tea	126,1
2 = Flavoured Soft Drinks	127,1
3 = Diet Soft Drinks	128,1
4 = Ready-to-drink Juices/Drinks/Nectars	129,1
5 = Ready-to-drink Milk (including Soya and Rice milk)	130,1
6 = Bottled Water	131,1
7 = Tap Water	132,1
8 = Filtered Water (from water cooler or at-home filtering system)	133,1
9 = Drink Mixes (e.g., powders, syrups)	134,1
A = Diet Drink Mixes (e.g., powders, syrups)	135,1
B = Juices/Drinks/Nectars made from frozen concentrate	136,1
C = Drinkable Yogurt	137,1
D = Energy Drinks	138,1
E = Sports Drinks	139,1
F = Other	140,1
G = None of the above	141,1
H = There are no members in the household under 18 years of age	142,1
Z = No more selections apply	143,1

Please indicate how much you agree or disagree with the following statements.

Use this scale for Qn#31 thru #33:
1= 6-Agree Completely
2= 5
3= 4
4= 3
5= 2
6= 1-Disagree Completely

31. I read the ingredient labels on food products very carefully. 144,1
32. I am very careful to eat and serve foods that have a good amount of nutrients. 145,1
33. I really work at limiting the amount of fat and cholesterol in my diet. 146,1

Exercise

34. During an average week, about how often, if ever, do you, yourself, exercise? By exercise, we mean any physical activity you engage in for the purpose of maintaining/improving your overall fitness level. 147,1

    1=More than 3 times a week
    2=2 to 3 times a week
    3=Once a week
    4=Less often than once a week
    5=Never

35. Which one of the following best describes your exercising habits during the past 6 months? 148,1

    1= I exercised to lose/ maintain my weight
    2= I exercised to look good
    3= I exercised to keep in shape
    4= I exercised to stay healthy
    5= I exercised to feel healthier
    6= I exercised to reduce stress
    7= I did not exercise

36. During the past 6 months, which of the following weight loss programs/strategies, if any, have you, yourself, followed? Please **scan all that apply**

    1= Normal diet with smaller portions 149,1
    2= A low-fat diet 150,1
    3= A diet where calories are counted 151,1
    4= A diet where points are counted 152,1
    5= A diet that limits carbohydrates 153,1

    6= A 40/30/30 balance of carbohydrates, protein,and fat 154,1
    7= A high fibre diet 155,1
    8= A low sugar diet 156,1
    9= A meal replacement diet (liquid or bar) 157,1
    A= Other 158,1

B= None, I have not followed a weight loss program/ strategy during past 6 months 159,1
Z= No more selections apply 160,1

37. In which of the following weight loss programs, if any, are you, yourself, currently participating? Please **scan all that apply.**

1= Atkins Diet 161,1
2= Carbohydrate Addict's Diet 162,1
3= Cereal Diet 163,1
4= Diet of own design 164,1
5= Diet program affiliated with a doctor, hospital medical group 165,1

6= Fit for Life 166,1
7= GI (Glycemic or Index) Diet 167,1
8= Jenny Craig 168,1
9= Personal Trainer/Health Club Program 169,1
A= Slim-Fast Program 170,1

B= South Beach Diet 171,1
C= The Zone 172,1
D= Weight Watchers 173,1
E= Other 174,1
F= None, I am not currently participating in a weight loss program 175,1

Z= No more selections apply 176,1

Trans Fats, Saturated Fats, Obesity

38. How concerned are you about trans fatty acids in your diet or the diet of other members of your household? 177,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

39. In general, how concerned are you about saturated fats in your diet or the diet of other members of your household? 178,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

40. How concerned are you with obesity in regards to you and/or other members of your household? 179,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

41. In general, are you, or any member of your household, aware of Omega 3 and its benefits? 180,1

1= Have heard of Omega 3, but not aware of its benefits
2= Have heard of Omega 3,and aware of its benefits
3= Have not heard of Omega 3 → **Skip to question 43**

42. From which sources, if any, do you try to obtain Omega 3 in your household's diet? Please **scan all that apply**.

1= Cheese 181,1
2= Eggs 182.2
3= Fish 183,1
4= Fish oil supplement (e.g., cod liver oil) 184,1
5= Fortified Juice 185,1

6= Fortified Milk 186,1
7= Vegetable-based supplement (e.g., flaxseed, grape seed, linseed) 187,1
8= Other 188,1
9= Don't know 189,1
A= Do not try to obtain Omega 3 in the household's diet 190,1

Z= No more selections apply 191,1

43. In general, are you, or any member of your household, aware of Probiotic Active Culture in dairy products and its benefits? 192.1

1= Have heard of Probiotic Active Culture in dairy products, but not aware of its benefits
2= Have heard of Probiotic Active Culture in dairy products, and aware of its benefits
3= Have not heard of Probiotic Active Culturein dairy products

Organics

44. Have you ever seen, read or heard about 'organic' foods? 193,1

1= Yes
2= No → **Skip to question 50**

45. Which of the following factors, if any, do you associate with 'organic' foods? Please **scan all that apply.**

1= Foods that are produced or grown through processes that eliminate or minimize use of chemical pesticides and artificial fertilizers 194,1
2= Foods that are produced through processes that are free of genetically engineered and/or modified organisms (GMOs) 195,1
3= Less harmful to/protects the environment 196,1
4= Healthier/more nutritious 197,1
5= Special attention to the safe treatment/welfare of animals 198,1

6= Tastes better	199,1
7= Fresher	200,1
8= Safer than foods produced by traditional means	201,1
9= More expensive	202,1
A= Shorter shelf-life	203,1
B= Other	204,1
C= None of the above	205,1
Z= No more selections apply	206,1

46. Please indicate to what extent you agree or disagree with the following statement: **I try to eat organic fruits and vegetables when possible**. 207,1

1= Strongly agree
2= Somewhat agree
3= Neither disagree nor agree
4= Somewhat disagree
5= Strongly disagree

47. Which, if any, of the following types of organically grown or produced foods have you purchased in the past 12 months? Please **scan all that apply.**

1= Bagged salad (e.g., chopped lettuce in a bag, etc.)	208,1
2= Baking mixes (e.g., cakes, muffins, etc.)	209,1
3= Breads/Grains/Rice	210,1
4= Cereals	211,1
5= Cheese	212,1
6= Coffee	213,1
7= Eggs	214,1
8= Fruits	215,1
9= Juices or Drinks	216,1
A= Loose vegetables	217,1
B= Meat	218,1
C= Milk	219,1
D= Pasta	220,1
E= Pre-packaged vegetables (other than bagged salad)	221,1
F= Tea	222,1
G= Yogurt	223,1
H= Other beverages (other than tea, juices, drinks or milk)	224,1
J= Other dry packaged foods	225,1
K= Have purchased organically grown or produced foods, but have not done so in the past 12 months	226,1
L= Have never purchased organically grown or produced foods → **Skip to question 50**	227,1
Z= No more selections apply	228,1

48. Where have you purchased organically grown or produced foods in the past 12 months? Please **scan all that apply**.

1= Bakery	229,1
2= Conventional grocery store	230,1
3= Delicatessen	231,1
4= Department Store	232,1
5= Discount grocery store	233,1
6= Drug Store	234,1
7= Farm/farmer's market	235,1
8= Health food store	236,1
9= Mass Merchandiser	237,1
A= Organic grocery store	238,1
B= Warehouse Club	239,1
C= Other	240,1
Z= No more selections apply	241,1

49. What is the PRIMARY reason that you purchased organically grown or produced foods? 242,1

1= Eliminate or minimize use of chemical pesticides and artificial fertilizers in the production process
2= Free of genetically engineered and/or modified organisms (GMOs)
3= Special attention to the safe treatment/welfare of animals
4= Tastes better
5= Fresher
6= Healthier/more nutritious
7= Less harmful to/protects the environment
8= Safer than foods produced by traditional means
9= Like to try new products
A= Other
B= None of the above

50. How concerned are you about the safety of the food supply in Canada? 243,1

1= Very concerned
2= Somewhat concerned
3= Not at all concerned

51. Please indicate how familiar you are with functional or fortified foods. 244,1

1= Very familiar
2= Somewhat familiar
3= Neutral
4= Somewhat unfamiliar
5= Not at all familiar

52. How important is it that food and/or beverages have been fortified with additional vitamins/minerals? 245,1

1= Extremely important
2= Very important
3= Somewhat important
4= Not very important
5= Not at all important

53. Which of the following foods and/or beverages, if any, has your household purchased in the past 12 months? Please **scan all that apply**.

1= Milk with added vitamins/minerals	246,1
2= Cereal with added vitamins/minerals	247,1
3= Soy beverages	248,1
4= Rice or potato based beverages	249,1
5= Energy drinks	250,1
6= Orange juice with added vitamins/minerals	251,1
7= Bread with added supplements/vitamins	252,1
8= Whole Grain/high fibre products	253,1
9= Yogurts with probiotics (i.e., active cultures)	254,1
A= Eggs with added supplements	255,1
B= Cheese with added supplements	256,1
C= Other functional or fortified foods	257,1
D= None of the above **→ Skip to question 56**	**258,1**
Z= No more selections apply	259,1

54. Which of the following factors, if any, do you associate with functional or fortified foods? Please **scan all that apply**.

1= Added vitamins/minerals (i.e., not naturally occurring)	260,1
2= Enhanced nutritional benefit	261,1
3= Promote specific health benefits	262,1
4= Shown to reduce risk of chronic disease	263,1
5= Other	264,1
6= Don't know	265,1
Z= No more selections apply	266,1

55. What are the reasons that you purchased the functional or fortified foods selected in **question 53**? Please **scan all that apply**.

1= Minimize mineral deficiency	267,1
2= Minimize potential future health problems	268,1
3= Minimize current health problems	269,1
4= Minimize signs of aging (e.g., wrinkles, etc.)	270,1

5= Reduce stress 271,1

6= Increase energy levels 272,1
7= Like to try new products 273,1
8= Trendy/latest health trend 274,1
9= Appeals to my lifestyle for healthy living 275,1
A= Don't know 276,1

B= Other 277,1
Z= No more selections apply 278,1

56. Which, if any, of the following types of foods and/or beverages would you be willing to pay more for? Please **scan all that apply**.

1= Organic 279,1
2= Foods/beverages that have added vitamins/minerals 280,1
3= Foods/beverages that promote a specific health benefit 281,1
4= Foods/beverages that are shown to reduce risk of chronic disease 282,1
5= Reduced fat 283,1

6= Reduced sugar or sugar-free 284,1
7= Reduced salt/sodium 285,1
8= Low calorie 286,1
9= Low carb 287,1
A= Nut-free 288,1

B= Decaffeinated 289,1
C= Trans fat free 290,1
D= Low in preservatives 291,1
E= None of the above 292,1
Z= No more selections apply 293,1

Nutrition Labelling

57. When shopping for household groceries, when do you refer to the Nutrition Facts table on packaged foods and/or beverages? Please **scan all that apply**

1= Every time I (we) shop 294,1
2= When thinking of buying a product for the first time 295,1
3= When on a diet/trying to lose weight 296,1
4= When considering customary eating/dietary habits (e.g., Vegetarian, Kosher, Halal, etc.) 297,1
5= When considering health conditions 298,1

6= When buying products for my children 299,1
7= When buying desserts 300,1
8= When buying snack items 301,1
9= When buying meal (breakfast/lunch/dinner) items 302,1
A= When buying certain food types 303,1

B= When I have the time	304,1
C= When making the final choice between two or more brands	305,1
D= I never refer to the Nutrition Facts table	306,1
Z= No more selections apply	307,1

Blanks **308,2**

60. When reading product labels/packaging, which of the following factors do you consider when deciding to buy packaged food and/or beverages? Please **scan all that apply**.

1= Artificial sweeteners	310,1
2= Calcium	311,1
3= Calories	312,1
4= Carbohydrates	313,1
5= Cholesterol	314,1
6= Fat	315,1
7= Fibre	316,1
8= Health Claims	317,1
9= Iron	318,1
A= Potassium	319,1
B= Preservatives	320,1
C= Probiotic Active Culture	321,1
D= Protein	322,1
E= Salt/Sodium	323,1
F= Saturated Fat	324,1
G= Sugar	325,1
H= Trans Fat	326,1
J= Vitamin A	327,1
K= Vitamin C	328,1
L= Vitamin D	329,1
M= The amount of food in a serving	330,1
N= Glycemic index	331,1
P= Ingredient list to identify allergens	332,1
Q= Ingredient list to ensure my dietary restrictions (other than allergens) are being met	333,1
R= Ingredient list to check order of ingredients	334,1
S= None	335,1
Z= No more selections apply	336,1

61 Have you seen, read or heard of any dietary or nutrition-related symbols/logos or endorsements (other than the Nutrition Facts table) on any packaged food and/or beverage products? 337,1

1=Yes
2=No

62. When shopping for household groceries, how often, if ever, do you look for dietary or nutrition-related symbols/logos or endorsements (other than the Nutrition Facts table) on the package? 338,1

1= Every time I (we) shop
2= Most of the time
3= Sometimes
4= Rarely
5= Never

63. When shopping for household groceries, how important is it to you that food and/or beverage packages have dietary symbols/logos or endorsements? 339,1

1= Extremely important
2= Very important
3= Somewhat important
4= Not very important
5= Not at all important

64. In the last 3 months, have you purchased one brand over another because it had a dietary symbol/logo or endorsement on the package? 340,1

1= Yes
2= No

65. Which, if any, of the following dietary symbols/logos or endorsements have you looked for when grocery shopping in the past 30 days? Please **scan all that apply**

1= "5 to 10 a Day for Better Health" logo and statement	341,1
2= "Canada Organic" symbol/logo	342,1
3= Certified Organic symbol/logo or claim	343,1
4= Diabetic Association logo or endorsement	344,1
5= “Eat Smart” symbol/logo	345,1
6= Gluten-free claim or logo	346,1
7= Glycemic Index	347,1
8= Halal certified claim or logo	348,1
9= “Health Check” symbol/logo	349,1
A= Kosher certified claim or logo	350,1
B= Lactose free	351,1
C= No GMO or non-genetically engineered symbol, logo or claim	352,1
D=Nut-free claim or symbol/logo	353,1
E= Sensible Solutions” symbol/logo	354,1

F= Smart Spot" symbol/logo 355,1

G=Other 356,1
H= None of the above **→ Skip to question 67** **357,1**
Z= No more selections apply 358,1

66. Which of these following statements best describes your primary reason for looking for products with a dietary symbol, logo or endorsement? Please **scan one response only.** **359,1**

1= I am seeking out foods that are best for the treatment of an existing health condition (e.g., high blood pressure, high cholesterol, diabetes, allergies)

2= These products are consistent with my ideological/religious beliefs
3= I have no specific health condition I am treating, but simply believe that such products are better for my general health and well-being than other choices available
4= I believe these products are prepared with better quality ingredients
5= I believe these products are more nutritious
6= I believe these products are safer to eat
7= I believe these product choices are less processed/more natural
8= Other

67. Which of the following are your TOP 3 sources of information on the topic of healthy eating? Please **scan your TOP 3 sources**.

1= Books 360,1
2= Canada's Food Guide 361,1
3= Family member/Friend 362,1
4= Flyers 363,1
5= Health Claims 364,1

6= Health symbol/logo on food package 365,1
7= Holistic specialist/ Naturopath/Homeopath 366,1
8= Internet 367,1
9= Magazines 368,1
A= Medical doctor 369,1

B= Newspapers 370,1
C= Nutritionist/Dietician 371,1
D= Nutrition Facts table 372,1
E= Personal/Fitness Trainer 373,1
F= Pharmacist 374,1

G= Television 375,1
H= Weight management program (e.g., Jenny Craig, Weight Watchers, etc.) 376,1
J= Word of mouth recommendation (other than family/friend) 377,1
K= Other 378,1
L= I don't use any sources of information on the topic of healthy eating 379,1

Z= No more selections apply 380,1

Blanks **381,14**

70. From the list below, please scan the health conditions/ailments that you or any other member of your household have experienced within the past 12 months. Please **scan all that apply**.

1= Acid reflux/GERD	395,1
2= Acne	396,1
3= Allergies	397,1
4= Anxiety	398,1
5= Arthritis/Rheumatism	399,1
6= Asthma	400,1
7= Back pain	401,1
8= Colds	402,1
9= Constipation	403,1
A= Coughs/Bronchitis/ Pulmonary Disease	404,1
B= Dermatitis/Eczema/Seborrhea	405,1
C= Depression	406,1
D= Diabetes	407,1
E= Diarrhea	408,1
F= Flu (Influenza)	409,1
G= Headaches (excluding Migraines)	410,1
H= Heart Disease	411,1
J= Heartburn/Indigestion	412,1
K= High blood pressure	413,1
L= High cholesterol levels	414,1
M= Incontinence	415,1
N= Insomnia/Sleeplessness	416,1
P= Menstrual/Hormonal disorders/Menopause	417,1
Q= Migraines	418,1
R= Muscle aches and pains	419,1
S= Nausea/Vomiting	420,1
T= Obesity	421,1
U= Osteoporosis	422,1
V= Smoking (attempting to quit)	423,1
W= Stress	424,1
X= Vaginal yeast infections	425,1
Y= No one in the household has experienced any of the listed health conditions/ ailments in the past 12 months	426,1
Z= No more selections apply	427,1

71. Do you, or any other household member, have any of the following food allergies? Please **scan all that apply**.

1= Eggs	428,1	
2= Fish	429,1	
3= Soy	430,1	
4= Peanuts	431,1	
5= Milk/Dairy/Lactose Intolerance	432,1	
6= Shellfish (e.g., shrimp, lobster, crab, etc.)	433,1	
7= Tree Nuts (e.g., walnuts, almonds, cashews, etc.)		434,1
8= Food colouring or preservatives	435,1	
9= Wheat/Flour/Gluten (Celiac)	436,1	
A= Foods high in Nickel/Zinc	437,1	
B= Food additive	438,1	
C= Food flavouring	439,1	
D= Sesame Seeds	440,1	
E= Sulphites	441,1	
F= Unknown food allergy	442,1	
G= Other food allergy	443,1	
H= No food allergies	444,1	
Z= No more selections apply	445,1	
Blank		446,1

Appendix D ONLINE Canadian June 2008 Health and Wellness Survey

Outgoing sample: 8,331 (English version) and 1,942 (French version) = 10,273 households
Complete Respondents: 8,114 households
Fielded date: 5/28/2007
Closeout date: 6/21/2007
Final response rate: 78.9%
Filename: `CA_580601_healthwellness_jun08.fnldat_UofA`

	Column location, length
Household Id number	**1,8**
Survey number (580601)	**10,6**
Blanks	**16,6**
Standard demo breaks:	
Sub-Division/(region)	**22,1**
1=Maritimes	**5=Rem. Ontario**
2=Montreal	**6=Man/Sask**
3=Rem. Quebec	**7=Alberta**
4=Tornoto	**8=BC**
Region:	
Maritimes=1	**Ontario =4/5**
Quebec=2/3	**Total West=6,7,8**
Income	**23,2**
03/11 = under $20k	**27/54 = $70K+**
13/15 = $20-$29k	**27,28,38/48=$70k - $99k**
16/17 = $30-$39k	**29,30,50/54=$100k+**
18/19 = $40-$49k	
21/23 = $50-$69k	
Age and Presence of Children	**25,1**
9=adult	**2,4,6,7 = any 6 to 12**
1/7=with kids	**3,5,6,7 = any 13 to 17**
1,4,5,7 = any under 6	
1=under 6 only	**5=under 6 and 13 to 17**
2=6 to 12 only	**6=6 to 12 and 13 to 17**
3=13 to 17 only	**7= under 6, 6 to 12 and 13 to 17**
4=under 6 and 6 to 12	**9= no child in the household**
HHLD age	**26,1**
1/3 = <35	**8 = 55/64**
4/5 = 35/44	**9 = 65+**
6/7 = 45/54	
Lifestyle	**27,1**
1=Young Singles	**2=Middle Aged Singles**

3=Older Singles
4=New Families
5=Established Families
6=Maturing Familes
7=Childless Younger Couples
8=Middle Aged Childless Couples
9=Empty Nesters

Household Size **28,1**
1=1 member
2=2 members
3=3 members
4=4 members
5=5 members
6=6 members
7=7 members
8=8 members
9=9+ members

Language **29,1**
1,3=English
2=French

blank **30,1**

Household Head Education **31,1**
1=Elementary School
2=Some High School
3=Completed High School
4=Some Technical or College
5=Completed Technical or College
6=Some University
7=Completed University

National Urban vs Rural **32,1**
1=urban
2=rural

1. What is your gender? 33,1

1=Male
2=Female

2. What is your age? 34,1

1=18-24
2=25-34
3=35-44
4=45-54
5=55-64
6=65 and older

How concerned are you about each of the health matters noted in questions 3 through 8? Please scan one response option only for EACH health matter.

1=Very concerned
2=Somewhat concerned
3=Not very concerned
4=Not at all concerned

3.	How concerned are you about losing weight?	35,1
4.	How concerned are you about improving body image?	36,1
5.	How concerned are you about minimizing potential future health problems?	37,1
6.	How concerned are you about minimizing signs of aging (e.g., wrinkles, etc.)?	38,1
7.	How concerned are you about reducing stress?	39,1
8.	How concerned are you about increasing energy levels?	40,1

Healthy Eating

For each of the categories listed in questions 9 through 15, please indicate how much more or less you think your household purchases, compared to the 'average' household.

1=A lot more than the 'average' household
2=A little more than the 'average' household
3=About the same as the 'average' household
4=A little less than the 'average' household
5=A lot less than the 'average' household

9.	Diet supplements — Our household purchases	41,1
10.	Fresh fruits and vegetables — Our household purchases…	42,1
11.	Low fat products — Our household purchases…	43,1
12.	Organic products — Our household purchases…	44,1
13.	Vitamins — Our household purchases…	45,1
14.	Sugar — Our household purchases…	46,1
15.	Salt/sodium — Our household purchases…	47,1

16. Which of the following food items, if any, have you, yourself, been reducing the intake of during the past 3 months? Please scan all that apply, then scan 'No more selections apply' when you are done.

Artificial sweeteners/ sugar substitutes	48,1
Caffeine	49,1
Calories	50,1
Carbohydrates	51,1
Cholesterol	52,1

Fat	53,1
Salt/Sodium	54,1
Sugar	55,1
Trans fatty acids	56,1
Other	57,1
None, have not been reducing the intake of any food items during the past 3 months	58,1

17. Which one of the following food items do you find to be the most challenging to reduce in your household's diet? Please scan one response only. 59,2

01=Artificial sweeteners/ sugar substitutes
02=Caffeine
03=Calories
04=Carbohydrates
05=Cholesterol
06=Fat
07=Salt/Sodium
08=Sugar
09=Trans fatty acids
10=Other
11=None, have not been reducing the intake of any food items during the past 3 months

18. Which, if any, of the following have you consciously tried to incorporate into your diet or increase your intake of during the past 3 months? Please scan all that apply, then scan 'No more selections apply' when you are done.

Calcium	61,1
Fibre	62,1
Folic Acid	63,1
Fruits	64,1
Iron	65,1
Magnesium	66,1
Milk	67,1
Omega 3	68,1
Organic Foods	69,1
Potassium	70,1
Probiotic Active Culture	71,1
Prebiotic Fibre	72,1
Soy or soy-based foods	73,1
Vegetables	74,1
Vitamin A including Beta Carotene	75,1

Vitamin B	76,1
Vitamin D	77,1
Vitamin E	78,1
Water	79,1
Whole Grains	80,1
Other	81,1
None, have not been trying to incorporate or increase intake of any food items during the past 3 months	82,1

19. Thinking about healthy foods, which of the following factors are most important in your purchase decision? Please scan the TOP 3 factors, then scan 'No more selections apply' when you are done.

Portable healthy options	83,1
Easy to prepare healthy options	84,1
Ready to eat healthy options	85,1
Tasty healthy alternatives	86,1
Foods approved by a nutritionist/medical association/medical professional	87,1
Affordable healthy alternatives	88,1
Variety of healthy alternatives	89,1
Foods that help reduce the risk of (nutrition-related) disease	90,1
Healthy-sized portions	91,1
Other	92,1
I do not choose foods for health or nutritious purposes	93,1

20. At what meal time are you most concerned about eating healthy? 94,1

1=Breakfast
2=Lunch
3=Dinner
4=Snack time/between meals
5=None of the above

21. Which of the following statements best describes your breakfast routine in an average week? 95,1

1=I do not typically eatbreakfast
2=I eat breakfast on the go(e.g., on the way to work,school, etc.)
3=I eat a sit-down breakfast

22. Which of the following best describes your eating habits? 96,1

1=I try to have three 'square'meals a day

2=I eat many small mealsthroughout the day
3=I often skip meals

23. When cooking, how often do you substitute ingredient(s) for more healthy alternatives? 97,1

1=Every time
2=Most of the time
3=Sometimes
4=Rarely
5=Never

24. How does the presence of artificial sweeteners/sugar substitutes (e.g., Aspartame) affect your food and beverage purchase decisions for your household? 98,1

1=I choose food and beverageproducts because they contain artificial sweeteners/sugar substitutes
2=I avoid food and beverageproducts because they contain artificial sweeteners/sugar substitutes
3=The presence/absence ofartificial sweeteners/sugar substitutes does not affect my purchase decisions

25. How important it is that food and beverage products are naturally sweetened? 99,1

1=Extremely important
2=Very important
3=Somewhat important
4=Not very important
5=Not at all important

26. How important it is that food and beverage products are sweetened with artificial sweetener? 100,1

1=Extremely important
2=Very important
3=Somewhat important
4=Not very important
5=Not at all important

27. How important it is that food and beverage products are low in sugar or sugar-free? 101,1

1=Extremely important
2=Very important
3=Somewhat important
4=Not very important
5=Not at all important

28. When buying beverages for your household, which of the following factors do you look for? Please scan all that apply, then scan ‘No more selections apply’ when you are done.

Reduced Sugar	102 ,1
Sugar-free	103 ,1
Low calorie	104 ,1
Diet	105 ,1
Sweetened with Artificial Sweetener (e.g., Aspartame, Splenda)	106 ,1
100% Juice/Juice blend	107 ,1
Other	108 ,1
None of the above	109 ,1

29. Which of the following non-alcoholic beverage products do the adult members (18 years old or older) of your household drink? Please scan all that apply.

Coffee	110 ,1
Tea	111 ,1
Flavoured Soft Drinks	112 ,1
Diet Soft Drinks	113 ,1
eady-to-drink Juices/Drinks/Nectars	114 ,1
Ready-to-drink Milk (excluding Soya and Rice Milk)	115 ,1
Ready-to-drink Soya or Rice Milk	116 ,1
Bottled Water	117 ,1
Tap Water	118 ,1
Filtered Water (from water cooler or at-home filtering system)	119 ,1
Drink Mixes (e.g., powders, syrups)	120 ,1
Diet Drink Mixes (e.g., powders, syrups)	121 ,1
Juices/Drinks/Nectars made from frozen concentrate	122 ,1
Drinkable Yogurt	123 ,1
Energy Drinks	124 ,1
Sports Drinks	125 ,1
Other	126 ,1
None of the above	127 ,1

30. Which of the following beverage products do the members of your household who are under 18 years old drink? Please scan all that apply.

Coffee	128 ,1
Tea	129 ,1
Flavoured Soft Drinks	130 ,1
Diet Soft Drinks	131 ,1
eady-to-drink Juices/Drinks/Nectars	132 ,1
Ready-to-drink Milk (excluding Soya and Rice Milk)	133 ,1
Ready-to-drink Soya or Rice Milk	134 ,1
Bottled Water	135 ,1

Tap Water	136 ,1
Filtered Water (from water cooler or at-home filtering system)	137 ,1
Drink Mixes (e.g., powders, syrups)	138 ,1
Diet Drink Mixes (e.g., powders, syrups)	139 ,1
Juices/Drinks/Nectars made from frozen concentrate	140 ,1
Drinkable Yogurt	141 ,1
Energy Drinks	142 ,1
Sports Drinks	143 ,1
Other	144 ,1
None of the above	145 ,1
There are no members in the household under 18 years of age	146 ,1

Please indicate how much you agree or disagree with the following statements.

31. I read the ingredient labels on food products very carefully. 147,1

1=6=Agree Completely
2=5
3=4
4=3
5=2
6=1=Disagree Completely

32. I am very careful to eat and serve foods that have a good amount of nutrients. 148,1

1=6=Agree Completely
2=5
3=4
4=3
5=2
6=1=Disagree Completely

33. I really work at limiting the amount of fat and cholesterol in my diet. 149,1

1=6=Agree Completely
2=5
3=4
4=3
5=2
6=1=Disagree Completely

Exercise

34. During an average week, about how often, if ever, do you, yourself, exercise? By exercise, we mean any physical activity you engage in for the purpose of maintaining/ improving your overall fitness level. 150,1

1=More than 3 times a week
2=2 to 3 times a week
3=Once a week
4=Less often than once a week

5=Never

35. Which one of the following best describes your exercising habits during the past 6 months? 151,1

1=I exercised to lose/ maintain my weight
2=I exercised to look good
3=I exercised to keep in shape
4=I exercised to stay healthy
5=I exercised to feel healthier
6=I exercised to reduce stress
7=I did not exercise

36. During the past 6 months, which of the following weight loss programs/strategies, if any, have you, yourself, followed? Please scan all that apply.

Normal diet with smaller portions	152 ,1
A low-fat diet	153 ,1
A diet where calories are counted	154 ,1
A diet where points are counted	155 ,1
A diet that limits carbohydrates	156 ,1
A 40/30/30 balance of carbohydrates, protein,and fat	157 ,1
A high fibre diet	158 ,1
A low sugar diet	159 ,1
A meal replacement diet (liquid or bar)	160 ,1
Other	161 ,1
None, I have not followed a weight loss program/ strategy during the past 6 months	162 ,1

37. In which of the following weight loss programs, if any, are you, yourself, currently participating? Please scan all that apply.

Atkins Diet	163 ,1
Carbohydrate Addict's Diet	164 ,1
Cereal Diet	165 ,1
Diet of own design	166 ,1
Diet program affiliated with a doctor, hospital or medical group	167 ,1
Fit for Life	168 ,1
GI (Glycemic Index) Diet	169 ,1
Jenny Craig	170 ,1
Personal Trainer/Health Club Program	171 ,1
Slim-Fast Program	172 ,1
South Beach Diet	173 ,1
The Zone	174 ,1
Weight Watchers	175 ,1

Other 176,1
None, I am not currently participating in a weight loss program 177,1

Blanks 178,15

Trans Fats, Saturated Fats, Obesity

39. How concerned are you about trans fatty acids in your diet or the diet of other members of your household? 193,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

40. In general, how concerned are you about saturated fats in your diet or the diet of other members of your household? 194,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

41. How concerned are you with obesity in regards to you and/or other members of your household? 195,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

42. In general, are you, or any member of your household, aware of Omega 3 and its benefits? 196,1

1=Have heard of Omega 3, but not aware of its benefits
2=Have heard of Omega 3,and aware of its benefits
3=Have not heard of Omega 3 -->Skip to question 44

43. From which sources, if any, do you try to obtain Omega 3 in your household's diet? Please scan all that apply.

Cheese 197,1
Eggs 198,1
Fish 199,1
Fish oil supplement (e.g., cod liver oil) 200,1
Fortified Juice 201,1

Fortified Milk 202,1
Vegetable-based supplement (e.g., flaxseed, grape seed, linseed) 203,1
Yogurt 204,1
Other 205,1
Don't know 206,1

Do not try to obtain Omega 3 in the household's diet 207,1

44. In general, are you, or any member of your household, aware of Probiotic Active Culture in dairy products and its benefits? 208,1

1=Have heard of Probiotic Active Culture in dairy products, but not aware of its benefits
2=Have heard of Probiotic Active Culture in dairy products, and aware of its benefits
3=Have not heard of Probiotic Active Culturein dairy products

Organics

45. Have you ever seen, read or heard about 'organic' foods? 209,1

1=Yes
2=No **--> Skip to question 51**

46. Which of the following factors, if any, do you associate with 'organic' foods? Please scan all that apply.

Foods that are produced or grown through processes that eliminate or minimize use of chemical pesticides and artificial fertilizers	210,1
Foods that are produced through processes that are free of genetically engineered and/or modified organisms (GMOs)	211,1
Less harmful to/protects the environment	212,1
Healthier/more nutritious	213,1
Special attention to the safe treatment/welfare of animals	214,1
Tastes better	215,1
Fresher	216,1
Safer than foods produced by traditional means	217,1
More expensive	218,1
Shorter shelf-life	219,1
Other	220,1
None of the above	221,1

47. Please indicate to what extent you agree or disagree with the following statement: I try to eat organic fruits and vegetables when possible. 222,1

1=Strongly agree
2=Somewhat agree
3=Neither disagree nor agree
4=Somewhat disagree
5=Strongly disagree

48. Which, if any, of the following types of organically grown or produced foods have you purchased in the past 12 months? Please scan all that apply.

Bagged salad (e.g., chopped lettuce in a bag)	223,1
Baking mixes (e.g., cakes, muffins)	224,1
Breads/Grains/Rice	225,1
Cereals	226,1
Cheese	227,1
Coffee	228,1
Eggs	229,1
Fruits	230,1
Juices or Drinks	231,1
Loose vegetables	232,1
Meat	233,1
Milk	234,1
Pasta	235,1
Pre-packaged vegetables (other than bagged salad)	236,1
Tea	237,1
Yogurt	238,1
Other beverages (other than tea, juices, drinks or milk)	239,1
Other dry packaged foods	240,1
Have purchased organically grown or produced foods, but have not done so in the past 12 months **--> Skip to question 50**	241,1
Have never purchased organically grown or produced foods **--> Skip to question 51**	242,1

49. Where have you purchased organically grown or produced foods in the past 12 months? Please scan all that apply.

Bakery	243,1
Conventional grocery store	244,1
Delicatessen	245,1
Department Store	246,1
Discount grocery store	247,1
Drug Store	248,1
Farm/farmer's market	249,1
Health food store	250,1
Mass Merchandiser	251,1
Organic grocery store	252,1
Warehouse Club	253,1
Other	254,1

50. What is the PRIMARY reason that you purchased organically grown or produced foods? 255,2

01=Eliminate or minimize use of chemical pesticides and artificial fertilizers in the production process
02=Free of genetically engineered and/or modified organisms (GMOs)
03=Special attention to the safe treatment/welfare of animals
04=Tastes better
05=Fresher
06=Healthier/more nutritious
07=Less harmful to/protects the environment
08=Safer than foods produced by traditional means
09=Like to try new products
10=Other
11=None of the above

51. How concerned are you about the safety of the food supply in Canada? 257,1

1=Very concerned
2=Somewhat concerned
3=Not at all concerned

52. Please indicate how familiar you are with functional or fortified foods. 258,1

1=Very familiar
2=Somewhat familiar
3=Neutral
4=Somewhat unfamiliar
5=Not at all familiar

53. How important is it that food and/or beverages have been fortified with additional vitamins/minerals? 259,1

1=Extremely important
2=Very important
3=Somewhat important
4=Not very important
5=Not at all important

54. Which of the following foods and/or beverages, if any, has your household purchased in the past 12 months? Please scan all that apply.

Milk with added vitamins/minerals	260,1
Cereal with added vitamins/minerals	261,1
Soy beverages	262,1

Rice or potato based beverages	263,1
Energy drinks	264,1
Orange juice with added vitamins/minerals	265,1
Bread with added supplements/vitamins	266,1
Whole Grain/high fibre products	267,1
Yogurts with probiotics (i.e., active cultures)	268,1
Yogurts with prebiotics	269,1
Eggs with added supplements	270,1
Cheese with added supplements	271,1
Other functional or fortified foods	272,1
None of the above **-->skip to question 57**	273,1

55. Which of the following factors, if any, do you associate with functional or fortified foods? Please scan all that apply.

Added vitamins/minerals (i.e., not naturally occurring)	274,1
Enhanced nutritional benefit	275,1
Promote specific health benefits	276,1
Shown to reduce risk of chronic disease	277,1
Other	278,1
Don't know	279,1

56. What are the reasons that you purchased the functional or fortified foods **selected in question 54?** Please scan all that apply.

Minimize mineral deficiency	280,1
Minimize potential future health problems	281,1
Minimize current health problems	282,1
Minimize signs of aging (e.g., wrinkles, etc.)	283,1
Reduce stress	284,1
Increase energy levels	285,1
Like to try new products	286,1
Trendy/latest health trend	287,1
Appeals to my lifestyle for healthy living	288,1
Don't know	289,1
Other	290,1

57. Which, if any, of the following types of foods and/or beverages would you be willing to pay more for? Please scan all that apply.

Organic	291 ,1
Foods/beverages that have added vitamins/minerals	292 ,1
Foods/beverages that promote a specific health benefit	293 ,1
Foods/beverages that are shown to reduce risk of chronic disease	294 ,1
Reduced fat	295 ,1
Reduced sugar or sugar-free	296 ,1
Reduced salt/sodium	297 ,1
Low calorie	298 ,1
Low carb	299 ,1
Nut-free	300 ,1
Decaffeinated	301 ,1
Trans fat free	302 ,1
Low in preservatives	303 ,1
None of the above	304 ,1

Nutrition Labelling

58. When shopping for household groceries, when do you refer to the Nutrition Facts table on packaged foods and/or beverages? Please scan all that apply.

Every time I (we) shop	305 ,1
When thinking of buying a product for the first time	306 ,1
When on a diet/trying to lose weight	307 ,1
When considering customary eating/dietary habits (e.g., Vegetarian, Kosher, Halal)	308 ,1
When considering health conditions	309 ,1
When buying products for my children	310 ,1
When buying desserts	311 ,1
When buying snack items	312 ,1
When buying meal (breakfast/lunch/dinner) items	313 ,1
When buying certain food types	314 ,1
When I have the time	315 ,1
When making the final choice between two or more brands	316 ,1
I never refer to the Nutrition Facts table	317 ,1

59. When reading product labels/packaging, which of the following factors do you consider when deciding to buy packaged food and/or beverages? Please scan all that.

Artificial sweeteners	318 ,1
Calcium	319 ,1
Calories	320 ,1
Carbohydrates	321 ,1
Cholesterol	322 ,1
Fat	323 ,1
Fibre	324 ,1
Health Claims	325 ,1
Iron	326 ,1
Organic	327 ,1
Potassium	328 ,1
Preservatives	329 ,1
Probiotic Active Culture	330 ,1
Prebiotic Fibre	331 ,1
Protein	332 ,1
Salt/Sodium	333 ,1
Saturated Fat	334 ,1
Sugar	335 ,1
Trans Fat	336 ,1
Vitamin A	337 ,1
Vitamin C	338 ,1
Vitamin D	339 ,1
The amount of food in a serving	340 ,1
Glycemic Index	341 ,1
Ingredient list to identify allergens	342 ,1
Ingredient list to ensure my dietary restrictions (other than allergens)are being met	343 ,1
Ingredient list to check order of ingredients	344 ,1
None	345 ,1

60. Have you seen, read or heard of any dietary or nutrition-related symbols/logos or endorsements (other than the Nutrition Facts table) on any packaged food and/or beverage products? 346,1

1=Yes
2=No

61. When shopping for household groceries, how often, if ever, do you look for dietary or nutrition-related symbols/logos or endorsements (other than the Nutrition Facts table) on the package? 347,1

1=Every time I (we) shop
2=Most of the time
3=Sometimes
4=Rarely
5=Never

62. When shopping for household groceries, how important is it to you that food and/or beverage packages have dietary symbols/logos or endorsements? 348,1

1=Extremely important
2=Very important
3=Somewhat important
4=Not very important
5=Not at all important

63. In the last 3 months, have you purchased one brand over another because it had a dietary symbol/logo or endorsement on the package? 349,1

1=Yes
2=No

64. Which, if any, of the following dietary symbols/logos or endorsements have you looked for when grocery shopping in the past 30 days? Please scan all that apply.

"5 to 10 a Day for Better Health" logo and statement	350,1
"Canada Organic" symbol/logo	351,1
Certified Organic symbol/logo or claim	352,1
Diabetic Association logo or endorsement	353,1
“Eat Smart” symbol/logo	354,1
Gluten-free claim or logo	355,1
Glycemic Index	356,1
Halal certified claim or logo	357,1
“Health Check” symbol/logo	358,1
Kosher certified claim or logo	359,1
Lactose free	360,1
No GMO or non-genetically engineered symbol, logo or claim	361,1
Nut-free claim or symbol/logo	362,1
“Sensible Solutions” symbol/logo	363,1
“Smart Spot” symbol/logo	364,1
Other	365,1
None of the above **--> Skip to question 66**	366,1

65. Which of these following statements best describes your primary reason for looking for products with a dietary symbol, logo or endorsement? Please scan one response only.

367,1

1=I am seeking out foods that are best for the treatment of an existing health condition (e.g., high blood pressure, high cholesterol, diabetes, allergies)
2=These products are consistent with my ideological/religious beliefs
3=I have no specific health condition I am treating, but simply believe that such products are better for my general health and well-being than other choices available
4=I believe these products are prepared with better quality ingredients
5=I believe these products are more nutritious
6=I believe these products are safer to eat
7=I believe these product choices are less processed/more natural
8=Other

66. Which of the following are your TOP 3 sources of information on the topic of healthy eating? Please scan your TOP 3 sources.

Books	368,1
Canada's Food Guide	369,1
Family member/Friend	370,1
Flyers	371,1
Health Claims	372,1
Health symbol/logo on food package	373,1
Holistic specialist/ Naturopath/Homeopath	374,1
Internet	375,1
Magazines	376,1
Medical doctor	377,1
Newspapers	378,1
Nutritionist/Dietician	379,1
Nutrition Facts table	380,1
Personal/Fitness Trainer	381,1
Pharmacist	382,1
Television	383,1
Weight management program (e.g., Jenny Craig, Weight Watchers)	384,1
Word of mouth recommendation (other than family/friend)	385,1
Other	386,1
I don't use any sources of information on the topic of healthy eating	387,1

67. From the list below, please scan the health conditions/ailments that you or any other member of your household have experienced within the past 12 months. Please scan all that apply.

Acid reflux/GERD	388,1
Acne	389,1
Allergies	390,1
Anxiety	391,1
Arthritis/Rheumatism	392,1
Asthma	393,1
Back pain	394,1
Colds	395,1
Constipation	396,1
Coughs/Bronchitis/ Pulmonary Disease	397,1
Dermatitis/Eczema/Seborrhea	398,1
Depression	399,1
Diabetes	400,1
Diarrhea	401,1
Flu (Influenza)	402,1
Headaches (excluding Migraines)	403,1
Heart Disease	404,1
Heartburn/Indigestion	405,1
High blood pressure	406,1
High cholesterol levels	407,1
Incontinence	408,1
Insomnia/Sleeplessness	409,1
Menstrual/Hormonal disorders/Menopause	410,1
Migraines	411,1
Muscle aches and pains	412,1
Nausea/Vomiting	413,1
Obesity	414,1
Osteoporosis	415,1
Smoking (attempting to quit)	416,1
Stress	417,1
Vaginal yeast infections	418,1
No one in the household has experienced any of the listed health conditions/ ailments in the past 12 months	419,1

68. Do you, or any other household member, have any of the following food allergies? Please scan all that apply.

Eggs	420,1
Fish	421,1
Soy	422,1
Peanuts	423,1
Milk/Dairy/Lactose Intolerance	424,1
Shellfish (e.g., shrimp, lobster, crab)	425,1
Tree Nuts (e.g., walnuts, almonds, cashews)	426,1
Food colouring or preservatives	427,1
Wheat/Flour/Gluten (Celiac)	428,1
Foods high in Nickel/Zinc	429,1
Food additive	430,1
Food flavouring	431,1
Sesame Seeds	432,1
Sulphites	433,1
Unknown food allergy	434,1
Other food allergy	435,1
No food allergies	436,1

Appendix E Chapter 7 T-Tests

Hypothesis 1: Health concerned households will have lower total meat expenditures than not concerned households.

Q20: Healthy eating concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total meat expenditure of not concerned participants	*Total meat expenditure of concerned participants*
Mean	18738.21845	21046.33581
Variance	277820597	321381363.8
Observations	737	6319
Hypothesized Mean Difference	0	
df	946	
t Stat	-3.528798361	
P(T<=t) one-tail	0.000218771	
t Critical one-tail	1.646467354	
P(T<=t) two-tail	0.000437541	
t Critical two-tail	1.962475835	

Q5: Potential future health problems concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total meat exp. of "not concerned at all" participants	*Total meat exp. of "very concerned" participants*
Mean	22955.2381	20685.93
Variance	461642479.5	3.3E+08
Observations	84	3070
Hypothesized Mean Difference	0	
df	86	
t Stat	0.958680053	
P(T<=t) one-tail	0.170203706	
t Critical one-tail	1.662765499	
P(T<=t) two-tail	0.340407412	
t Critical two-tail	1.987932592	

Q40: Saturated fats concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total meat exp. of "not concerned at all" participants	*Total meat exp. of very concerned" participants*
Mean	19535.22296	21050.53604
Variance	274395363.1	326580119.9
Observations	749	2511
Hypothesized Mean Difference	0	
df	1324	
t Stat	-2.15071401	
P(T<=t) one-tail	0.015839664	
t Critical one-tail	1.646005785	
P(T<=t) two-tail	0.031679328	
t Critical two-tail	1.961757334	

Q41: Obesity concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total meat exp. of "not con. at all" participants	*Total meat exp. of "very concerned" participants*
Mean	19644.5802	21470.29083
Variance	279435337.1	354380243.7
Observations	1889	2180
Hypothesized Mean Difference	0	
df	4065	
t Stat	-3.276498352	
P(T<=t) one-tail	0.000529926	
t Critical one-tail	1.645228167	
P(T<=t) two-tail	0.001059853	
t Critical two-tail	1.960547706	

Hypothesis 2: Health concerned households will purchase less processed meats than not concerned households.

Q20: Healthy eating concerns

t-Test: Two-Sample Assuming Unequal Variances

	Processed meat expenditure of not concerned participants	*Processed meat expenditure of concerned participants*
Mean	3622.025271	4021.68607
Variance	17801589.19	19349667.21
Observations	554	4982
Hypothesized Mean Difference	0	
df	694	
t Stat	-2.10590756	
P(T<=t) one-tail	0.017785488	
t Critical one-tail	1.647051704	
P(T<=t) two-tail	0.035570975	
t Critical two-tail	1.963389877	

t-Test: Two-Sample Assuming Unequal Variances

	UPC expenditure of not concerned participants	*UPC expenditure of concerned participants*
Mean	4235.5	4725.032821
Variance	19120355.01	25873009.04
Observations	548	4875
Hypothesized Mean Difference	0	
df	724	
t Stat	-2.441615088	
P(T<=t) one-tail	0.007430052	
t Critical one-tail	1.646960754	
P(T<=t) two-tail	0.014860104	
t Critical two-tail	1.963244358	

Q5: Potential future health problems concerns

t-Test: Two-Sample Assuming Unequal Variances

	Processed exp. of "not concerned at all" participants	*Processed exp. of "very concerned" participants*
Mean	3760.476923	3955.011662
Variance	15814699.53	19363321.04
Observations	65	2401
Hypothesized Mean Difference	0	
df	68	
t Stat	-0.388009518	
P(T<=t) one-tail	0.349610508	
t Critical one-tail	1.667572178	
P(T<=t) two-tail	0.699221015	
t Critical two-tail	1.995467755	

t-Test: Two-Sample Assuming Unequal Variances

	UPC exp. of "not concerned at all" participants	*UPC exp. of "very concerned" participants*
Mean	3760.476923	3955.011662
Variance	15814699.53	19363321.04
Observations	65	2401
Hypothesized Mean Difference	0	
df	68	
t Stat	-0.388009518	
P(T<=t) one-tail	0.349610508	
t Critical one-tail	1.667572178	
P(T<=t) two-tail	0.699221015	
t Critical two-tail	1.995467755	

Q40: Saturated fats concerns

t-Test: Two-Sample Assuming Unequal Variances

	Processed meat exp. of "not concerned at all" participants	*Processed meat exp. of "very concerned" participants*
Mean	3893.803478	4055.365112
Variance	16160555.62	21808722.42
Observations	575	1972
Hypothesized Mean Difference	0	
df	1067	
t Stat	-0.816379179	
P(T<=t) one-tail	0.207232761	
t Critical one-tail	1.646283181	
P(T<=t) two-tail	0.414465522	
t Critical two-tail	1.962189344	

t-Test: Two-Sample Assuming Unequal Variances

	UPC exp. of "not concerned at all" participants	*UPC exp. of "very concerned" participants*
Mean	4533.462081	4733.332474
Variance	22394923.08	26814648.43
Observations	567	1940
Hypothesized Mean Difference	0	
df	996	
t Stat	-0.865578865	
P(T<=t) one-tail	0.193464795	
t Critical one-tail	1.646385499	
P(T<=t) two-tail	0.386929591	
t Critical two-tail	1.962348506	

Q41: Obesity concerns

t-Test: Two-Sample Assuming Unequal Variances

	Processed meat exp. of "not con. at all" participants	*Processed meat exp. of " very con." participants*
Mean	3769.58488	4159.057937
Variance	17662662.73	20911940.89
Observations	1455	1726
Hypothesized Mean Difference	0	
df	3155	
t Stat	-2.500780863	
P(T<=t) one-tail	0.006221157	
t Critical one-tail	1.645337306	
P(T<=t) two-tail	0.012442315	
t Critical two-tail	1.960715963	

t-Test: Two-Sample Assuming Unequal Variances

	UPC exp. of "not concerned at all" participants	*UPC exp. of "very concerned" participants*
Mean	4591.427481	4827.176023
Variance	23049255.15	32427680.48
Observations	1441	1710
Hypothesized Mean Difference	0	
df	3149	
t Stat	-1.260869941	
P(T<=t) one-tail	0.103724559	
t Critical one-tail	1.645337306	
P(T<=t) two-tail	0.207449118	
t Critical two-tail	1.960715963	

Hypothesis 3: Health concerned households will purchase less beef and pork and more poultry than not concerned households.

Q20: Healthy eating concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total beef expenditure of not concerned participants	*Total beef expenditure of concerned participants*
Mean	8000.78744	8376.443893
Variance	73574842.35	73905075.91
Observations	621	5436
Hypothesized Mean Difference	0	
df	769	
t Stat	-1.033672631	
P(T<=t) one-tail	0.150807095	
t Critical one-tail	1.646837973	
P(T<=t) two-tail	0.30161419	
t Critical two-tail	1.963053364	

t-Test: Two-Sample Assuming Unequal Variances

	Total Pork exp. of not concerned participants	*Total pork exp. of concerned participants*
Mean	4853.203704	5200.458286
Variance	20533165.32	23756575.4
Observations	594	5274
Hypothesized Mean Difference	0	
df	756	
t Stat	-1.756769052	
P(T<=t) one-tail	0.039680984	
t Critical one-tail	1.646872079	
P(T<=t) two-tail	0.079361968	
t Critical two-tail	1.963107934	

t-Test: Two-Sample Assuming Unequal Variances

	Total poultry not con.	*Total poultry con.*
Mean	5434.035235	6017.502392
Variance	26932881.81	37295422.27
Observations	596	5434
Hypothesized Mean Difference	0	
df	787	
t Stat	-2.557376068	
P(T<=t) one-tail	0.005366453	
t Critical one-tail	1.646792498	
P(T<=t) two-tail	0.010732906	
t Critical two-tail	1.962980605	

Q5: Potential future health problems

t-Test: Two-Sample Assuming Unequal Variances

	Total beef exp. of "not concerned at all" participants	*Total beef exp. of "very concerned" participants*
Mean	9847.478261	8186.001522
Variance	121984254.9	77859942.77
Observations	69	2628
Hypothesized Mean Difference	0	
df	70	
t Stat	1.239247425	
P(T<=t) one-tail	0.109696432	
t Critical one-tail	1.666915068	
P(T<=t) two-tail	0.219392864	
t Critical two-tail	1.994435479	

t-Test: Two-Sample Assuming Unequal Variances

	Total pork exp. of "not concerned at all" participants	*Total pork exp. of "very concerned" participants*
Mean	5982.583333	5146.370885
Variance	40973548.27	24122696.09
Observations	72	2521
Hypothesized Mean Difference	0	
df	73	
t Stat	1.099284845	
P(T<=t) one-tail	0.137628016	
t Critical one-tail	1.665996479	
P(T<=t) two-tail	0.275256031	
t Critical two-tail	1.992998477	

t-Test: Two-Sample Assuming Unequal Variances

	Total poultry exp. of "not concerned at al" participants	*Total poultry exp. of " very concerned" participants*
Mean	6145.704225	6080.688914
Variance	46632896.1	37838294.98
Observations	71	2652
Hypothesized Mean Difference	0	
df	73	
t Stat	0.079365544	
P(T<=t) one-tail	0.468479519	
t Critical one-tail	1.665996479	
P(T<=t) two-tail	0.936959038	
t Critical two-tail	1.992998477	

Q40: Saturated fats concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total beef exp. of "not concerned at all" participants	*Total beef exp. of "very concerned" participants*
Mean	8335.643533	8415.754206
Variance	67563443.61	78107790.47
Observations	634	2140
Hypothesized Mean Difference	0	
df	1103	
t Stat	-0.211798213	
P(T<=t) one-tail	0.416151796	
t Critical one-tail	1.646235432	
P(T<=t) two-tail	0.832303591	
t Critical two-tail	1.962116585	

t-Test: Two-Sample Assuming Unequal Variances

	Total pork exp. of "not concerned at all" participants	*Total pork exp. of "very concerned" participants*
Mean	4924.409165	5051.2154
Variance	18826106.79	23502194.24
Observations	611	2052
Hypothesized Mean Difference	0	
df	1102	
t Stat	-0.616806275	
P(T<=t) one-tail	0.268744959	
t Critical one-tail	1.646237706	
P(T<=t) two-tail	0.537489918	
t Critical two-tail	1.962116585	

t-Test: Two-Sample Assuming Unequal Variances

	Total poultry exp. "not concerned at all" participants	*Total poultry exp. "very concerned" participants*
Mean	5451.241776	6254.598255
Variance	28856030.47	40918523.38
Observations	608	2178
Hypothesized Mean Difference	0	
df	1133	
t Stat	-3.121207522	
P(T<=t) one-tail	0.00092334	
t Critical one-tail	1.646199053	
P(T<=t) two-tail	0.00184668	
t Critical two-tail	1.962062015	

Q41: Obesity concerns

t-Test: Two-Sample Assuming Unequal Variances

	Total beef exp. of "not concerned at all" participants	*Total beef exp. of very concerned" participants*
Mean	7831.8347	8385.783898
Variance	66728857.26	74906067.53
Observations	1585	1888
Hypothesized Mean Difference	0	
df	3424	
t Stat	-1.937133406	
P(T<=t) one-tail	0.026405592	
t Critical one-tail	1.645298653	
P(T<=t) two-tail	0.052811184	
t Critical two-tail	1.960656846	

t-Test: Two-Sample Assuming Unequal Variances

	Total pork exp. of "not concerned at all" participants	*Total pork exp. of "very concerned" participants*
Mean	4965.889251	5202.253723
Variance	19650330.39	25731949.47
Observations	1535	1813
Hypothesized Mean Difference	0	
df	3343	
t Stat	-1.438613824	
P(T<=t) one-tail	0.075176789	
t Critical one-tail	1.645310022	
P(T<=t) two-tail	0.150353579	
t Critical two-tail	1.960675036	

t-Test: Two-Sample Assuming Unequal Variances

	Total poultry exp. of "not concerned at all" participants	*Total poultry exp. of "very concerned" participants*
Mean	5894.493606	6300.618337
Variance	34331366.95	44272051.41
Observations	1564	1876
Hypothesized Mean Difference	0	
df	3428	
t Stat	-1.902893159	
P(T<=t) one-tail	0.028569089	
t Critical one-tail	1.645298653	
P(T<=t) two-tail	0.057138178	
t Critical two-tail	1.960656846	