RURAL ECONOMY

Consumer Attitudes, Willingness to Pay and Revealed Preferences for Different Egg Production Attributes: Analysis of Canadian Egg Consumers

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Project Report #07-03

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Abstract

The Canadian egg industry has introduced a number of specialty eggs, including Omega-3, organic, free run/range, vitamin enhanced and vegetarian over the past few decades. These eggs are generally sold at prices higher than the 'normal' egg and there has been little analysis of the consumer awareness of and interest in purchasing these eggs. All previous econometric analysis of the Canadian egg market has assumed eggs and consumers are homogeneous. This study makes use of Stated preference and Revealed preference data to model the consumer interest in the different egg types. Stated preference surveys were conducted in two separate years: 2005 during which consumers were surveyed on their interest in Omega-3 and Vitamin Enhanced eggs relative to 'normal' eggs, white large, Grade A eggs, and 2006 during which consumers were surveyed on their interest in organic, free-run and vegetarian eggs relative to brown Grade-A eggs. Consumers were also assessed on their health behaviour, health consciousness, and in 2006 on their attitudes towards animal welfare, novelty foods, and environmental concerns. Results from this phase of the research suggested that among the sample of Alberta consumers, there is only modest interest in the specialty eggs, eggs, in general, are associated with other healthy behaviours, health conscious consumers are willing to pay more for specialty eggs, of all types, older consumers and consumers with families are significantly more price sensitive and hence, have constraints on their ability to purchase specialty eggs. As well, consumers with concerns about animal welfare will pay more for free run eggs, there is an increased interest in eggs with identified health attributes among older consumers.

Revealed preference analysis of actual purchase behaviour was conducted on an A C Nielsen Homescan© panel data set over a three year period. Separate analyses were conducted for Alberta and Ontario frequent egg purchasers, with some significant differences across provinces. In Alberta no one is willing to pay more for specialty eggs than for normal eggs, with either modeling technique applied. In Ontario this assessment is less clear, the frequency model of how often across a three year period households purchased each type of

egg, would suggest that consumers are willing to pay more for specialty eggs than for 'normal' eggs , with organic the egg that they are willing to pay the most for. At the same time the choice model for Ontario, a model of actual purchases across time with the type of egg as the dependent variable, suggests that consumers are willing to pay the most for 'normal' eggs with Free run and Organic close behind. Overall, as we look more closely at the relative ranking of specialty eggs, at the mean of all variables, organic eggs are the ones all households are willing to pay the most for. In the frequency model Alberta consumers's willingness to pay for organic eggs is closest to the normal egg and Ontario consumers would pay $1.72 relative to normal eggs. The choice model exhibits similar patterns. Free run eggs are also popular in Ontario, but less so than organic. One of the findings of the study is that there may be some misunderstanding of the relative nutritional benefits of the different types of eggs or other human health aspects of agricultural production. Health seems to be an issue in the purchase of organic eggs as much as it does in the purchase of Omega-3 eggs. Further specific research on the reasons why consumers purchase organic would allow the industry to develop better marketing tools.

JEL Codes: D12, Q11, Q18
Keywords: consumer behaviour, egg consumption, differentiated products

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BACKGROUND

The live stock industry has been and still is today a major contributor to the gross domestic income of Alberta. The stability and growth of the industry is critical to the welfare of major areas in the province. Recently, the live stock industry has seen a disproportionate share of challenges with respect to consumers' perceptions; food safety concerns (domestically and internationally); transitions in environmental policy; changes in production practices and technology; and product innovation to counter the declining aggregate consumption of meat. In recent years there has been a significant industry led/consumer oriented drive to put innovative value-added products on retail shelves. Value-added products provide consumers with a wider range of food products that address concerns of food safety, nutrition, and quality. At the forefront of this valued-added advancement is the Alberta poultry industry. A growing selection of consumer orientated value-added egg products (ie. Omega-3 enhanced, organic, vitamin enhanced, vegetarian, free run/ free range, and processed) have appeared (Alberta Egg Producers 2004). The poultry industry has taken a significant leadership role in this era of product differentiation and quality innovation. It must however be recognized with large product differentiation, there may come consumer confusion. Many of these products contain credence attributes making it difficult, if not impossible, for consumers to detect the quality attributes and claims in pre-purchase and post purchase evaluations (Hoffman, 2000). Recent studies indicate a lack of consumer knowledge pertaining to product quality (Cason 2002) and perceived health claims (Urala and Lahteenmaki, 2003). Confusion over product attributes and quality claims such as organic, free-range, and free-run poultry products are examples of this problem (Harper and Makatouni, 2002). Furthermore, the consumer ability to evaluate and interpret the health related claims and perceived benefits has not kept pace with product differentiation (Urala and Lahteenmaki, 2003). In dealing with these challenges the poultry industry must find ways to increase the engagement of consumers within the food chain and to provide effective avenues to aid consumers in their evaluation of products attributes and claims (Korthals 2001). Industry supported initiatives must be undertaken to quantitatively and qualitatively

assess the influence consumers perceptions, beliefs, and attitudes have on product evaluation and purchasing decisions (Sunding et al. 2003). A growing body of evidence indicates the existences of price premiums consumers are willing-to-pay for these value added quality attributes. Studies have found these premiums are motivated by health claims and benefits (Dixon and Shackley 2003); increased consumer environmental awareness and stewardship (Loureiro et al. 2002; Moon and Florkowsko, 2002); and ethical concerns of animal welfare and their links to product safety and quality (Egbart et al. 2003). The existence of price premiums underscores the importance of understanding the links between consumer perceptions, behaviors, and food demand to address consumer concerns (Zepeda et al. 2003) and to maintain consumer confidence and trust in the live stock industry (Brom, 2000). The understanding of these links should focus on the influence attributes of food safety, nutrition, animal welfare, and environmental quality have on consumers' purchasing decisions.

Recent outbreaks of animal transmitted diseases (BSE and avian flu); advancements in biotechnology and genetic engineering; and food borne illness scares (i.e. salmonella and ecoli bacteria) have helped to underscore consumer perceptions of food safety as one of the major challenges facing the livestock industry. Consumer perceptions of the perceived risks and dangers associated with livestock commodities has dominated debates concerning food safety issues (Myhr and Traavik, 2003). Consumers are becoming increasingly skeptical about the safety and security of livestock products. This cynicism can be attributed to (1) lack of data and insufficient information concerning health and ecological risks (2) general mistrust about the motives of scientists, companies, and political institutions (3) and uncertainty about the short and long term health and ecological risks of food products (Myhr and Traavik, 2003).

Increased general public awareness of the relationship between diet and lifestyle related diseases (i.e. obesity, cardiovascular disease, and cancer) have resulted in an increase consumer scrutiny of traditional nutritional aspects of food (i.e. fat, fibre, salt, and vitamin content) and nontraditional nutritional attributes of food (i.e. Omega-3 content) (Urala and Lahteenmaki, 2003). To satisfy consumer demand for value-added nutritional attributes there has been a proliferation of functional foods on retail store shelves by producers. Consumer acceptance of the functional foods along their health claims and positive benefits are strongly influenced by the manner information is communicated; understanding and

familiarity of nutritional claims and functional components; and perceptions of the motives behind the health claims (Urala and Lahteenmaki, 2003).

Animal welfare friendly production systems and perceived ethical husbandry practices are increasingly being viewed as attributes adding value to livestock products (Schroder and McEachern 2004). Recent developments in the European Union have seen several nations move to ban conventional cages for laying hens (Appleby 2003); and the adoption of regulations and guidelines outlining the ethical husbandry practices for the egg laying industry (Babcock et al. 2002). However, there is a lack of consistent information on the influence animal welfare plays on the consumers' perceptions of food quality and purchasing behaviour. Studies have shown consumer beliefs on humane animal products vary considerably. There are segments of consumers which the existence of welfare friendly production is quite significant, whiles other consumer groups express indifference towards the issue (Fearne and Lavelle, 1996). Due to the added costs to producers associated with the implementation of animal welfare strategies the extent to which consumers stated views on animal welfare influence their actual purchasing behaviours requires examination.

The impact of human activities on the environment is becoming an increasingly prevalent topic of debate. Due to the intimate relationship of livestock production operations and the physical environment focus is shifting to potential environmental risks and consequences of poultry production (Alberta Government, 2003). Potential environmental impacts associated with poultry production include transmissions of pathogen and zoonotic disease transmission, soil erosion and compaction, disposal of excess nutrients and water; and groundwater contamination (Alberta Government, 2003). These concerns have been in motivated by increased environmental awareness amongst consumers; extensive media coverage of the impact of livestock operations on the environment; and by uncertainty and lack of knowledge on the fate of many of these pollutants in the open environment (Pillai and Ricke 2002). An exploration of how product attributes associated with environmental quality impact consumer decisions is warranted due to the added cost associated with changes in production practices.

Table 1: Product Quality Attributes

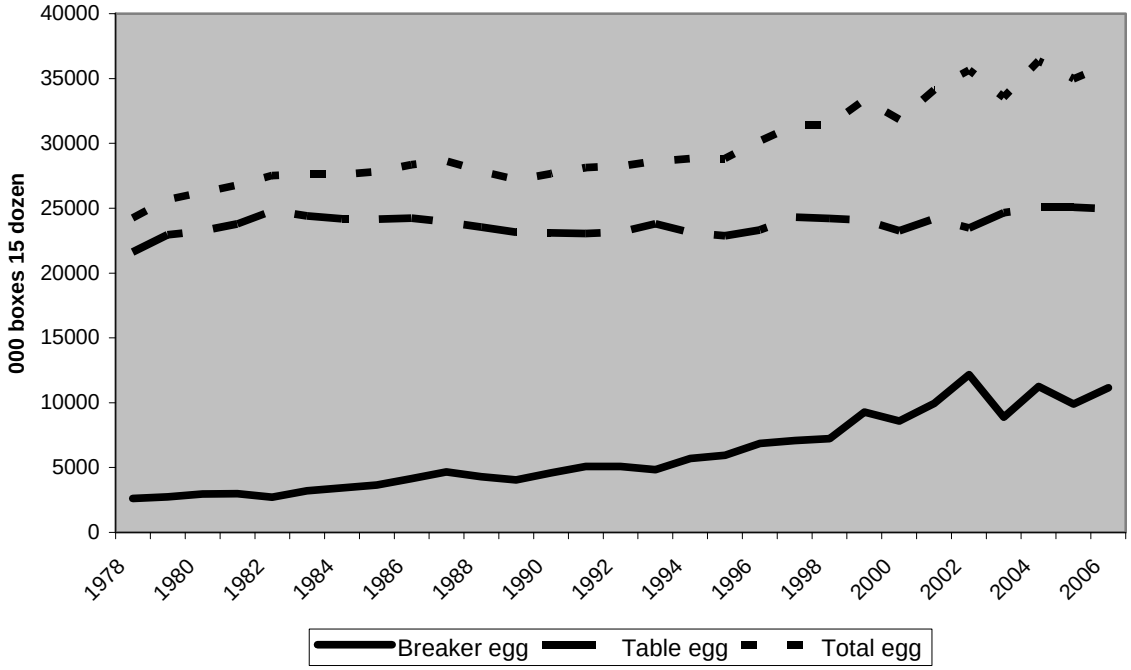
Characteristics	**Description of issues**
Food Safety	• Consumer concern and perceptions of risks associated with the transmission of zoonotic diseases (BSE and avian flu), GMO

	food products, biotechnology, and food borne illness. • Influence information has on consumer stated preferences and purchasing behaviour. • Effects of HAACCP and Stay Clean-Stay Safe programs on consumer perceptions and behaviour.
Nutrition	• Consumer perceptions of food fortification advantages and disadvantages (i.e. Omega-3, vitamin enhanced, organic) • Consumer preferences for specialty egg products and existence of premiums for these products. • Consumer perception of health related claims and influence on purchasing behaviour
Animal Welfare	• Consumer perceptions of animal welfare influence preferences and purchasing behaviour. • Values and motivations behind the consumer preferences for products produced through animal welfare friendly production systems (i.e. Factory farm, free range, free run) • Influence knowledge of different production methods influence consumer preferences and behaviours (i.e. conventional cages, modified cages, and barn raised)
Environmental	• Consumer concerns and perceptions of risks associated with current environmental practices in the livestock industry. • Influence information about environmental practices has on consumer preferences stated and purchasing behaviour. • Consumers stated preferences and willingness to pay premiums for changes in livestock environmental practices.

Overview of the egg market in Alberta and Canada.

In Canada egg disappearance suffered a blow in the 1980's when total and per capita disappearance declined, ascribed partially to concerns about increasing cholesterol in the diet. However from the mid-1980s , there was an increase in the number of eggs consumed in the 'breaker' market, resulting in an overall increasing trend in egg disappearance in Canada (Figure 1).

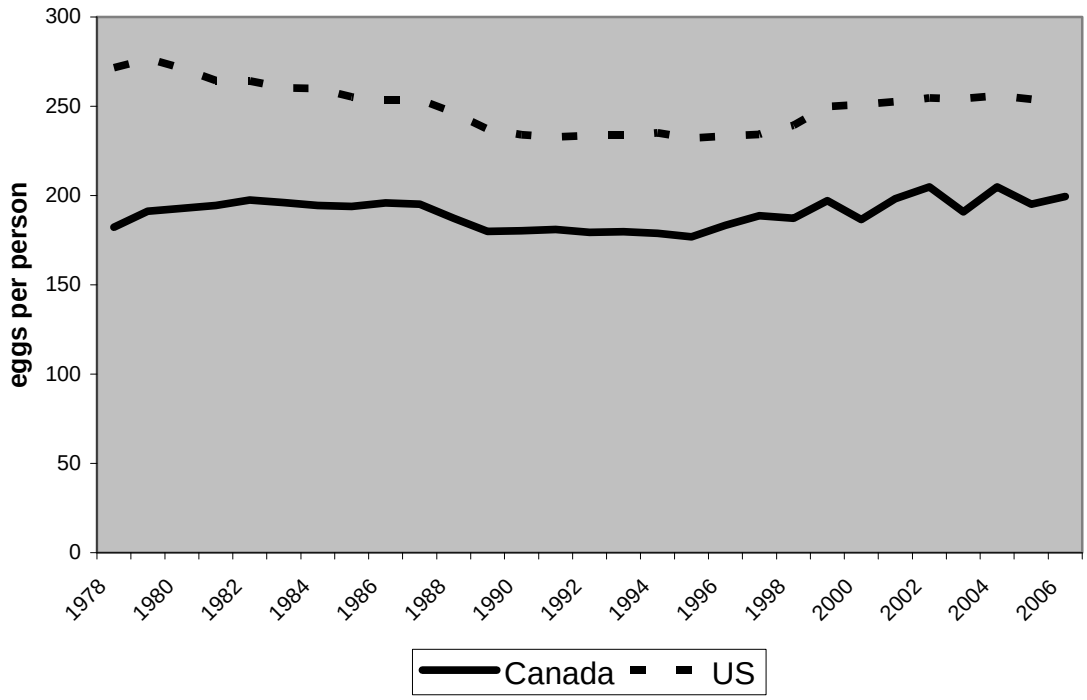
Figure 1, Egg Disappearance, Canada



Source: Statistics Canada (disappearance and trade)

Even with this increasing trend in total egg disappearance, Canadian egg disappearance on a per capita basis remains significantly lower than that in the U.S. This is similar to the trend in most meat products where per capita disappearance remains lower in Canada than in the United States (Figure 2).

Figure 2, Per Capita Egg Disappearance, US and Canada



Source: Statistics Canada and USDA

The most popular breed of chickens for egg production in Canada today is the White Leghorn. Leghorns are also responsible for providing most of the brown eggs in the marketplace. It should be noted that brown or white, there is no difference in the nutritional value or cooking performance of either egg (Alberta Egg Producers, 2004). However, there are three possible grades for eggs sold in the Canadian egg market. (1) Grade A, (2) Grade B, and (3) Grade C eggs.

Grade A are the most common in the grocery stores and are sold at the retail market for household use. The major characteristic of this type of egg is that it has a firm white, well-centered yolk, a small air cell and a clean, uncracked shell with normal shape. Grade B eggs may have a slightly un-centered yolk, a watery white and an uncracked shell. These eggs can be found in some grocery store although they are mainly used for commercial purposes and in the non food sector. Grade C eggs are only sold to processors as these do not meet the require standards to be sold on the shelves (Canadian Egg Marketing Agency, 2004).

As well, the egg market is composed of a number of products produced from breaker eggs. These are eggs that have been mechanically broken, and the liquid contents are separated

from the shell, and are either packaged whole or processed further and packaged for more specific purpose such as in pharmaceuticals. The various types of processed eggs that exist are:

- **Liquid egg product**: contains pasteurized egg whites, a small amount of pasteurized egg yolk and other ingredients. Omega-3 fatty acids could be added. This product is sold in packages containing two 250 ml cartons. Can be found in the egg case or frozen foods in the grocery stores.
- **Liquid albumen (or egg whites)**: pasteurized egg white. Found in the grocery store.
- **Low fat, yolk replaced egg product**: contains egg white and other ingredients. Found in 227 ml cartons. Found in the frozen section.
- **Dried whole Eggs**: convenient for outdoors. Found at camping supplies store.
- **Dried albumen and Meringue powder**: used for baking and can be found in stores that sell bulky foods and baking supplies.

Every year, hens produce nearly half a billion dozen eggs in Canada. About 40 million dozen of these eggs come from Alberta. Of these eggs, over 75% of them are sold in their shell and the reminder of the eggs processed into liquid, frozen or dried form (Alberta Egg Producers, 2004). Egg producers in Alberta fall in mainly two categories; unregistered and registered egg producers.

Unregistered producers are the egg producers with 300 or fewer layers and are not required to have a quota. This group of producers is not required to register with the Alberta Egg Producer's Board unless they are using a registered grading station. On the other hand, registered producers are those who house more than 300 hundred layers. This group of producers must have a quota. These quotas can be purchased by any Albertan. The Alberta Egg Industry reported that as of December 27, 2003, there were 167 registered egg producers in Alberta. The total number of hens issued to registered Alberta producers was 1, 602, 722 with an average flock size of 9,597 hens on each farm (The Alberta Egg Industry, 2004).

In Canada, as in the rest of the world, consumers are becoming more aware of issues related to food quality. Producers and food marketers are responding to these developments by

offering products which are consistent with the changing consumer preferences. The new developments are occurring in four major areas. These areas are in regards to nutrition, food safety, animal welfare and lastly, the environment. Below is an overview of the current developments made by the marketers and producers in Alberta.

Food safety.

Bonnie Cohen (2004) notes that due to the outbreak of Avian influenza in the Belgium and the Netherlands, the Exotic Newcastle Disease in California, poultry producers in Canada have become very aware that their sector is vulnerable to such events. She further notes the bird losses in these two outbreaks were larger than the total number of layers in Canada. On February 19, 2004 in Abbotsford area in BC there was an epidemic of Avian Influenza making the reality of a poultry epidemic outbreak a possibility across Canada. It should be noted that due to efforts by the CFIA and the provincial government, the Avian Influenza has so far been contained and the eradication process is on schedule.

One Food Safety initiative pursued by the egg industry is the development of the on farm program, Start Clean-Stay Clean, which is based on the principles of Hazard Analysis Critical Control Points (HACCP). HACCP was developed in the US and is based on seven principles aimed at identifying hazards in food production, controlling hazards at the critical control points in the process, and verifying whether the system is working properly. The underlying goal behind the HACCP is prevention. The principles of the HACCP are highly recommended by Codex Alimentarius. The Codex Alimentarius Commission was created by FAO and WHO to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme (Canadian Food Inspection Agency, 2004). The Start Clean-Stay Clean (SC-SC) program was introduced on farms in 1990. It may however, have not received the recognition it deserves from consumers. However, through constant lobbying and discussions with the provincial governments' agricultural departments and the Canadian Food Inspection Agency (CFIA) in 2003, Canadian Egg Marketing Agency (CEMA) managed to get these institutions to consider Start Clean-Stay Clean as a HACCP based program. Technical accreditation for the program was received in January 2004.

A testing protocol has been introduced by CEMA to check specifically for Salmonella Enteritidis (SE). This bacterium is of great concern in the poultry industry because it can be

passed on from the hen to the interior contents of an egg (Bonnie Cohen, 2004). Thus CEMA and the various provincial boards have developed a set of standardized procedures for taking environmental samples in barns and testing them for the presence of SE. If a positive sample is found, all the eggs from the barn are immediately taken to a processing center (egg breakers) and are pasteurized. This process kills the SE in the eggs and hence they can be used for other purposes. The barn in question is clean and the birdsare disposed of through own use rendering or composting. CEMA compensates the farmer for the loss (CEMA Annual Report, 2001). This procedure is also supported by the on-farm program SC-SC.

Nutrition.

Nutritionally enriched or "designer eggs" have become a very important component of the egg market in particular table eggs. Some of the varieties of these specialty eggs are:

- **Omega-3**: hens are fed with diets that contain 10-20 percent of flaxseed. Thus these eggs are rich with omega three polyunsaturated fatty acids.
- **Vitamin enhanced eggs**: hens are fed with a diet rich in vitamins E, folate, B6, and B12. The amount of vitamins included in the egg may vary based on the various brand names.
- **Organic**: fed with certified organic grains. These eggs have the same nutritional value as the normal eggs.
- **Vegetarian**: these hens are fed on a diet containing no animal protein
- **Premium quality**: from young hens at the peak of their laying cycles.

All of these above products were introduced to give consumers more choice and to try and accommodate specialized nutritional niches.

Animal welfare.

Animal welfare issues have been addressed to a certain extent in the development of certain egg types. One of the most prevalent animal welfare issues to do with egg production is the housing of layer hens.

Free Run: these eggs have the same nutritional component as the normal eggs. The difference however, is that these eggs are specifically from hens that have access to the floor

of the barn, nesting boxes and possibly perches. Thus, animal well-being is the underlying principle behind the production of these eggs.

Free Range eggs: these eggs have the same nutritional component as normal eggs. The difference between these eggs and the free run eggs is that these layers hens have access to the outdoors whenever the weather is conducive.

Animal care guidelines are an intricate part of the SC-SC on-farm program. The New Code of Practice for the care and handling of pullets, layers and spent fowl was introduced in 2003. This code is based on scientific principles. It was developed by scientists, the Canadian Food Inspection Agency (CFIA), Agriculture and Agrifood Canada, the Canadian Veterinary Medical Association and the Canadian Humane Societies (Bonnie Cohen, 2004, CEMA annual report, 2001). This code is the basis of the Canadian egg industry's animal care rating and inspection system that was developed by provincial egg marketing boards and CEMA. Some of the issues that are being dealt with in regards to animal welfare are: beak trimming, space requirements, and disposal of spent layers.

Other major players with regard to the animal welfare are the fast food chains. Companies such as KFC, Burger King, Macdonald's and Wendy's are developing (or have) animal welfare codes and are moving towards third **party auditing systems** that would be required for all their suppliers in Canada and the US (Babcock et al, 2002, The Alberta Egg Industry, 2004).

Environmental concerns.

In the past decades, there has been growing public concern with regard to environmental care. This increase in environmental awareness has resulted in considerable attention to potentially odorous emissions produced from livestock and poultry production sites. In recent years, attention has also shifted to the impact of production on the environment and its effects on water, soil, and air quality. Other environmental issues that are of great concern in the egg industry have been with regard to compositing of spent hens.

The volume of manure generated today may present a major obstacle to the future development of the livestock and poultry industries if the impact on the environment is not properly managed and controlled. There is legislative activity to restrict agricultural activities and impose penalties for exceeding manure land application limits. In Alberta for instance, there are several federal and provincial laws in place to protect the soil, air and water from

sources of pollution, including agricultural pollution. The Alberta government has the environmental obligations and regulatory approvals for live stock producers. Under these regulations, poultry producers are required to be knowledgeable about the Agricultural Operations Practices Act, Alberta Environmental Protection and Enhancement Act, the Public Health Act, the Livestock Diseases Act, the Water Act and the federal Fisheries Act. It is worth noting that prior to January 1st 2002, the approval process for poultry expansions was governed by the municipal governments. However, since January 1st 2002, the primary responsibility for the poultry operation approvals has been transferred to the provincial government.

The Canadian egg industry has been innovative with the introduction of many new types of shell eggs widely available through out the market place; at the same time consumers are interested in the added convenience of processed eggs and are increasingly consuming their eggs in completely processed foods (bakery products) or in the partially processed forms available in the grocery store. The innovations in the egg industry have been aimed at the niche markets among consumers who are concerned about health, food safety, animal welfare and the environment.

Previous Research

Summary of Canadian egg studies

Canadian egg consumers have changed their egg consumption patterns during the last 3 decades. Understanding these changes is of vital importance to egg producers, processors and government policy makers. It is difficult to identify and quantify the causes of changes in shell egg demand, particularly since many of the factors affecting consumer purchasing behaviour have changed. Previous studies in Canada have all focused on aggregate consumption or disappearance of shell eggs within Canada. Sometimes eggs are included in a broad categorization of all foods in Canada (Hassan and Johnson, 1976, Johnson and Safyurtlu, 1984, Curtin, Theoret and Zafiriou, 1987, Barewal and Goddard, 1985), or within the category of protein goods (Andrikopoulos and Carvalho, 1984), or the complete egg market is the focus of the study (Kulshreshtha and Ng, 1977, McCutcheon and Goddard, 1991, Chyc and Goddard, 1992, Hailu and Goddard, 2004).

Table 1. Summary Price and Income Elasticities: Previous Canadian Studies

Authors	Price Elasticity	Income Elasticity	Period
Hassan and Johnson	-0.120	0.000	1950-1972
Kulshreshtha and Ng	-0.003	-0.267	1961-1973
Johnson and Safyurtlu	-0.120	0.000	1960-1981
Andrikopoulos and Carvalho	-0.545	0.417	1968-1981
Barewal and Goddard. (excluding demographics)	-0.287	0.154	1972, 1974, 1976, 1978
Barewal and Goddard. (including demographics)	-0.126	0.146	1972, 1974, 1976, 1978
Curtin et al.	-0.070	-0.058	1960-1985
McCutcheon and Goddard			
(1)Expenditure equation			
(a)	-1.120	-0.860	1978-1989
(b)	-2.160	-0.900	1978-1987
(2) Retail price equation			
(a)	-7.270	-1.120	1978-1989
(b)	-4.710	-0.852	1978-1987
Chyc and Goddard			
Equation 1:	-0.856	0.439	1974-1989
Equation 2:	-0.849	0.293	1974-1989
Equation 3:	-0.895	0.723	1974-1989
Hailu and Goddard			
Conditional elasticity	-0.704	0.768	1978-2001
Unconditional elasticity	-0.189	-0.079	1978-2001

Results of earlier studies (Curtin et al. 1987; Hassan and Johnson 1976; Kulshreshtha and Ng 1977; Johnson and Safyurtlu 1984; Andrikoploulos and Carvalho 1984) show the price elasticity of eggs to be low as compared to later studies by McCutcheon and Goddard (1992),

Chyc and Goddard (1992), Hailu and Goddard (2004), thus, today egg demand appears to be somewhat more price elastic. The income elasticities from the previous egg studies have mixed messages. Some studies show eggs to be inferior goods (negative income elasticity implies that the more income people earn the few eggs they purchase) while other studies show eggs to be normal goods. A particular assessment of whether the income elasticity of eggs has been changing with time cannot be established. Curtin, Theoret, and Zaferiou (1987) conclude that extreme care should be given when interpreting elasticities because they change with time and are also very sensitive to the methodology used. Curtin et al also conclude that to understand elasticities one must understand the data that was used in the estimation. Aggregating different types of egg together could result in estimated elasticities that do not represent the reality of consumer response to price changes for individual eggs or eggs in aggregate. Since products are constantly changing (for instance today there is a greater variety of egg products than there was 20 years ago), determining what factors are influencing egg demand is of great importance to the egg industry.

All the above studies treated eggs as a homogeneous product. No study has generated elasticities for the different egg products in the market today. Thus, this study is different from all the above studies in that eggs are treated as differentiated products each with a set of unique attributes.

Previous Studies Related to Modeling the Demand for Consumer Attributes

Consumers stated preferences and willingness to pay for product attributes such as food safety, environmental quality, nutrition content, and animal welfare are examined in the various studies presented below. Methods to examine preferences for specific product attributes are very different than the aggregate demand for eggs models that have previously been used in the Canadian literature referred to above. These studies focus on modeling the consumer demand for product attributes at the level of the individual or household. They provide a much finer level of understanding of what characteristics of individuals drive particular purchase decisions. Models to examine the demand for specific attributes generally fall into either STATED preference or REVEALED preference studies. Stated preference studies, in general, provide consumers with a series of product choices at a particular point in

time and identify through many choice options, consistent patterns of preference for each respondent. The choices provided may or may not be actual choices existing in the marketplace and thus this approach can provide more detailed evaluation (with a broader range of price/quality attributes and with a more detailed assessment of demographic and attitudinal characteristics of consumers) than any secondary data can provide. However the approach is somewhat limited in that consumers may hypothetically make choices that would not be borne out in actual purchase decisions. Revealed preference studies make use of actual purchase data, recorded by individuals or households. In Canada there are market research companies who collect actual purchase data from a panel of households. The demographic data provided on the households and the actual purchases data, tracked over time, can provide the basis for econometric analysis of actual purchase decisions, by product attribute and household demographic characteristic. However with this kind of analysis it is difficult to control for the actual choices faced by the individual households within the sample. The actual purchase decision recorded may be driven by product availability at a particular store which may be very different than that in another community or at another store. From the analysis conducted on data from either type of consumer preference study it is possible to calculate consumer willingness to pay for particular product attributes. These willingness to pay calculations can be undertaken for particular demographic or attitudinal characteristics depending upon the factors that have statistical significance in affecting the choice behaviour modeled econometrically. This type of willingness to pay calculation is very different than asking a straightforward 'are you willing to pay xx$ more for the product' question of a consumer, the more common approach often referred to by market research companies as willingness to pay.

Studies pertaining to the effect of consumer attitudes or stated preferences are presented in Table 2. There are indications of a strong relationship between consumer perceptions of food safety, nutrition, animal welfare, and the environment and purchasing behaviour. Studies estimating consumer willingness to pay are presented in Table 3. The studies indicate that consumers' views on issues of animal welfare, food safety, nutrition, and environmental quality influence their WTP a premium for products with associated positive attributes.

Table 2: Summary of methodology and techniques used in stated preference surveys

Title	Objective	Method	Results
Fearne, A., D. Lavelle. Perceptions of food "quality" and the power of marketing communication: results of consumer research on a branded-egg concept. Journal of Product and Brand Management 5(2), 1061.1996.	Use of group discussions to establish consumer attitudes and perceptions on egg shopping habits; diet, health, and food safety; bird welfare and egg production; and branded concept (description of the perfect egg) in order to formulate hypothesis	Conducted a total of 60 taste test in 30 households. Each household participated in a blind and informed taste test. Respondents score attributes (taste, texture, outer and inner appearance of eggs) and rank over preference .	Branding could have potential benefits for egg producers. Suggest that mid-priced, welfare friendly eggs could have market success with proper marketing communication
Fearne, A., D. Lavelle. Segmenting the U.K. egg market; results of a survey of consumer attitudes and perceptions. British Food Journal 98(1), 7-12. 1996.	Use of consumer food discussion groups to generate hypothesis on consumer attitudes and perception to be tested. Discussion focused on egg shopping habits; diet, health, and food safety; bird welfare and egg production.	Survey questionnaires administered (n=747) and analyzed using SPSSX statistical package (sample frequency, cross-tabulations, Chi-squared). Results discussed were purchasing behaviour; purchasing factors; consumption; knowledge attitudes and perceptions.	Concerns of cholesterol and animal welfare are major threats to the long term growth of the shell market.
Brennan, C., K. Gallagher, M. McEachern. A review of the 'consumer interest' in organic meat. International Journal of	Overall examination of European Union countries organic meat markets looking at consumer perceptions of organic meat markets		Summary statistics include set target for organic agriculture, land dedicated to organic production, price premiums currently paid for organic meat products.

Consumer Studies, 27(5), 13. 2003	(information, access, safety, choice, and representation).		
Harper, G.C., and A., Makatouni. Consumer perception of organic food production and farm animal welfare. British Food Journal 104(3-5), 287. 2002.	Interviewed consumer focus groups to determine the influence perceptions, attitudes, and behaviour have on issues of organic food and animal welfare. Specifically, identify buyer versus non buyer (1) perceptions of organic production and (2) attitudes towards animal welfare standards in organic food production. Finally, reveal the underlying values motivating consumer substitution or reduced consumption of animal-based products.	Interviews conducted in focus groups of 8 people with a total of 6 focus groups (n=48) which were audio and video recorded. All group members where parents of children between the ages of 4-11 yrs.	Study results indicate consumers confuse organic and free-range food products as equivalent. The main motives behind the purchase of organic foods were health and food safety concerns; and ethical concerns about animal welfare standards.
Maruyama, A., M. Kikuchi. Risk-learning process in forming willingness to pay for egg safety. Agribusiness 20(2), 12.2004.	Used contingent valuation and regression analysis to calculate willingness to pay and risk beliefs for reducing the risk of salmonella contamination of eggs based on prior and new risk knowledge.	Use of mail survey questionnaire (n=484). Focus includes demographic information, preference of eating eggs, prior risk beliefs, and hypothetical risks.	General findings are perceptions of new/future risks have a greater influence on purchasing decisions then prior risks.
McEachern, M.G, and G. Warnaby. Retail 'Quality Assurance' labels as a strategic marketing communication	Examination and identification of meat purchasing behaviour of consumers and their perceptions, attitudes, and knowledge towards the main	Mail out of questionnaires to female purchasers of fresh meat (n=1000). Response rate of 42 % with a rural to urban ratio of 51:49.	Findings suggest consumer purchase preferences to be more influenced industry standardized labels than individual retail chain labels. Furthermore, recognition/knowledge

mechanism for fresh meat. International Review of Retail Distribution and Consumer Research, 14(2), 16. 2004	quality assurance labels.	Analysis conducted using SPSS. Attitudinal questions based on a Likert scale measurement and Viramax rotation used to derive a Confirmatory Factor Analysis (CFA).	of individual chain logos lower than industry led organization logos.
Nelson, R. Risk management behaviour by the Northern Ireland food consumer. International Journal of Consumer Studies, 28(2), 186. 2004.	Examines how consumer perceptions of risks influence decision making process.	Use of a questionnaire developed to measure how food risks were estimated in both a societal and personal context (n= 185). Analysis used a principle component analysis technique.	Consumers require clear communication on how to deal with the risks in question and coping strategies. Furthermore, if consumers are provided information in a transparent manner risks there is a greater possibility they will manage and deal with the risk on a personal level.
Ness, M.R., and H. Gerhardy. Consumer preference for quality and freshness attributes of eggs. British Food Journal 96(3), 8. 1994.	Use of conjoint analysis to examine consumer attribute trade-offs with respect to quality and freshness attributes of eggs (production method, origin, freshness information, and price).	Use of questionnaire and analysis was conducted on a sample of 40 responses out of the 171 responses received (demographic bias).	Products defined in terms of attributes make it possible to estimate consumer willingness to trade off one attribute for another. Possible for consumers to lack full understanding of implication of various alternatives for simple products like eggs.
Phan-Huy, S.A., and R.B. Fawaz. Swiss Market for Meat from Animal-Friendly Production - Responses of Public and Private Actors in	The focus of the paper was to (1) provide empirical evidence of how attitudes towards animal protection influence purchasing behaviour for meat produced in conventional	Analysis was conducted from two cross sectional surveys. The first survey on meat and animal husbandry was conducted through telephone and personal interviews	Animal-friendly husbandry is important aspect of meat quality due to consumer perception of sensory quality and food safety; and as value added public good. The meat must regain consumer confidence through

Switzerland. Journal of Agricultural and Environmental Ethics 16(2). 119. 2003.	production systems and animal friendly production systems; (2) Show the impact attitudes have on household meat consumption.	(n=645). The second survey involved people responsible for housekeeping (n=502) which collected detailed data on meat consumption is households.	improved transparency of production methods and ameliorating meat quality.
Schroder, M.J.A, and M.G. McEachern. Consumer value conflicts surrounding ethical food purchase decisions: a focus on animal welfare. International Journal of Consumer Studies 28(2), 9. 2004.	Examined attitude towards meat production, value conflict management, label knowledge, and trustworthiness of consumers' agents.	Interview of 30 female meat consumers focusing on the influence meat logos have on meat purchasing, belief, and attitudes of quality.	Found process differentiation in the meat market is poor and existence of weak quality signals. Consumers require better information about food production which is presented in a value-neutral context.

Table 3: Summary of methodology and techniques used in willingness to pay surveys

Title	Objectives	Methods	Results
Bennett, R. M. ,J. Anderson, and R. J. P. Blaney. Moral Intensity and Willingness to Pay Concerning Farm Animal Welfare Issues and the Implications for Agricultural Policy. Journal of Agricultural and Environmental Ethics 15(2). 2002.	Explores how characteristics of a moral issue and the degree of moral intensity/moral imperative associated with the issue affects peoples' stated WTP. The study focuses on the issues of cage legislation and live animal export legislation.	Contingent valuation survey was used to elicit WTP. Analysis involved a sample size (n= 119). Survey was administered by authors in a class room setting.	The results of the survey indicate increases in moral characteristics surrounding an issue results in increased moral intensity and the degree of moral imperative. WTP for policy to address the issues was positively correlated with moral intensity/moral imperative.

Dixon, S. and P. Shackley. The use of willingness to pay to assess public preferences towards the fortification of foodstuffs with folic acid. Health Expectations 6(2), 140-148. 2003.	The focus of this study was an assessment of public attitudes towards fortification of flour with folic acid and to quantify their intensity of preferences towards postulated policies.	Survey was conducted through door to door interviews over a 4 week period (n=76). Survey elicited demographic data; respondents WTP, and voting preference on food fortification policies.	A majority of the respondents (67%) were in favor of food fortification. Those in favor indicated the health benefits, whiles those opposed cited lack of evidence
Guagnano, G.A. Altruism and market-like behavior: An analysis of willingness to pay for recycled paper products. Population and Environment 22(4), 2001.	Test the ability of the Schwartz model of altruism can explain willingness to pay for recycled products.	Telephone survey was administered to randomly selected house holds (n=367). Respondents where presented with a hypothetical starting point bid of 85 cents for a standard role of toilet paper. Analysis techniques included conceptual dimensions within the Schwartz Norm Activation Model, principle factor technique with Viramax rotation. Willingness to pay was calculated using a Path Analysis.	Results suggest public may be willing to pay something extra for alternative goods which offers them no direct benefits.
Huang, C.L., K. Kan, and T. Fu. Consumer willingness to pay for food safety in Taiwan: A binary-ordinal probit model of analysis. The Journal of Consumer Affairs 33(1), 1999.	Study used a probit model and order probit model to determine the existence price premium consumers would be willing to pay for hydroponically grown vegetables (HGV) and the	Survey was administered to a households (n=400), with a completion rate of 95% (n=379), with analysis conducted with sample (n=323). Survey was designed to obtain information on food	The study finds the existence of premiums consumers are WTP for reduced exposure to pesticides. Furthermore, these premiums are not homogeneous amongst different demographic groups.

	magnitude of premiums for consumers willing o pay them.	purchasing patterns and behaviour; consumer attitudes towards pesticide use and assessments on food safety; and WTP for HGV to reduce exposure to pesticide residue.	
Huffman, W.E., J. F. Shogren, M. Rousu, A.Tegene. Consumer Willingness to Pay for Genetically Modified Food Labels in a Market with Diverse Information: Evidence from Experimental Auctions. Journal of Agricultural and Resource Economics 28(3), 481. 2003.	Study examined how consumer WTP of food products (vegetable oil, tortilla chips, and potatoes) changed with the introduction of GM labels.	The study incorporated the use of experimental auction markets and randomized treatments of statistical experimental design. Regression analysis was used to calculated median WTP from a sample size (n= 172).	Results indicate respondents discounted GM label foods in the presence of non GM substitutes. The introduction of GM labels resulted in a decrease in consumer willingness to pay.
Loureiro M.L., J. J. McCluskey, and R.C. Mittelhammer. Will consumers pay a premium for eco-labeled apples? The Journal of Consumer Affairs 36(2), 203. 2002.	Study examined consumer WTP for third party certified eco-labeled apples.	Contingent valuation survey method was used in the study and median WTP was calculated using a double-bounded logit model. Survey as conducted through in store interviews and of consumers purchasing apples. Sample size (n= 285) was involved. Data collected included demographic data, consumer information and perception variables on the environment, food safety, quality.	Results indicate gender, presence of children, and concerns of environmental and food safety were positively correlated with consumers WTP a premium for eco-labeled apples.
Moon, W., S. K.	Study examined the	Contingent valuation survey	Findings indicate risk perception

Balasubramanian. Willingness to Pay for Non-biotech Foods in the U.S. and U.K. The Journal of Consumer Affairs 37(2), 2003.	existence of a price premium consumers U.S. and U.K. were WTP for breakfast cereals made from non-biotech ingredients.	techniques using a close-ended and payment card format where used to assess consumer WTP. The U.S. survey was conducted through mail and a sample size(n=3060). The U.K. survey was conducted online survey with a sample size (n=2,570) of completed surveys.	is a major influencing factor in determination of consumers WTP for non-biotech breakfast cereals. Consumers who perceived a risk to human health or the environment; or had a negative view of multinational corporations expressed a WTP a premium. Consumers' associated positive benefits from agribusiness technology were less likely to pay a premium to avoid bio-tech breakfast cereals.

RESEARCH STATEMENT

It is worth noting that very few studies on the demand for specific product attributes has been done in Canada, for eggs or for any other livestock product. Many new egg products exist in the Canadian grocery stores and there is little exact knowledge of the number and type of customer that is willing to consistently pay more for eggs with certain nutrition, food safety, environmental or animal welfare production attributes. Canadian egg producers and marketers have recognized that today's consumers have attitudes and perceptions that affect their preferences towards the eggs they consume and diversified the products available accordingly. To meet the various preferences of consumers producers/processors have come up with products such as the designer eggs meant to meet nutrition needs and animal welfare concerns, and on-farm programs and policies meant to deal with issues regarding the environment and food safety. However, it should be noted that all these changes have been happening on the production side of the market and there is little direct feedback on what the consumer's perceptions and attitudes are, given the above developments. In many cases the retailers are driving the decision of how many specialty eggs to produce and specialty egg farm level pricing is also being driven by the retailers.

The problem with a differentiated system is that consumers may get confused and overwhelmed by the many products. Evidence of the complicated market for eggs that may be generated is shown by the divergent range in prices for similar egg products that were collected from two major grocery stores in Edmonton, Alberta on September 9, 2004.

Table 4: Example Prices of Various Egg Prices at Save-on-Foods and Safeway Stores, Edmonton, September 2004.

Company Name	Store	Specialty	Size	Price	Colour
Western Family	Save-on	Normal	Extra large	2.15	White
Western Family	Save-on	Normal	Small	1.55	White
Western Family	Save-on	Normal	Medium	1.85	White

Western Family	Save-on	Normal	Large	2.25	Brown
Western Family	Save-on	Normal	Large family pack	1.99	White
Western Family	Save-on	Normal	Large	2.04	White
Western Family	Save-on	Normal	Large	2.09	White
Naturegg Prestige	Save-on	Normal	Large	2.55	White
Naturegg Natures Best	Save-on	Vitamin-enhanced	Large	2.75	White
Naturegg	Save-on	Free run	Large	3.30	White
Natureegg	Save-on	Omega- 3	Large	2.92	White
Lucerne	Safeway	Normal	Medium	1.85	White
Lucerne	Safeway	Normal	Large	2.09	White
Lucerne	Safeway	Normal	Extra Large	2.15	White
Safeway/Lucerne	Safeway	Normal	Jumbo	2.25	White
Lucerne	Safeway	Normal	Large	2.19	Brown
Safeway/Lucerne	Safeway	Normal	Large	1.99	White
Lucerne	Safeway	Normal	Jumbo	2.33	White
Safeway/Lucerne	Safeway	Normal	Small	1.55	White
Sho White	Safeway	Normal	Medium	1.78	White
Sho White	Safeway	Normal	Large	1.99	White
Safeway	Safeway	Normal	Large	2.18	White
Naturegg	Safeway	Omega-3	Large	2.92	White
Naturegg	Safeway	Free-Run[1]	Large	3.78	White
Dr. Sims Designer Egg	Safeway	Omega-3	Large	2.69	White

The majority of the egg brands sold at these two stores are 'normal' eggs, with a great variety in price across different sized eggs, but similarity in price across stores. There is about a twenty cent per dozen difference in price by colour (brown versus white large normal eggs), consistently across stores. This is interesting given that there is no

[1] Note only free run eggs are include in this table because free range eggs are only produced in the summer when the weather is conducive to hens being let outdoors.

nutritional difference between the eggs by colour and may reflect consumer desire for eggs by colour. There is a large difference in egg price when we move away from the store brand eggs to the name brand eggs, Natureegg, Dr. Sims, where the price difference could be as much as $1.79 per dozen. However this may reflect the specialty nature of the eggs, with free-run reflecting the most expensive egg (please note the difference in price for the same egg across stores, at Save-On Natureegg free run is $3.30 per dozen, at Safeway the same egg sells for $3.78 per dozen). Different brands of Omega-3 eggs sell for different prices (Dr. Sims for $2.69 versus Natureegg for $2.92).

The focus of this study is to examine how consumer's perceptions of quality with regard to food safety, concern for animal welfare, health/nutrition and the environment are revealed through their purchases of the various types of eggs in the market. The study is aimed at identifying if consumers are willing to pay (WTP) a premium for these various attributes since the changes by the producers to fit the consumer preferences in general, mean increased costs for the producers. Specifically the research objectives of the study are to:

- identify consumer attitudes towards each of the following attributes and egg production: food safety, nutrition, animal welfare and the environment
- identify current consumer understanding of industry initiatives around food safety, nutrition, animal welfare and the environment
- through stated preferences methods identify consumer willingness to pay for particular production and labeling attributes
- through revealed preference methods characterize current consumer purchase decision using food diary purchase data
- provide a robust characterization of egg purchase decisions, based on the above analysis, that can be used as the basis of planning and policy analysis within the egg industry.

The analysis conducted for the study will focus on Canadian and Albertan consumer preferences for eggs. To highlight a variety of individual, related or unrelated consumer preferences, two different types of modeling will be undertaken. Rather than examine the market for eggs in Canada, on a per capita basis (which makes the assumption that eggs

are homogeneous and that consumers all have similar preference patterns) the two models to be used will attempt to link egg purchases intentions or behaviour to the characteristics and attitudes of individuals and households. The analysis will allow a more disaggregate picture of who purchases what types of eggs to be developed. The first type of analysis will use a stated preference survey approach to determine consumer willingness to pay for shell egg attributes. The benefit of using a stated choice experiment to determine preferences is that a complete range of product attribute combinations can be used to determine how consumers make choices, more combinations than provided in the marketplace. Individuals responding to the survey will make explicit choices. However it is clear that this type of research poses a potential hypothetical bias, so revealed preference analysis of specific egg purchases by household over a historical period of time can also be used to examine the linkages between actual purchases and household characteristics (using data from A. C. Nielsen who collect purchase data through their Homescan services). The potential problem with this research is that we can't identify which options the household/consumer faced when they made their purchase decisions, we only know the products they actually purchased. For example, did they purchase Omega-3 eggs because there were no others available? The combination of the two approaches will significantly enrich our understanding of the unique egg characteristics and household preferences that determine Canadian consumption of eggs by type.

STATED PREFERENCE ANALYSIS

In the intention to purchase an egg type, egg characteristics and decision maker characteristics can each play a significant role. Decision maker characteristics include both demographics (age, income, education, household size, location) and attitudes (concerns about human health, animal welfare, environment, for example). The approach to understanding the influence of egg and decision maker characteristics on intention to purchase is to use a survey. The stated preference survey approach has been chosen because of its ability to evaluate respondents' attitudes, ease of distribution and analysis, and ability to facilitate critical thinking in stated preference options (Lusk and Hudson 2004). There are a variety of decisions required to implement any survey:

Medium of delivery – face to face, mail, internet

Size of sample population

Type and structure of questions.

The focus of this study is on shell egg purchases and the types of eggs that are considered as relevant include those in Table 5. Table 5 also includes the attitudes/behaviours that might potentially be linked to the purchase decision. There is no exact science to determine a priori what triggers are affecting purchase decisions but it is possible to hypothesize a number of plausible links. For example, consumers concerned about the future quality of the environment might choose organic eggs, in the same way they might choose a hybrid car or green electricity. At the same time organic eggs might be chosen by other consumers because of their desire not to ingest antibiotics fed to chickens, to protect their own health. What the table hopes to illuminate is that there is likely not a direct link between a particular attitude and a purchase decision around a specific egg type. There are likely multiple attitudes that affect most purchase decisions.

Table 5. Possible Links between Attitudes and Purchase Decisions

Egg type	Attitude			
	Health Behaviour	Health Consciousness	Environment	Animal Welfare
Omega-3	√	√		
Organic	√	√	√	
Vitamin Enhanced	√	√		
Vegetarian	√	√		√
Free Run	√			√
Free range	√			√

Beyond attitudes and demographics, price will also be a major factor affecting purchase decisions. Anecdotal information suggests that agricultural producers are often puzzled by consumers who say they prefer a particular production attribute but appear to be unwilling to pay the price offered in grocery stores for that product. In fact individuals who completed our survey occasionally commented on the fact that they want organic but

can't afford the price (of a relatively cheap, frequently purchase product). The reference point that consumers assume when they make purchase decisions can affect their overall willingness to pay for new and improved products. Hence it is not the proportion of their budget they spend on the item that determines their willingness to pay for a different product but their general perception of the price of the new product relative to the price paid in previous purchases. Doubling prices of a very inexpensive product can make the product seem unaffordably expensive for some consumers, even if it remains a very small proportion of their overall expenditure.

This study makes use of two survey data sets[2]. The first survey conducted in 2005 (Asselin 2005) focused on specialty eggs classified as being nutritionally enhanced (vitamin and Omega-3 eggs), while a similar survey developed in 2006 focuses on nutritionally equivalent, alternatively produced eggs (vegetarian, organic, and free run eggs, free range eggs w ere not included since they are not available year round in Canada). Beyond the egg varieties examined the surveys also differ in their distribution methods and questions chosen. The 2005 survey was a face to face survey distributed in Edmonton grocery stores, while the 2006 survey was answered on-line by recruited sample of Albertan. The general structure of the survey was the same in both cases composed of three sections; attitude questions, stated choice options, and socio-demographic questions. The content of the surveys differed in a couple of ways, the second survey included different attitudinal scales related to purchasing organic products and concerns about the environment. In both cases attitudinal scales related to health consciousness and health behaviour were included as part of the questions. Examples of the two surveys are provided in Appendix 1.

Attitude Measurements

In 2005 it was predicted that consumers exhibiting concern for their health and displaying healthy behavioural traits would reveal a preference for nutritionally enhanced eggs. These predictions were re-examined and tested in the second survey for the alternatively produced eggs.

[2] The text in this section is based on Boyd, Curtis, ' ', Undergraduate Paper presented at the American Agricultural Economics Association Annual Meeting, 2006.

A health consciousness scale developed by Peter Oude Ophuis in 1989 (cited in Schifferstein and Oude Ophuis) is used to elicit awareness of health. This eleven question scale utilizes a five point Likert representation ranging from strongly disagree to strongly agree. This scale arose from the concept of health locus of control, which identifies ones' personal belief that he/she has control over their health (Schifferstein and Oude Ophuis 1998). If one considers their own health in decision making, it could be predicted that one might prefer certain types of eggs.

Health behaviour is modelled using six questions based on frequency of certain health related activities (Breslow and Enstrom 1980). Questions related to health behaviour include frequency of smoking, hours of sleep, eating between meals, physical activity, eating breakfast, and alcohol consumption. This scale continues to be used quite frequently in spite of its age. These questions have been utilized to characterize health behaviour by by Schifferstein and Oude Ophuis (1998) in their study on organic food consumption**.**

A growing concern, in the European Union and world wide, is animal welfare. A European survey showed that 66% of people had reduced their consumption of livestock products based on animal welfare concerns (Bennett and Blaney, 2003). As the Canadian industry considers the necessity to regulate animal welfare issues, it is important to gauge the Albertan preference for egg variety based on animal welfare. Six questions were utilized from previous animal welfare studies (Frewer et. al. 2005; Bennet and Blaney 2003) to form one scale. While it is predicted that animal welfare concerns might likely generate an increased preference for free run eggs, there is no predicted influence on the remaining nutritionally equivalent egg varieties. Concern for the environment has also been identified as a factor that may influence organic consumption (Schifferstein and Oude Ophuis 1998). Although a measure of environmental concern was not included solely to correspond to organic egg choice, it is a personal attitude trait that may impact the preference of consumers across a few egg types and it was therefore included in the survey in 2006. The seven questions were developed based on research focusing on environmental preservation (Clark et al. 1998)

A question set specifically aimed at capturing consumers' preference for organics was also included in the survey for 2006. Again, this scale may explain more than just

preferences for organic eggs. The questions surrounding organic preference were extracted from the work of McEachern and McClean (2002) in their work to uncover the motivations behind buying organic goods. Do people who believe in organic consumption also believe in free run eggs?

Stated Preference

To reveal consumers' preferences for individual egg types a stated preference methodology was used. This method has been widely used in recent years to value goods and services. This method requires the survey respondent to make a choice between options with a bundle of attributes for each bundle. This method was utilized as it most closely resembles the shopping experience where consumers are forced to make trade-offs between prices and varieties (Lusk and Hudson 2004). The ultimate goal of the consumer is to maximize utility in a simulated situation. Given that the individuals are facing alternatives, *i*, each having an associated level of utility, rational individuals maximize

(1) $$U_i = v_i + \varepsilon_i$$

whereby utility is composed of that associated with the given choice (v_i) and a random error component(ε_i) (Boxall et al. 1996). The increased realism comes at the cost of confusion and the tendency for respondent simplification by weighting the attributes of the choices (Lusk and Hudson 2004), for example the dominant strategy to choose the lowest price.

Combinations of prices and egg types were developed in the 2005 survey using three egg types (generic, vitamin-enhanced and omega-3-enhanced) as well as using three price levels ($1.79, 2.78, and $3.12). The specific procedure for developing the various combinations are outlined by Asselin (2005) and a similar procedure was used in the 2006 survey development. The 2006 survey differs in that only two prices were used ($2.20 and $3.88) generated as a reasonable high/low set from grocery store observation, and four egg types were presented (generic, vegetarian, organic, and free run). Because more egg varieties were included, the number of prices was limited to expose respondents to a variety of egg types while keeping the number of questions asked to a minimum. The 2005 survey was set up with 7 choice set questions in 4 versions of the survey while the 2006 survey had 5 choice set questions in 5 versions of the survey. These differences

were minor and chosen to keep the length of the survey minimal yet collect the required information.

Demographic Questions

To capture a profile of the respondents and to associate demographic and socio-economic characteristics to egg preference, appropriate questions were asked. These questions include inquiries about age, household income, sex of respondent, number of minors in the household, and education. Similar demographic questions were included in both surveys.

Data Collection

As per the University of Alberta requirements, each completed survey was subject to a human ethics review under the Faculty of Agriculture, Forestry and Home Economics. In both survey years, a pre-test was completed within a Resource Economics class. Although this data was only used in the pre-test analysis, it did confirm the functionality of the surveys. The surveys were then distributed, the 2005 survey within grocery stores with a $2 Tim Hortons gift certificate as a sign of appreciation, and the 2006 survey on-line with a donation to the Calgary or Edmonton Food Bank (dependent on location deciphered through postal codes).

The 2006 survey sample was recruited by a third-party market research company. Respondents were contacted via telephone with the survey content described in general terms, participants who agreed were sent an email identifying how to log on and complete the survey. The respondent was provided with an ID number which was used to prevent multiple entrees. This ID number was entered within a welcoming page providing respondents contact information so that they may report comments and/or request a copy of the final report. Utilizing the internet in distribution comes with a number of pros and cons (Scornavacca, Becker, and Barnes 2004). While the positives associated with the online survey include low marginal costs, the ease of the automated data entry, the ability to easily capture large samples, it comes at the price of a potentially low response rate and a bias towards technologically inclined respondents.

Data

From the 2006 on-line survey a total of 248 usable surveys were generated while 128 responses were generated with the grocery store intercept method in 2005. Although small the samples were considered to be large enough to undertake preliminary analysis of respondent preferences given that each respondent made multiple choices between different types of eggs as part of the survey.

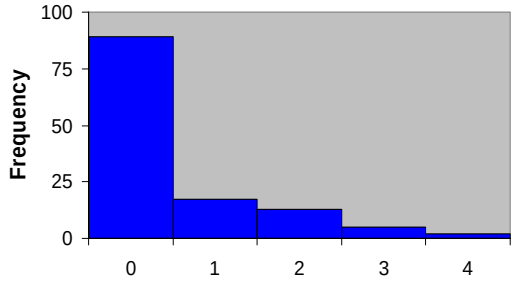


Figure 3: Households having children, 2005

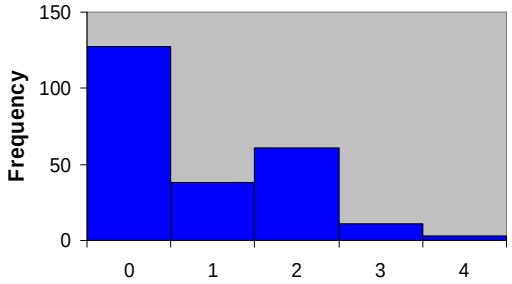


Figure 4: Households having children 2006

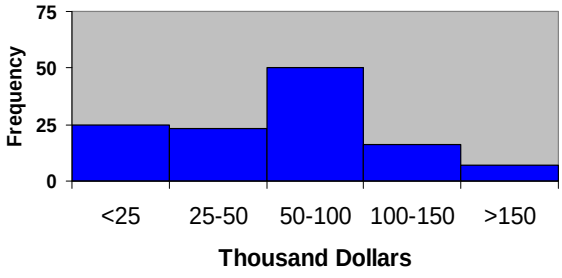


Figure 5: Household income, 2005

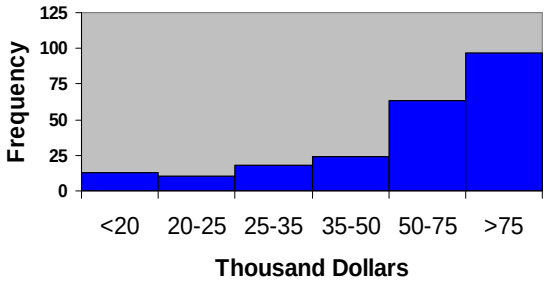


Figure 6: Household income, 2006

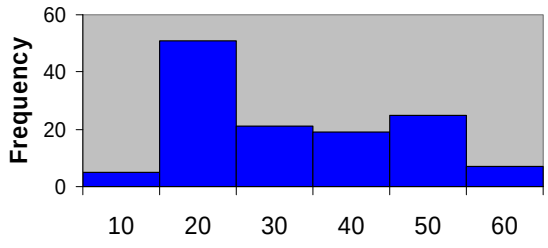


Figure 7: Age Distribution, 2005

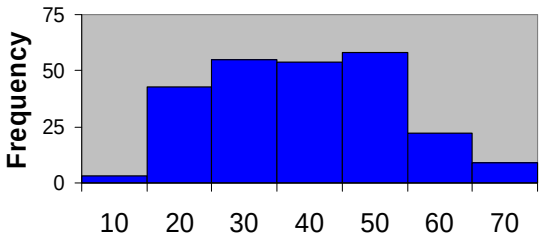


Figure 8: Age Distribution, 2006

Demographic information highlighted strong differences between survey sets are shown in the figures above. The most striking difference is in household income distribution;

however, this is most likely due to the change in the income classifications which were reduced in 2006 to fit other national survey classes. Age distribution is relatively evenly distributed in the 2006 sample, relative to the 2005 sample which is skewed to a younger consumer. The final visual comparison made is that there is a slight difference in the number of children such that the internet sample has a greater proportion of respondents with minors in the household. In both samples the proportion of female respondents is much greater than their male counterparts with 65% female in the on-line survey, and 60% in grocery intercept survey. While this distribution is not representative of the census population split, this is of little concern as females are still normally the major purchasers in each household. A survey conducted by Gilbert (2000) identified that women account for 81% of the sample as they identify themselves as the primary household shopper. In both years consumption of eggs was centered around 1-2 eggs per week with a normal distribution around the mean. This finding is greater than that of Gilbert (2000), however, is of little concern because of the consistency between samples.

Attitude Analysis

Attitude or behaviour scales created with multiple questions can be reduced by principle factor analysis to fewer factors to facilitate data analysis. Questions within a scale are analyzed for principal factor(s) and then the individual factors created can be tested for tested for internal consistency using Cronbach's alpha. Given a satisfactory alpha score a particular scale can be described by one principal factor rather than multiple questions. It has been shown by Berghaus et al. (2005) that the number of individual questions may be reduced by factor analysis, to one or more factors, and the resulting factor scores may be loaded with comparable predictive ability.

In the 2006 sample, the attitude scales (health consciousness, social representation of food attitudes, concern for animal welfare, concern for the environment, and preference for organics) were each subjected to factor analysis in TSP 4.5 as a method of data reduction. Limiting the number of factors to those with eigenvalues greater than one resulted in one factor for each of the animal welfare, environmental and organic scales. Following Huotilanin and Tuorila (2005) the social representation of food attitudes was disaggregated into three factors – resistance and suspicion of novelties, adherence to

natural food and food as a necessity. The health consciousness scale was analyzed in each survey, 2005 and 2006 and resulted in two factors. The first factor related to health consciousness describes people who are willing to sacrifice for their health and the second describes people who are occupied with their health, but not as willing to make sacrifices. The second factor identified in health consciousness had a relatively low eigenvalue (in both the 2006 and 2005 sample).

The Principle Components/factors are found in Appendix 2. The factors are positive, in other words, the factor extracted from the environmental scale is explanatory of "Pro-Environment", while the others will be called, "Pro-Organics", "Pro-Animal Welfare", and "Health Conscious" for those who show concern for their health (statements posed in a negative way have been recoded to suggest positive responses). Health behaviour is coded as positive for Factor 1 and negative for Factor 2

Each individual factor was subjected to a reliability test using Cronbach's alpha, a measure for internal consistency. The general formula for Cronbach's alpha is

(2)
$$\alpha = \frac{N \cdot \bar{r}}{1 + (N-1) \cdot \bar{r}}$$

whereby N is the number of observations and r-bar is the inter-item correlation between variables. The analysis for each scale was completed in SPSS 11.0. A sample of the resulting alpha values are as follows; Health Consciousness (2005 α=0.8177, 2006 α=0.818) Pro-Organics (α=0.8663) Animal Welfare (α=0.7466) and Pro-Environment (α=0.8873).

Egg Purchase Behaviour

As the surveys were about egg consumption it was deemed important to attempt to determine whether or not any of the demographic or attitudinal variables had a direct link with the number of eggs respondents self-identified they consumed, on average. To conduct this analysis an ordered probit model was used as the basis of a regression explaining the number of eggs consumed per week (never, occasionally, 1 or 2 times per week, 3-7 times per week, more than 7 times per week). The explanatory variables included in the regression were gender, age, presence of children, income, highest level

of education, and all of the principal factors developed from each attitudinal scale for each sample. As well, in the 2005 sample there were a number of independent questions, related to animal welfare, pesticide use, intensive livestock operations, GM foods, nutritional labels, eat away from home, engineered foods, eco-labels that were also tested in the regression models. Selected regressions for each of the 2005 and 2006 sample are provided in Table 6. In the main, there were few explanatory variables that contribute in a statistically significant way to explaining the number of eggs consumed per week. The one important characteristic for each sample is that there is a statistically significant link between people with positive health behaviour and higher egg consumption per week. This suggests that people who follow other healthy behaviours, not smoking or drinking to excess etc. also consumer more eggs, a good indicator for the egg industry.

Table 6: Estimation of Eggs Per Week, 2005 and 2006

Variable	**2005**		**Variable**	**2006**	
	Estimate	**P-value**		**Estimate**	**P-value**
Constant	**1.688**	**0.00**	**Constant**	**2.232**	**0.00**
Health Conscious 2	-.1277	.197	**Health Conscious 2**	.0829	.244
Health Behav 1	**.2053**	**.040**	**Health Behav 1**	**.1431**	**.045**
Eataway	-.1198	.125	**Adherence to Natural**	-.123	.111
Age	.0085	.237	**Age**	.003	.567
MU2	**1.211**	**0.00**	**Environment**	.122	.105
MU3	**2.623**	**0.00**	**MU2**	**1.687**	**.000**
MU4	**4.255**	**0.00**	**MU3**	**3.058**	**.000**
			MU4	**4.324**	**.000**
Scaled R squared	**.0682**		**Scaled R-squared**	**.0336**	

The other interesting phenomenon is that the survey was originally set up with a white Grade A egg as the generic choice for each of the choice sets. In organizing the data for the second year of the sample it was found that organic and free run eggs were more likely to be brown eggs than white eggs in a sample of grocery stores within Edmonton. Therefore the generic egg for the second year's sample was taken to be a brown egg. As a result an additional question was added to the survey to elicit respondent preference for brown over white eggs. A simple logit regression was run on the choice of brown over white, vice versa and no preference to establish whether there are any demographic or attitudinal preferences that could be identified in the 2006 sample. The results are presented in Table 7.

Table7: Estimation of Choice of Brown over White Egg, 2006

Variable	Name	Estimate	P-value
Type	**Brown preferred to white**	-.965	.112
	White preferred to brown	-.161	.802
Health Conscious 1	**Brown preferred to white**	**.342**	**.094**
	White preferred to brown	**.541**	**.014**
Health conscious 2	**Brown preferred to white**	-.139	.436
	White preferred to brown	**-.444**	**.033**
Sr – resistant to novelty foods	**Brown preferred to white**	.161	.352
	White preferred to brown	**.538**	**.013**
Sr- adherence to natural food	**Brown preferred to white**	**.576**	**.008**
	White preferred to brown	**-.548**	**.019**
Environment	**Brown preferred to white**	-.271	.156
	White preferred to brown	**-.476**	**.020**
Age	**Brown preferred to white**	-.008	.506
	White preferred to brown	**-.033**	**.025**
Scaled R-squared		**.190**	

The reference case in this estimation is no preference on colour of eggs and in the main the respondents did not strongly prefer one colour of egg over the other. However there are a few cases where certain respondents do get more utility out of one colour of egg than the other. Respondents who are resistant to the idea of novel foods receive higher utility from white eggs than brown, but respondents who have a strong adherence to natural foods prefer brown eggs to white. Respondents who have a strong interest in the environment, and are older generally receive lower utility from white eggs. Although this result is very exploratory, given that brown and white eggs are not different nutritionally and there is a difference in price, perhaps the perceptions underlying brown and white eggs is worth further research.

Stated Choice Analysis

In 2005, 128 respondents completed 7 choice set questions resulting in 896 choices. The 2006 on-line survey resulted in 248 completed surveys with 5 choice sets answered for each responder providing 1240 choices made. These choices were subsequently used as the dependent variable in analysis potentially explaining utility associate with individual egg purchases by price, demographics and respondents revealed attitudes.

The data was analyzed through a conditional logit model in TSP 4.5. The logit model has long been used as a method to quantify consumer utility (McFadden, 1974). The regression refers to a relative measure of utility and relates to the probability of choosing a given alternative (Boxall et al., 1996). In the case of a binary logit model, describing two choices described as 0 or 1 in a particular data set, the predicted values for the dependent variable will never be less than (or equal to) *0*, or greater than (or equal to) *1*, regardless of the values of the independent variables. The regression can be described as:

$$\Pr ob(y) = e^{\beta' x}/(1+e^{\beta' x}),$$

where β represents regression coefficients, x represents explanatory variables (characteristics of the respondent), and the dependent variable represents the probability that the response is either a 0 or 1 in the case of a binary choice.

The model can be applied to more than two choices, termed a multinomial conditional logit model and include both characteristics of the choice (in this case types of eggs and prices) as well as the characteristics of the respondent. Logit analysis allows one to compare the respondent's utility within a model; however the magnitudes of the results are not comparable across models. In this study two different regressions will be estimated, one for each of the 2005 and 2006 preferences. The generic egg is housed in both models and therefore comparisons will be made relative to the generic egg.

Logit Regression Results

The analysis did reveal that various consumer characteristics do explain preferences for different egg varieties. All estimates presented (in Tables 8 and 9) should be regarded as a change in utility relative to generic egg consumption. This idea of additional utility then translates into an increased probability of purchase of specialty eggs.

Table 8: Logit Regression Estimation of 2005 Survey Data

Parameter		Estimate	P-Value
Price		-0.928	0.00
No-Eggs		-3.996	0.00
Type	Omega-3	-1.63	0.00
	Vitamin	-2.00	0.00
Health Conscious	Omega-3	0.264	0.01
	Vitamin	0.275	0.02
Foods engineered to provide health benefits are better for you	Omega-3	0.548	0.00
	Vitamin	0717	0.00

	Omega-3	0.228	0.03
Income	Vitamin	0.073	0.44
	Age	-0.009	0.00
Price	Youth	-0.098	0.00

Table 9: Logit Regression Estimation of 2006 Survey Data

Parameter		Estimate	P-Value
Price		-0.431	0.00
No-Eggs		-3.888	0.00
	Organic	-0.226	0.14
	Vegetarian Fed	-0.377	0.01
Type	Free Run	0.732	0.00
	Organic	0.445	0.00
	Vegetarian Fed	0.476	0.00
Health Conscious	Free Run	0.370	0.00
	Organic	0.588	0.00
	Vegetarian Fed	0.352	0.00
Adherence to natural	Free Run	0.045	0.73
	Organic	-0.063	0.59
	Vegetarian Fed	-0.099	0.42
Animal Welfare	Free Run	0.364	0.00
	Organic	0.378	0.00
	Vegetarian Fed	0.144	0.21
Youth	Free Run	0.237	0.05
	Age	-0.007	0.00
Price	Youth	-0.076	0.03

The coefficient on price, reveals the negative utility associated with increased prices. The first and largely significant note is that from the two different samples is that free run eggs are the only variety preferred to the generic and therefore preferred to all others (given the sign and significance of the coefficients on all egg varieties). Although in the respective samples vegetarian, Omega-3 and Vitamin-enhanced are all statistically significant, their signs are negative reflecting lower utility than generic eggs. The findings on price and free run preference coupled together match the findings of Fearne and Lavelle (1996), who found that the two fundamental factors determining consumer

preferences were price and bird welfare. Albertan preferences for free run eggs perhaps reflect a shift in consumer demands similar to that experienced in the EU.

Respondents who score high values on health conscious scale (those who are health sacrificers) do have a higher preference for all specialty egg varieties. For the 2005 sample it is clear that the preference might be for the health benefits of the two types of eggs. However things are less clear in the 2006 sample. Why do health conscious consumers who are willing to make sacrifices for their health prefer different but nutritionally equivalent eggs? Given that this study does not allow respondents the choice between nutritionally enhanced and equivalent eggs it is difficult to extrapolate as to whether there is confusion about the nutritional qualities of different eggs or if they simply chose the specialty egg given there was no nutritionally enhanced egg within the 2006 survey. Possible consumer confusion is a potential problem for egg marketers.

Although it was previously hypothesized that concern for the environment may result in a preference for organic eggs, under no estimation did pro-environment behaviour prove significant in explaining consumer egg preferences in 2006. When it comes to marketing and deciphering policy implications knowing what variables are insignificant may be just as vital as knowing what are significant.

For the 2006 sample people characterized as having an adherence for natural foods do exhibit a partiality for organic and vegetarian eggs, with no significant preference for free run eggs. Those people associated with having concerns for animal welfare have a preference for free-run eggs over all other nutritionally equivalent eggs. In the 2005 sample, respondents who agree with a single statement about 'foods engineered to provide health benefits' are willing to pay more for each Omega-3 and Vitamin Enhanced eggs. Respondents with higher incomes in 2005 will pay more , receive higher utility from Omega-3 eggs but not vitamin-enhanced eggs. In 2006 income was not a significant explanatory variable.

The demographic trait which proves to be most interesting is the number of children in the household, those with more children prefer free-run eggs. In 2005 the presence of children in the household did not explain a preference for any egg type. In 2006 it is shown that those households with more minors in the household are more likely to purchase free run eggs and organic eggs. Again, with no nutritional advantage to free-run

eggs, one questions why these particular eggs. The rationale behind this would be worth examining as it is those with more minors at home who are often faced with a more restrictive budget as they attempt to maximize utility.

Two secondary effects are examined with the regressions for 2005 and 2006, these effects are how price interacts with age, and with the number of minors at home, interactive terms are included in each regression. It is shown that those homes with children present are more sensitive to price increases as are older respondents. Increased responsiveness to price changes may result in lower adoption of specialty eggs, given their higher prices, a marketing challenge for the industry.

REVEALED PREFERENCE ANALYSIS

The second type of analysis that can be conducted to examine consumer preferences for eggs, at the household level, is revealed preference analysis. This analysis makes use of actual household or individual purchases data, recorded over time by panels recruited by market research companies (occasionally similar analysis is undertaken by organizations such as Statistics Canada, but their samples are usually one-off and do not contain a history of purchases for the same household). In this research AC Nielsen Homescan © data was purchased on all egg and egg products for the entire panel for three years, 2002-2005, for Alberta and Ontario. The data contained all individual egg purchases, classified by size, by package size, by colour, by brand and by type. As well household demographic data, including average age of head of household, number of children, income for each household, average food expenditure annually, language spoken were also recorded.

In total 2635 households were observed in Alberta (3750 in Ontario). The data on shell eggs and egg product purchases was collected on a four week cycle from various grocery stores starting with purchases from the week ending 02/02/2002 until the week ending 01/01/2005 (which is equivalent to a period of 39 months)[3]. It is noteworthy that the full data set included more than shell egg purchases. However, for this analysis the study was limited to purchases of shell eggs for a total of 11459 observations. Five choice alternatives were selected: (1) normal eggs (2) omega-3 eggs (3) free range/free run eggs

[3] It is worth noting that people can purchase eggs from other sources not recorded here such as farmer's markets and convenience stores.

(4) organic eggs (5) vitamin enhanced eggs. It should also be noted that omega-3 eggs, free range eggs, free run eggs and organic eggs were the only defined products in the data file. The vitamin-enhanced and normal eggs had to be identified and labelled accordingly. This identification process was made possible due to the provision of UPC codes (the bar code on the package), the name of the manufacturer of a particular product and the product brand name in the data set. (see Emunu, John Paul, unpublished MSc. thesis 2006, for details). Because of the provision of the name of the manufacturer and the product brand name, it was possible to do an internet search and find the producers or manufacturers of some of the egg products. On these websites most of the manufacturers had descriptions of the products they produced. This helped in determining whether a particular shell egg product was normal, vitamin-enhanced, omega 3, free range/run or organic. Once a product was identified, the UPC codes helped with the identification of the products within the data set since each product has a unique UPC code.

Eggs come in different sizes and packages. To incorporate this factor into the model, all the different packages of eggs (6 pack, 18 pack and 30 pack) were normalized to a dozen. The prices of all these products were added and then averaged to get the average weighted price for the different egg types for each period. Egg size was ignored when doing the weighting and one product was generated labelled as normal, omega-3, free range/run, organic or vitamin enhanced egg. Similar approaches have been used in studies of milk purchasing where 1% and 2% milk were counted as one category (Chen and Chen, 2000). Also, for this study, since we are only interested in the demand for shell eggs, all purchases of processed eggs are omitted from the sample analysis.

One of the tasks involved in using panel data is with the construction of the vector prices faced by each consumer on each purchase occasion. The basic problem is that one only observes the price paid by the consumer for the egg type that he/she actually purchased. Prices for other products are inferred. If it was the case that a panellist did not purchase any of the alternatives during a particular month, we used the average price of that particular egg type experienced by other panellists in that month as the price that he or she could have faced had he/she decided to purchase a particular egg type[4]. Baltzer

[4] It is worth noting that the average prices where calculated using the sample of 2635 households and not the 292 households which were considered in this thesis.

(2004) used a similar approach when he was faced with the missing values for price. Baltzer argues that this solution has the advantage of being theoretically plausible as well as having no impact on the parameter estimates.

Studies by Keane (1997) and Park and Senauer (1996) presented other methods that have been used to replace the missing prices. Keane (1997) used three approaches to deal with the missing prices. He first sorted through all data for a particular store on a particular day; if a consumer was found who bought a particular brand, Keane uses the marked price the consumer faced as the marked price for that brand in that store on that day. If no one bought a particular brand in a particular store in a particular day, Keane then looked for purchases in adjacent days to fill in the price and if no one bought a particular brand in a particular week, then Keane looked for purchases in adjacent weeks to fill in the price. Keane's approach was made possible because the Nielsen data he had included price files that contained prices for each brand in each store on each day of the sample while this is not the case with our data. We cannot locate specific locations where each consumer purchased their eggs. Park and Senauer (1996) simply use the previous price faced by such a consumer to fill in the missing prices.

Table 10. Average Prices for the Shell Egg Products, Alberta and Ontario

	Mean		Std. Deviation	
	Alberta	Ontario	Alberta	Ontario
Normal	1.62	1.76	0.07	.09
Vitamin	2.33	2.28	0.35	.23
Free Range/Run	2.28	2.82	0.37	.05
Omega 3	2.51	2.88	0.10	.16
Organic	2.62	2.21	0.18	.05

Table 10 shows the average price of non-normal eggs to be higher than that of normal eggs. The higher prices associated with the non-normal eggs may be a reflection of pricing strategies by retailers and processors. The higher prices may also be a reflection of the high costs associated with producing eggs with additional attributes. These prices are also a clear approximation of the prices in the Alberta shell egg market (see Table 4 showing the prices of egg products in Safeway and Save on Foods grocery stores). However, the range of the prices in Table 10 is much smaller as compared to the range

found at a particular grocery store as is shown by Table 4. The difference in the price range may be due to the fact that Table 10 represents the average price over the entire time period being observed while Table 4 shows the prices at a particular time in the respective grocery stores.

For the purposes of the present models, it was decided to limit the sample to households who are frequent purchasers of shell eggs. Frequent purchasers of eggs are likely to be the households of most interest to the egg industry, they buy eggs regularly, their expenditure on eggs will be higher than other households and they are probably the most aware of changes in product availability on the egg shelf in their purchase location. A careful inspection of the data revealed that some households were heavy egg consumers for several months and then never purchased eggs again. It is not clear if this is because households actually stopped buying eggs, or because of some problem with the data[5]. In order to obtain a sample of households[6] who appeared to be regular participants in the egg market throughout the 39 months, households were only included in the sample if they purchased eggs more than 30 times out of the 39 time periods (Figure 9).

Figure 9. Summary of Purchase Occasions[7] Based on the 2635 Households: Alberta

[5] When faced by a similar situation Erdem et al. (2003) chose to speculate that either the households had moved out of the area of study but wasn't recorded or perhaps that the ID cards malfunctioned for some of the households.

[6] In total only 292 out of 2635 households in Alberta were used for the study.

[7] A purchase occasion is defined as a trip to the grocery store per month. In our data set, we had 39 months. Thus, the maximum purchase occasions a household could have is 39.

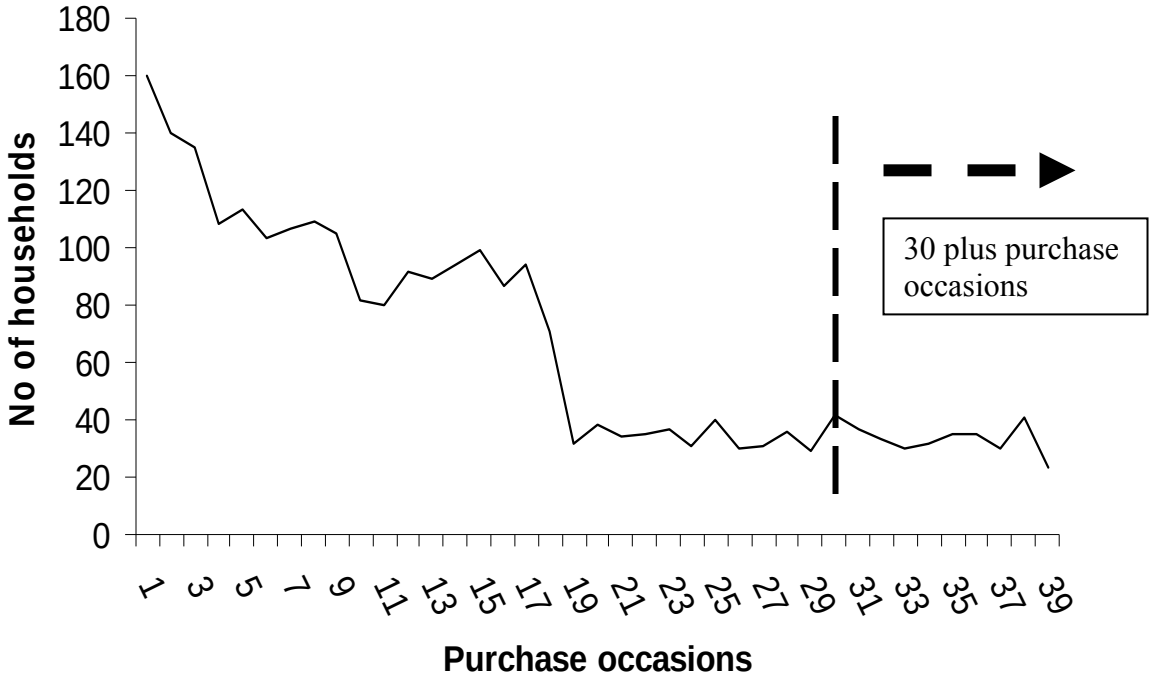
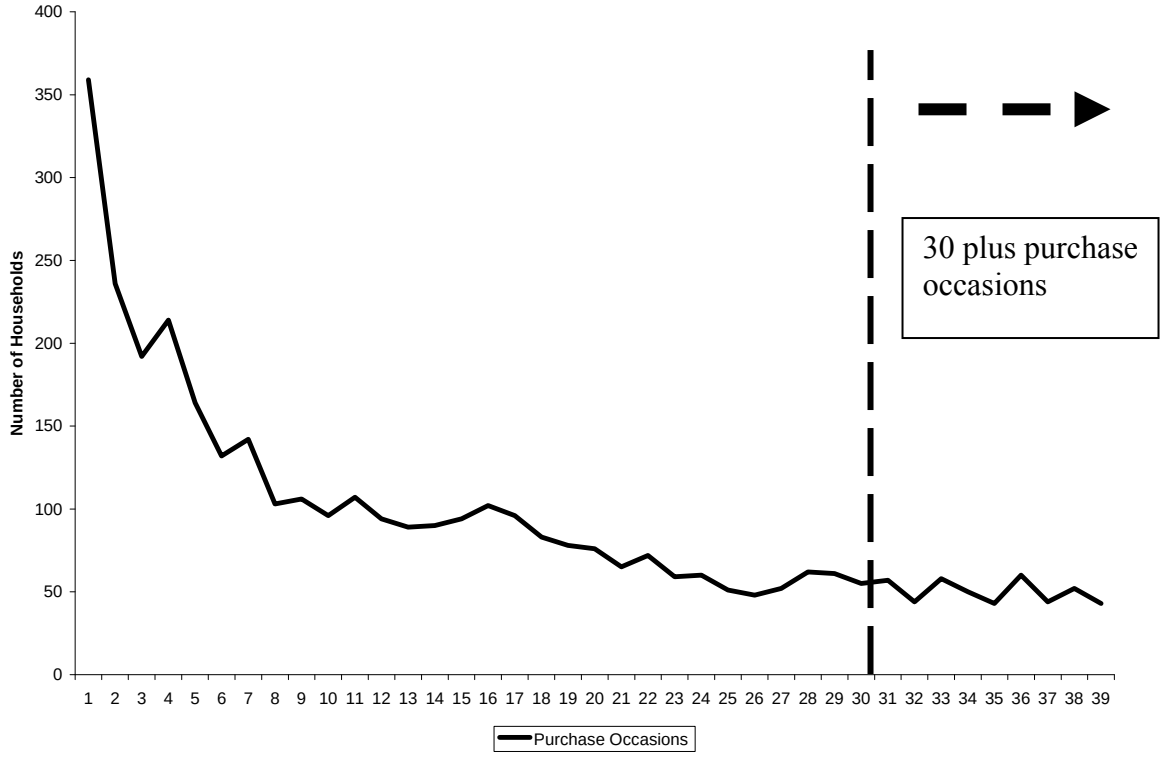


Figure 10. Summary of Purchase Occasions Based on the 3729 Households: Ontario



Data Setup for Multinomial Conditional Logit model with Choice as the Dependent Variable

Two different set ups of the data with 292 households were used in the estimation process. In the first data set up, we ignored the quantity decision and recorded only the egg type choice on each purchase occasion. A similar approach was adopted by Erdem, Imai and Keane (2003), Chintaguntaa, Kyriazidou, Perktold (2001) and Park and Senauer (1996). This data set was used to estimate a conditional logit model reported in the next section with egg choice as the dependent variable. In a few instances where people did select more than one type of egg on a purchase occasion, we selected one egg type. This was done by assigning an order randomly from 1 to 5, with 1 representing normal eggs, 2 representing omega 3 eggs, 3 representing free run/range eggs, 4 representing organic eggs, and 5 representing vitamin enhanced eggs. In an effort to assure that all egg types had an equal chance of being represented, we selected egg type 1 if a scenario was found where a household selected both the normal egg and another type of egg. This order was reversed if the same scenario was found in the next purchase occasion choosing the non-normal egg over the normal egg. If it was the case that a household purchased two different non-normal eggs on a single purchase occasion, the egg type that appears first on the number order list was selected. The no purchase option was easily identifiable as there was a zero if no egg type was selected at all. This selection method was created in order to not bias the sample to either normal or non-normal eggs. This approach of product selection was pursued in order to fit the data for discrete choice theories which follow the random utility theory where it is assumed that individuals are utility maximizers. Chintagunta, Kyriazidou and Perktold (2001) used a similar method when they selected brands randomly when they were faced with a scenario where households purchased multiple brands at one occasion.

Data Setup for MNL Model with Dozen of Eggs Purchased Per Egg Type as the Dependent Variable

In the second data set up, the quantity decision was included as the dependant variable. The eggs in dozen purchased were summed up across all the 39 time periods for each egg type creating a frequency variable (number of shell eggs purchased by type). Also, for

this second data set the weighted average prices for each egg type were generated for the entire 39 months. A summary of egg types purchased are shown in Table 11.

Table 11. Eggs Purchases Per Household, in dozens

Alberta

EggType	Minimum	Maximum	Mean	Std. Deviation
Normal	0	246	81.39	45.26
Omega 3	0	83	2.98	11.93
Free run/range	0	29	0.39	2.61
Organic	0	101	7.11	15.36
Vitamin enhanced	0	16	0.35	1.56

Ontario

EggType	Minimum	Maximum	Mean	Std. Deviation
Normal	0	439	72.6	48.95
Omega 3	0	240	8.19	23.87
Free run/range	0	42	0.50	3.20
Organic	0	100	1.40	7.06
Vitamin enhanced	0	41	0.70	3.45

Table 11 shows the highest egg type purchased per household for the entire 39 months are normal eggs, followed by organic eggs and then omega 3 eggs, free run/range eggs and lastly, vitamin enhanced eggs. This data set has an advantage over the first data set in the sense that it accounts for the multiple egg purchases that may occur in a single purchase occasion. The conditional logit model was used in the estimation.

Conditional Logit Model with Choice as the Dependant Variable

In the conditional logit model postulated, egg purchase by type is assumed to be dependent on a set of socio-economic variables and prices of the different egg types. Egg types were grouped into (1) "neither" option, (2) omega-3 eggs, (3) free run/range eggs, (4) organic eggs, (5) vitamin-enhanced eggs, and (6) normal. The "neither option" reflects the decision that the individual didn't purchase any egg type. The estimated coefficients β_j for all $j(j = 1,.....J)$, after normalizing the "neither alternative" $j = 0$, measure the effect of the explanatory variables in the indirect utility function on the

likelihood of choosing egg type *i* relative to the "neither option". Estimates from the equation are reported for normal eggs, omega-3 eggs, free run/range eggs, organic eggs and vitamin enhanced eggs in Table 12 while the neither option is not shown since the probability for the j^{th} option is known once j-1 of the egg options are estimated. Estimates with a negative sign imply the preference for the "no purchase" option while estimates with a positive sign imply the preference for a respective type of egg.

Table 12. Conditional Logit Regression Estimates
Alberta

Variable	Parameter	t-values
PRICE	-2.087**	-27.300
Normal Eggs		
ASC	4.72**	20.659
Household Income	-0.002*	-1.870
Presence of children	0.101	1.144
Age	0.006**	2.033
Total Expenditure	0.161**	6.623
Omega 3 Eggs		
ASC	3.33**	7.17
Household Income	0.003*	1.700
Presence of children	0.336*	1.683
Age	-0.002	-0.269
Total Expenditure	0.065	1.201
Free Run/Range Eggs		
ASC	0.587	0.647
Household Income	0.012**	2.587
Presence of children	1.523**	3.461
Age	-0.036**	-2.493
Total Expenditure	0.452**	5.125
Organic Eggs		
ASC	4.64**	12.46
Household Income	-0.008**	-4.712
Presence of children	0.821**	5.383
Age	-0.018**	-3.625
Total Expenditure	0.414**	11.505
Vitamin Enhanced Eggs		
ASC	-7.84**	-4.078
Household Income	0.020**	4.880
Presence of children	-1.157**	-2.376

Variable	Parameter	t-values
Age	0.109**	4.864
Total Expenditure	0.259**	2.517
Log-likelihood		-6964.13
Adjusted Pseudo R^2		0.067
Number of observations		11388
Restricted (Slopes=0) Log-L		-7500.45
χ^2 (20)		31.41

**** p < .05 * p < .10**

Ontario

Variable	Parameter	t-values
PRICE	-2.094**	-28.483
Normal Eggs		
ASC	5.12**	24.500
Household Income	0.009**	2.052
Presence of children	0.186**	2.434
Age	0.099**	3.510
Total Expenditure	0.074**	3.517
Omega 3 Eggs		
ASC	1.738**	5.398
Household Income	.0817**	12.738
Presence of children	-1.011**	-10.061
Age	0.006	0.167
Total Expenditure	0.168**	7.099
Free Run/Range Eggs		
ASC	1.462**	2.426
Household Income	0.043**	2.793
Presence of children	0.401*	1.738
Age	0.005	0.056
Total Expenditure	0.104*	1.718
Organic Eggs		
ASC	1.298**	2.336
Household Income	0.043**	3.088
Presence of children	0.156	0.753
Age	0.049	0.585
Total Expenditure	0.211**	4.049
Vitamin Enhanced Eggs		
ASC	-0.76	-1.292
Household Income	.0434**	2.810

Variable	Parameter	t-values
Presence of children	0.136	0.560
Age	0.270**	2.937
Total Expenditure	0.111*	1.737
Log-likelihood		-10441.7
Adjusted Pseudo R^2		0.066
Number of observations		13806
Restricted (Slopes=0) Log-L		-11174.67
$\chi^2(20)$		31.41

**** p < .05 * p < .10**

The pseudo R-squared values of the final model are 0.067 and .066. Additionally, to determine whether a model is statistically significant we use the Likelihood ratio-test to compare the Log Likelihood function of the estimated model to that of the base model (i.e. a model with only the ASCs) at $\alpha < 0.05$. The χ^2 value from the LL ratio-test is 1072 (Alberta) and 1465.91 (Ontario). Comparing this result to a $\chi^2_{(20)df}$ of 31.41 shows that the estimated model performs better than the base model in predicting peoples choices since the statistic obtained from the LL ratio-test is higher than the critical chi–squared statistic.

The alternate specific constants (ASCs) are positive and significant for normal eggs, omega 3 eggs and organic eggs at the 5 % level in Alberta and Ontario and also for free run eggs in Ontario. The ASC is negative and significant with regards to vitamin enhanced eggs in Alberta and insignificant for Alberta free run/range and Ontario vitamin enhanced eggs at the 5 % level. The positive ASCs imply that that there is positive utility associated with purchasing normal, organic and omega 3 eggs, all other things held constant, as compared to no eggs. The negative ASC implies that there is some disutility associated with purchasing vitamin enhanced eggs, all other things held constant. The alternative specific constants, however, cannot be interpreted separately from the other estimated parameters of the model.

For both provinces the price coefficient is negative and significant, indicating that increasing price decreases the probability of a household purchasing any egg type. This is as expected since an increase in the price of any egg type should reduce the probability of that type being chosen.

In Alberta, the coefficient on the income variable is positive and significant for free run/range and vitamin enhanced eggs (5% level) and positive and significant for omega 3 eggs at the 10% level. The income variable is negative and significant for normal eggs at the 10% level and for organic eggs at the 5 %. This means that as household incomes increases, so does the probability of purchasing free run/range eggs and vitamin enhanced eggs while the probability of purchasing organic and normal eggs decreases relative to the no purchase option. In Ontario, all five egg types exhibit positive and statistical significant responses to income.

In Alberta, the coefficient on the presence of children is positive and significant for omega 3 eggs at the 10%, and for free run/range eggs and organic eggs at the 5 %. For normal eggs the presence of children variable is not statistically significant. Also, presence of children variable is negative and significant for vitamin enhanced eggs. In Ontario, the presence of children will result in higher probability of purchasing normal and free-run eggs.

For both provinces, the coefficient on age is positive and significant with regards to vitamin enhanced egg and normal eggs. The coefficient on age is negative and significant with regards to free run/range eggs and organic eggs and is negative and not significant with regards to omega 3 eggs in Alberta and insignificant for all other egg types in Ontario. This result suggests that as the age of the head of the household increases (person assumed to be making most of the food purchases) the probability of purchasing organic and free run/range eggs decreases in Alberta; also, as age increases the probability of purchasing vitamin enhanced eggs increases in both provinces.

The coefficient on total food expenditure is positive and significant for all egg types in both provinces with the exception of omega 3 eggs in Alberta. This result suggests that an increase in total food expenditures will increase the probability of purchasing any egg type.

Conditional Logit Model with Frequency as the Dependant Variable

The dependant variable frequency is equal to the total number of eggs purchased by dozen for each egg type for the entire 39 months. By using frequencies, one can account for the multiple egg purchases by a household at one purchase occasion. In the frequency model the “neither option” is omitted because it does not represent an egg type. Also,

given that we selected households that purchased eggs over 30 times out of the 39 time periods, omitting the "neither option" should not be a cause of great concern.

In the conditional logit model postulated, egg purchase by type is assumed to be dependent on a set of socio-economic variables and price of the different egg types. Egg types were grouped into (1) omega-3 eggs, (2) free run/range eggs, (3) organic eggs, (4) vitamin-enhanced eggs, and (5) normal. The estimated coefficients β_j for all $j(j = 1,.....J)$, after normalizing the "normal alternative" $j = 0$, measure the effect of the explanatory variables in the indirect utility function on the likelihood of choosing egg type i relative to the "normal option". Estimates from the equation are reported for omega-3 eggs, free run/range eggs, organic eggs and vitamin enhanced eggs in table 22 while the normal option is not shown since the probability for the j^{th} option is known once j-1 of the egg options are estimated. Estimates with a negative sign imply the preference for the "no purchase" option while estimates with a positive sign imply the preference for a respective type of egg.

Table 13. Conditional Logit Regression Estimates for Frequency Model Ontario

Variable	Parameter	t-values
PRICE	-6.083**	-58.311
Omega 3 Eggs		
ASC	-1.524**	-11.391
Household Income	0.0139**	29.911
Presence of children	-0.437**	-8.811
Age	0.0101**	5.599
Total Expenditure	0.0529**	12.689
Free Run/Range Eggs		
ASC	0.599	1.476
Household Income	0.0076**	4.658
Presence of children	0.5683**	3.586
Age	-0.0049	-0.845
Total Expenditure	0.0549**	4.051
Organic Eggs		
ASC	1.005**	3.521
Household Income	0.0105**	10.195
Presence of children	-0.872**	-8.670
Age	-0.0039	-1.067
Total Expenditure	0.1528**	21.875

Variable	Parameter	t-values
Vitamin Enhanced Eggs		
ASC	-4.1577**	-11.483
Household Income	-0.0014	-0.874
Presence of children	1.0237**	7.871
Age	0.0313**	5.920
Total Expenditure	0.0143	1.015
Log-likelihood		-17198.72
Adjusted Pseudo R^2		0..1741
Number of observations		505
Restricted (Slopes=0) Log-L		-20823.89
χ^2 (15)		25.00

**** p < .05 * p < .10**

Alberta

Variable	Parameter	t-values
PRICE	-2.72749**	-51.014
Omega 3 Eggs		
ASC	-1.6583**	-5.082
Household Income	0.0062**	4.156
Presence of children	-0.6097**	-3.713
Age	0.0029	0.574
Total Expenditure	-0.1402**	-3.037
Free Run/Range Eggs		
ASC	-3.94264**	-5.931
Household Income	0.0172**	5.131
Presence of children	-1.4281**	-4.175
Age	-0.0536**	-4.678
Total Expenditure	0.3908**	5.579
Organic Eggs		
ASC	-0.19645	-0.962
Household Income	-0.0096**	-9.027
Presence of children	-0.6510**	-6.876
Age	-0.0219**	-7.526
Total Expenditure	0.3578**	17.057
Vitamin Enhanced Eggs		
ASC	-12.7529**	-10.092
Household Income	0.0282**	8.505
Presence of children	1.775**	4.483
Age	0.1126**	6.337

Variable	Parameter	t-values
Total Expenditure	-0.1511*	-1.709
Log-likelihood		-6341.72
Adjusted Pseudo R^2		0.2414
Number of observations		292
Restricted (Slopes=0) Log-L		-8359.20
$\chi^2(15)$		25.00

**** p < .05 * p < .10**

The pseudo R-squared value of the final model for Alberta is 0.2414 (24.14%), for Ontario is 0.1740 (17.40%). Additionally, to determine whether a model is statistically significant we use the Log-likelihood ratio-test to compare the LL function of the estimated model to that of the base model (i.e. a model with only the ASCs) at $\alpha < 0.05$. The χ^2 value from the LL ratio-test is 4034 for Alberta, 7250 for Ontario. Comparing this result to a $\chi^2_{(15)df}$ of 25.00 shows that the estimated model performs better than the base model in predicting peoples choices since the statistic obtained from the LL ratio-test is higher than the critical chi–squared statistic. The number of observations used in the final estimation is 292 in Alberta, 505 in Ontario.

The alternate specific constants (ASCs) are negative and significant for omega 3 eggs, free run/range eggs and vitamin enhanced eggs in Alberta, Omega-3 and vitamin enhanced in Ontario. The ASCs are negative and insignificant for organic eggs in Alberta, positive and significant for organic eggs in Ontario, positive and insignificant for free run eggs in Ontario. The negative ASC implies that there is some disutility associated with purchasing omega 3 eggs, free run/range eggs and vitamin enhanced eggs relative to normal eggs, all other things held constant. The alternative specific constants, however, cannot be interpreted separately from the other estimated parameters of the model. For both provinces, the price coefficient is negative and significant, indicating that increasing price decreases the probability of a household purchasing any egg type. The coefficient on the income variable is positive and significant for omega 3 eggs, free run/range and vitamin enhanced eggs in Alberta, and for Omega-3 and free run eggs in Ontario. The coefficient on organic eggs is negative and significant in Alberta but

positive and significant in Ontario (5% level). Income is not a significant determinant of vitamin enhanced egg utility in Ontario.

In Alberta, the coefficient on the presence of children is positive and significant for vitamin enhanced eggs relative to the normal eggs, and negative and significant for omega 3 eggs, free run/range eggs and organic eggs relative to normal eggs, in Ontario the coefficient on the presence of children is negative and significant (5% level) for Omega-3 eggs, organic eggs, negative and insignificant for vitamin-enhanced eggs. However for free run eggs in Ontario the coefficient on the presence of children is positive and statistically significant (5% level). These results suggest that the presence of children in a household will result in an increase in the probability of purchasing vitamin enhanced eggs relative to the normal eggs in Alberta and free run eggs in Ontario. The coefficient on age is positive and significant with regards to vitamin enhanced egg and positive and not significant with regard to omega 3 eggs in Alberta, positive and significant for Omega-3 and vitamin enhanced eggs in Ontario. In Alberta age is related negatively to utility from free run eggs and organic eggs, negative and insignificant in Ontario. This result suggests that as the age of the head of the household increases (person assumed to be making most of the food purchases) the probability of purchasing organic and free run/range eggs decreases relative to the normal option in Alberta, has little effect in Ontario. Similarly, as age increases the probability of purchasing vitamin enhanced eggs and Omega-3 eggs increases relative to normal eggs.

The coefficient on total food expenditure is positive and significant for free run/range eggs and organic eggs and negative and significant for omega 3 eggs and vitamin enhanced eggs in Alberta. In Ontario the coefficient on total food expenditure is positive and significant for Omega-3 eggs, for free run eggs, for organic eggs and insignificant for vitamin enhanced eggs.

In summary there are some similar and some different patterns in the consumer revealed preference analysis of eggs across the two provinces. The data are provided in Table 14.

Table 14: Signs of Significant Coefficients in Choice and Frequency Model, Alberta and Ontario

Variable	**Ontario**		**Alberta**	
	Choice	**Frequency**	**Choice**	**Frequency**

Income	**+ve O3, FR, OR, VE, Normal**	**+ve O3, FR OR**	**+ve O3, FR,VE**	**+ve O3, FR, VE**
Children	**+ve Normal, FR**	**+ve FR**	**+ve O3, FR, OR**	**+ve VE**
Age	**+ve VE**	**+ve VE, O3**	**+ve VE**	**+ve VE O3**
Food Expenditure	**+ve all five eggs**	**+ve O3, FR, OR**	**+ve FR, OR, VE, Normal**	**+ve FR OR**
ASC	**+ve Normal, O3, FR, OR (compared to no eggs)**	**+ve OR (compared to normal)**	**+ve Normal, O3, OR (compared to no eggs)**	**All -ve**

Willingness to Pay Revealed Preference Analysis

From each of the revealed preference analyses (Alberta, Ontario, choice and frequency models) willingness to pay for a certain type of eggs can be calculated from the regression coefficients. These numbers are shown in Table 15.

Table 15: Calculated Willingness to Pay, at the mean of all explanatory variables

FREQUENCY			CHOICE		
Egg Type	Alberta	Ontario	Egg Type	Alberta	Ontario
	$ per egg type relative to normal eggs			$ per egg type relative to no eggs	
			Normal	2.60	2.11
Omega - 3	-.65	.05	Omega-3	1.71	1.11
Free Run	-1.76	.99	Free Run	.23	1.63
Organic	-.37	1.72	Organic	2.06	1.59
Vitamin Enhanced	-1.76	-1.36	Vitamin Enhanced	.26	.83

From the willingness to pay, which allows the cross region and cross model comparison, some things are quite clear. In Alberta no one is willing to pay more for specialty eggs

than for normal eggs. In Ontario this assessment is less clear, the frequency model would suggest that consumers are willing to pay more for specialty eggs than for 'normal' eggs , with organic the egg that they are willing to pay the most for. At the same time the choice model for Ontario suggests that consumers are willing to pay the most for 'normal' eggs with Free run and Organic close behind. Overall, at the mean of all variables, organic eggs are the ones all households are willing to pay the most for, in terms of specialty eggs. In the frequency model Alberta consumers's willingness to pay for organic eggs is closest to normal and Ontario consumers would pay $1.72 relative to normal eggs. The choice model exhibits similar patterns. Free run eggs are also popular in Ontario, but less so than organic.

This makes even more pressing the issue of why people are purchasing organic eggs. The preliminary survey stated preference analysis that we did suggested that organic was preferred for reasons related to health consciousness. Further analysis of how and why consumers link 'organic' to healthier would allow better marketing strategies to be developed for consumers.

CONCLUSIONS AND IMPLICATIONS

The Canadian egg industry is striving to increase per capita egg consumption while over coming negative perceptions and lifestyle trends. Much can be learned from this study which may then be used as a reference point in developing marketing strategies or understanding the implications of policy changes. First of all consumers relate egg consumption to other healthy behaviours, a good basis for marketing for the egg industry. As changes are made in product development and in accepted production techniques, knowing what products consumers are demanding as well as understanding consumer perceptions of products within the industry is of importance in developing future industry direction. From analysis of stated preferences in Alberta, and revealed preferences in Alberta and Ontario there is a continuing interest in 'normal' or generic eggs. However within the marketplaces there are key niches for the newer specialty eggs. Of all of the specialty eggs available there appears to be some significant interest in free run eggs and in organic eggs (in particular examples willingness to pay higher than for normal eggs). For the other egg types there are niches where health conscious consumers, older

consumers (Omega 3, vitamin enhanced) appear to be interested and willing to pay for the egg. From the stated preference analysis there are key attitudinal characteristics that are driving consumer preferences, health, animal welfare and concerns about 'novelty' aspects of food. In future research it would be helpful to survey the respondents to the AC Nielsen Homescan© sample to establish whether those respondents fell the same as the Alberta survey respondents. Aging consumers do not appear to be much interested in free run or organic eggs, but they are interested in health attributes. Households with children do appear to be interested in some eggs with health attributes and in free run eggs. It is also possible that consumers are confused about the health benefits of eggs produced under organic and free run conditions or are imputing a health benefit to those production practices, that is worrying for the industry as a whole. One of the most profound findings of this research is that price remains the most important driver of purchase decisions. There is some evidence that consumers in households with children and with older heads of household are more price responsive than other households, a worrying trend as the Canadian population ages. Even for a small item in overall expenditure consumers are concerned about relative prices. To balance that as household spend more money on food or have more money to spend on all goods their interest in specialty eggs grows. Targeted marketing strategies to groups that have already shown interest in certain egg types, clarifying the safety and health attributes of 'normal' eggs relative to specialty eggs and providing additional information on the merits of specialty eggs are all strategies that could enhance revenues for egg producers.

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Appendix 1

Eggcentric Behaviour : Survey 2005

Thank you for taking the time to complete this questionnaire. Please try to answer all of the questions. Most questions can be answered by placing a check mark (√) or circle your selection. Feel free not to answer any question that you are uncomfortable with. Please return your completed questionnaire to the students collectors.

Part 1: General Health Attitudes

Below is a list of attitudes that may describe your own feelings. Please indicate your level of agreement in the table associated to each statement.

	Totally Disagree	**Disagree**	**Neither agree or disagree**	**Agree**	**Strongly Agree**
I have the impression that I sacrifice a lot for my health.					
I consider myself very health conscious.					
I think that I take health into account a lot in my life.					
I am prepared to leave food on my plate to eat as healthy as possible.					
I think it is important to know how to eat healthy.					
My health is so valuable to me, that I am prepared to sacrifice many things for it.					
I have the impression that others pay more attention to their health than I do.					
I do not continually ask myself whether something is good for me.					
I really don't think often about whether everything I do is healthy.					
I don't want to ask myself all the time, whether the things I eat are good for me.					
I often dwell on my health.					

	Excellent	**Very Good**	**Good**	**Fair**	**Poor**
I think my health in general is					

	Much better than 1 year ago	**Somewhat better than 1 year ago**	**About the same**	**Somewhat worse than I year ago**	**Much worse than 1 year ago**

Compared to one year ago, how would you say your health is now?					

Part 2: Food Purchasing Attitudes

Below is a list of food purchasing behaviours. Please indicate your level of agreement in the table associated to each statement.

	Totally Disagree	**Disagree**	**Neither agree or disagree**	**Agree**	**Strongly Agree**
I consider animal welfare when purchasing food products.					
I consider the environmental effects associated with pesticide use when I purchase food products.					
I consider the environmental effects associated with intensive livestock operations when I purchase food products.					
I consider the environmental effects associated with genetically modified foods when I purchase food products.					
I regularly read nutritional labels on the food I purchase.					
I eat away from home more than three times per week.					
I think that foods engineered to produce extra health benefits are better for me than non-engineered foods.					
I pay attention to eco-labels when I purchase foods.					

Part 3: Health Behaviour

Below is a list of characteristics that may describe your own behaviour. Please check one statement for each behaviour that best explains your current actions.

	I have never smoked	I am a former smoker	I currently smoke
I Smoke Cigarettes			

	Rarely or never	Almost every day	Every day
I eat between meals			

	6 hours or less	7 hours	8 hours	9 hours or more
Hours of sleep				

	Almost every day	Rarely or sometimes	Never
I eat breakfast			

	I am regularly active in sports	I often swim, garden, exercise	I sometimes swim or participate in sports	I sometimes garden or exercise	I am never active in any of the above activities
I am physically active					

	Never	1-2 times per week	3-4 times per week	5+ times per week
I consume alcohol				

Part 4: Choice of Eggs

Generic eggs are an excellent source of high quality protein plus they provide many vitamins and minerals, including Vitamin B12, riboflavin, Vitamin D, folacin and iron. Eggs are one of nature's most nutrient dense foods. Canada's Food Guide to Healthy Eating identifies a serving of one to two eggs as part of a healthy eating pattern.

1. How often do you consume eggs (in addition to that consumed in baking products) per week? Please circle one choice.
    a) Never
    b) Occasionally
    c) 1or 2 times per week
    d) 3-7 times per week
    e) More than 7 times per week

Note: If you answered "a" to this question please answer question #2; other wise please proceed to question 3.

2. I do not eat eggs because: **(Only answer this question if you do not eat eggs).**
    a) Don't like them (taste and other senses)
    b) Potential health issues (describe _____)
    c) Animal welfare issues
    d) Environmental issues
    e) Cost
    f) Lifestyle (time/facilities to prepare this item)

Other _____

Whether you currently eat eggs or not, we would appreciate you completing the following choice comparisons.

We will be considering the following types of eggs:

Omega-3 Eggs:

Omega-3 eggs are produced by feeding hens a diet that contains 10 to 20 percent flaxseed. Flax is high in polyunsaturated fatty acids which are important for lowering blood triglyceride levels and have been associated with a reduced risk of heart disease. Health Canada's *Nutrition Recommendations for Canadians* suggest a daily intake of 1 to 1.5 g omega-3 fatty acids. Omega-3 enhanced eggs contain 0.4 g omega-3 fatty acids compared to 0.04 g omega-3 fatty acids in generic eggs. Omega-3 enhanced eggs can also contain up to eight times more vitamin E than generic eggs.

Vitamin Fortified Eggs:

Vitamin-Enhanced Eggs are produced by feeding hens a nutritionally-enhanced diet containing higher levels of certain nutrients (e.g., vitamin E, folate, vitamin B6 and vitamin B12). As a result, these eggs contain higher levels of these nutrients than generic eggs.

Generic Eggs:

Generic eggs are produced using traditional methods. These eggs are not engineered to offer extra benefits to the consumer.

3. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

Option A	**Option B**	**Option C**
Barn Raised, White, Medium size		I would purchase neither of these types of egg
Omega-3 eggs: Known to reduce incidence of heart disease and help maintain good vision by providing increased amounts of polyunsaturated fatty acids.	Vitamin fortified eggs: These eggs contain slightly higher amounts of nutrients like vitamin A, folate, vitamin B-6, Vitamin-12.	
$2.80 per dozen	$1.90 per dozen	

□Option A **□ Option B** **□Option C**

4. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

Option A	**Option B**	**Option C**
Barn Raised, White, Medium size		I would purchase neither of these types of egg
Generic eggs: No added benefits.	Vitamin fortified eggs: These eggs contain slightly higher amounts of nutrients like vitamin A, folate, vitamin B-6, Vitamin-12.	
$1.90 per dozen	$2.80 per dozen	

□Option A **□ Option B** **□Option C**

5. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

Option A	**Option B**	**Option C**
Barn Raised, White, Medium size		I would purchase neither of these types of egg
Omega-3 eggs: Known to reduce incidence of heart disease and help maintain good vision by providing increased amounts of polyunsaturated fatty acids.	Generic Eggs: No added benefits.	
$2.80 per dozen	$1.90 per dozen	

□Option A **□ Option B** **□Option C**

Part 5: Some Questions About You

The following questions are designed to tell us a little about you. This information will only be used to report comparisons among groups of people and you will not be identified in any way. Your name will never appear with your answers, as we will not know who completes this questionnaire after it is collected. However, if for some reason there is a question you do not wish to answer, just leave it blank.

10. I am: ____ Female ____ Male

11. I am _____ years old

12. I have ____ children under the age of 18 residing in my household

13. Which category best describes your annual household income? (Before taxes)

____ Less than $25,000
____ $25,001-$50,000
____ $50,001 – $100,000
____ $ $100,001-$150,000
____Over $150,000

14. What is the highest level of education that you have completed?

____ Less than high school
____ High school
____ College/technical school
____ University
____ Post-university (graduate school)

15. Please provide the first 3 digits of your home Postal code: ☐ ☐ ☐

If you have any additional comments, please write on the back of this page.
Thank you for completing this survey.

Eggcentric Behaviour : Survey 2006

Thank you for taking the time to complete this questionnaire. Please try to answer all of the questions. Most questions can be answered by placing a check mark (√) in the box, or by circling your selection. Feel free to not answer any question that you are uncomfortable with. When you have completed the survey, please click 'SUBMIT' at the bottom of the page.

Below is a list of attitudes that may describe your own feelings. Please indicate your level of agreement in the table associated with each statement.

	Totally Disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
I have the impression that I sacrifice a lot for my health.					
I consider myself very health conscious.					
I think that I take health into account a lot in my life.					
I am prepared to leave food on my plate to eat as healthy as possible.					
I think it is important to know how to eat healthy.					
My health is so valuable to me, that I am prepared to sacrifice many things for it.					
I have the impression that others pay more attention to their health than I do.					
I do not continually ask myself whether something is good for me.					
I really don't often think about whether everything I do is healthy.					
I don't want to ask myself all the time, whether the things I eat are good for me.					
I often dwell on my health.					

	Never	**1-2 times per week**	**3-4 times per week**	**5+ times per week**
I consume meat or animal products				
I consume meat substitutes				

(Hoek et al., 2003)

Below is a list of food purchasing and consumption behaviours. Please indicate your level of agreement in the table associated with each statement.

	Totally Disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
There are too many kinds of new food available nowadays.					
New foods are just a silly trend.					
I prefer familiar and safe foods.					
I have some doubts about novelties.					
Traditionally made food is the best in the world.					
Functional food is like a nuclear power plant: efficient but dangerous.					
Contemporary food is artificial compared with the food that people ate when I was a child.					
Zeal about health causes unnecessary stress.					
I value things grown in accordance with nature.					
I trust in organically grown food.					
In my opinion, organically grown products are no better than conventionally grown.					
I feel good when I eat clean and natural foods.					
I would like to eat food with no additives.					
I do not care what I eat as long as I am hungry.					
I do not care how my food is produced.					
It makes no difference to me what kind of food is served at parties.					
I do not really need information about new foods.					
Organic foods are produced more ethically.					
Supermarkets should carry more organic products.					
Organic foods are not just fashionable products.					
Consumers want more organic products.					

Organic food production benefits the environment more than commercial farming					
Animal welfare is better under organic food production systems.					
Fish and poultry are the best 'meat' choices.					
Trimmed red meat is as healthful as fish or poultry.					
There are toxins in animal fat.					
Red meats have unnatural hormones.					
I think red meat contains antibiotics.					

(Huotilainen et al., 2005), (McEachern, & McClean, 2002), (Barr & Chapman, 2002)

Below is a list of environmental attitudes. Please indicate your level of agreement in the table associated to each statement.

	Totally Disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly Agree**
It makes me sad to see natural environments destroyed.					
Unique environments should be protected at all costs.					
One of the most important reasons to conserve is to preserve wild areas.					
Wild plants and animals have a right to live unmolested by humans.					
We must prevent any type of animal from becoming extinct, even if it means sacrificing some things for ourselves.					
I am willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant.					
Natural Ecosystems have a right to exist for their own sake, regardless of human concerns and uses.					
I am concerned about farm animals being mistreated.					
I avoid products on account of animal welfare issues.					
It is appropriate for hens to be kept in individual cages.					
Farm animals should be raised in					

natural living conditions.					
Farm animals should have the opportunity to be alone.					
Farm animals should have a clean living environment.					

(Clarke et al., 2004), (Bennett & Blaney, 2002 and Frewer et al. 2005)

Below is a list of characteristics that may describe your own behaviour. Please check one statement for each behaviour that best explains your current actions.

	I have never smoked	**I am a former smoker**	**I currently smoke**
I Smoke Cigarettes			

	Rarely or never	**Almost every day**	**Every day**
I eat between meals			

	6 hours or less	**7 hours**	**8 hours**	**9 hours or more**
Hours of sleep				

	Almost every day	**Rarely or sometimes**	**Never**
I eat breakfast			

	I am regularly active in sports	**I often swim, garden, exercise**	**I sometimes swim or participate in sports**	**I sometimes garden or exercise**	**I am never active in any of the above activities**
I am physically active					

	Never	**1-2 times per week**	**3-4 times per week**	**5+ times per week**
I consume alcohol				

(Breslow & Enstrom, 1980)

Generic eggs are an excellent source of high quality protein plus they provide many vitamins and minerals, including Vitamin B12, riboflavin, Vitamin D, folacin and iron. Eggs are one of nature's most nutrient dense foods. Canada's Food Guide to Healthy Eating identifies a serving of one to two eggs as part of a healthy eating pattern.

1. How often do you consume eggs (in addition to that consumed in baking products) per week? Please circle one choice.
    f) Never
    g) Occasionally
    h) 1or 2 times per week
    i) 3-7 times per week
    j) More than 7 times per week

Note: If you answered "a" to this question please answer question #2; other wise please proceed to question 3.

2. I do not eat eggs because: **(Only answer this question if you do not eat eggs).**
    g) Don't like them (taste and other senses)
    h) Potential health issues (describe _____)
    i) Animal welfare issues
    j) Environmental issues
    k) Cost
    l) Lifestyle (time/facilities to prepare this item)

Other _____

3. Given the option, I would choose:
    a) white eggs over brown eggs
    b) brown eggs over white eggs
    c) no preference

Whether you currently eat eggs or not, we would appreciate you completing the following choice comparisons.

We will be considering the following types of eggs:

Organic Eggs:
Organic eggs are produced by hens fed certified organic grains. Organic eggs have the same nutritional content as generic eggs. Organic eggs can be identified through a 'certified organic' designation on the carton, plus the name of the certifying organization.

Free Run Eggs:
Free Run Eggs are produced by hens that are able to move about the floor of the barn and have access to nesting boxes and, quite often, perches. The nutrient content of these eggs is the same as that of generic eggs.

Vegetarian Eggs:
Vegetarian Eggs come from hens fed a diet containing only ingredients of plant origin. The nutrient content of these eggs is the same as that of generic eggs.

Generic Eggs:
Generic eggs are produced using traditional methods. These eggs are not engineered to offer extra benefits to the consumer.

SECTION 2

(Survey 1)

1. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

<table>
<tr><th>Option A</th><th>Option B</th><th>Option C</th></tr>
<tr><td colspan="2">Large, nutritionally equivalent.</td><td rowspan="3">I would purchase neither of these types of egg</td></tr>
<tr><td>Organic eggs: From hens raised on certified organic feed.</td><td>Free Run eggs: Hens able to move on the barn floor, have access to nesting boxes.</td></tr>
<tr><td>$3.88 per dozen</td><td>$3.88 per dozen</td></tr>
</table>

□Option A □ Option B □Option C

2. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

<table>
<tr><th>Option A</th><th>Option B</th><th>Option C</th></tr>
<tr><td colspan="2">Large, nutritionally equivalent.</td><td rowspan="3">I would purchase neither of these types of egg</td></tr>
<tr><td>Generic Eggs: Traditional production methods.</td><td>Vegetarian Eggs: Hens fed only ingredients of plant origin.</td></tr>
<tr><td>$3.88 per dozen</td><td>$2.20 per dozen</td></tr>
</table>

□Option A **□ Option B** **□Option C**

3. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

<table>
<tr><th>Option A</th><th>Option B</th><th>Option C</th></tr>
<tr><td colspan="2">Large, nutritionally equivalent.</td><td rowspan="3">I would purchase neither of these types of egg</td></tr>
<tr><td>Generic Eggs: Traditional production methods.</td><td>Vegetarian Eggs: Hens fed only ingredients of plant origin.</td></tr>
<tr><td>$2.20 per dozen</td><td>$2.20 per dozen</td></tr>
</table>

□Option A **□ Option B** **□Option C**

4. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

Option A	Option B	Option C
Large, nutritionally equivalent.		I would purchase neither of these types of egg
Free Run eggs: Hens able to move on the barn floor, have access to nesting boxes.	Vegetarian Eggs: Hens fed only ingredients of plant origin.	
$2.20 per dozen	$3.88 per dozen	

□Option A **□ Option B** **□Option C**

5. During a typical shopping trip to the grocery store when you purchase eggs, if the following options were the only ones available, which option would you purchase?

<table>
<tr><th>Option A</th><th>Option B</th><th>Option C</th></tr>
<tr><td colspan="2">Large, nutritionally equivalent.</td><td rowspan="3">I would purchase neither of these types of egg</td></tr>
<tr><td>Free Run eggs: Hens able to move on the barn floor, have access to nesting boxes.</td><td>Organic eggs: From hens raised on certified organic feed.</td></tr>
<tr><td>$3.88 per dozen</td><td>$2.20 per dozen</td></tr>
</table>

□Option A **□ Option B** **□Option C**

Section 3: Some Questions About You

The following questions are designed to tell us a little about you. This information will only be used to report comparisons among groups of people and you will not be identified in any way. Your name will never appear with your answers, as we will not know who completes this questionnaire after it has been submitted. However, if for some reason there is a question you do not wish to answer, just leave it blank.

10. I am: ____ Female ____ Male

11. I am _____ years old

12. I have ____ children under the age of 18 residing in my household

13. Which category best describes your annual household income? (Before taxes)
    ____ Less than $50,000
    ____ $50,000 - $100,000
    ____ Over $100,000

14. What is the highest level of education that you have completed?

    ____ Less than high school
    ____ High school
    ____ College/technical school
    ____ University
    ____ Post-university (graduate school)

15. Please provide the first 3 digits of your home Postal code: ☐ ☐ ☐

Thank you for completing this survey.

Appendix 2

Table 1: Health Consciousness Attitude Scale with Factor Loadings, two samples

'Health Sacrificer'	Health Conscious 2005	Health Conscious 2006
I have the impression that I sacrifice a lot for my health	0.019	0.255
I consider myself very health conscious.	**0.782**	**0.778**
I think that I take health into account a lot in my life.	**0.552**	**0.747**
I am prepared to leave food on my plate to eat as healthy as possible.	**0.754**	**0.486**
I think it is important to know how to eat healthy.	**0.548**	**0.572**
My health is so valuable to me, that I am prepared to sacrifice many things for it.	**0.687**	**0.61**
I have the impression that others pay more attention to their health than I do.	**0.686**	**0.576**
I do not continually ask myself whether something is good for me.	**0.660**	**0.589**
I really don't often think about whether everything I do is healthy.	**0.715**	**0.739**
I don't want to ask myself all the time, whether the things I eat are good for me.	**0.506**	**0.642**
I often dwell on my health.	0.358	**0.487**

'Occupied with Health'	Health Conscious 2005	Health Conscious 2006
I have the impression that I sacrifice a lot for my health	0.395	**0.473**
I consider myself very health conscious.	0.338	0.143
I think that I take health into account a lot in my life.	0.096	0.074
I am prepared to leave food on my plate to eat as healthy as possible.	0.382	0.372
I think it is important to know how to eat healthy.	0.177	0.221
My health is so valuable to me, that I am prepared to sacrifice many things for it.	0.343	**0.480**
I have the impression that others pay more attention to their health than I do.	0.030	-0.211

I do not continually ask myself whether something is good for me.	-0.380	**-0.491**
I really don't often think about whether everything I do is healthy.	**-0.424**	-0.344
I don't want to ask myself all the time, whether the things I eat are good for me.	**-0.555**	**-0.439**
I often dwell on my health.	-0.356	0.094

Table 2: Health Behaviour, 2005 and 2006

	2005	2006
I smoke cigarettes	**0.718**	**0.643**
I eat between meals	-0.375	-0.311
Hours of sleep	**0.428**	**0.475**
I eat breakfast	**0.599**	**0.700**
I am physically active	0.355	**0.499**
I consume alcohol	**0.470**	-0.186

Table 3: Social Representation: Resistance to and suspicion of new foods, 2006

	Resistance
There are too many new kinds of food available nowadays	**0.732**
New foods are just a silly trend	**0.775**
I prefer familiar and safe foods	**0.718**
There are some doubts about novelties	**0.645**
Traditionally made food is the best in the world	**0.553**
Functional food is like a nuclear power plant: efficient but dangerous	**0.566**
Contemporary food is artificial compared with the food that people ate when I was a child	**0.570**
Zeal about health causes unnecessary stress	0.332

Table 4: Social Representation: Adherence to natural food, 2006

	Adherence to natural
I value things being in accordance with nature	**0.748**
I trust in organically grown food	**0.784**
In my opinion organically grown products are no better than conventionally grown	**0.790**
I feel good when I eat clean and natural food	**0.718**
I would like to eat only food with no additives	**0.753**

Table 5: Social Representation: Food as a necessity, 2006

	Necessity

I don't care what I eat, as long as I am not hungry	**0.765**
I don't care how my food is produced	**0.813**
It makes no difference to me what kind of food is served at parties	**0.700**
I don't really need information about new foods	**0.759**

Table 6: Pro-Organics with Factor Loadings, 2006

	Pro-Organics
Organic foods are produced more ethically.	**0.739**
Supermarkets should carry more organic products.	**0.851**
Organic foods are not just fashionable products.	**0.795**
Consumers want more organic products.	**0.747**
Organic food production benefits the environment more than commercial farming	**0.82**
Animal welfare is better under organic food production systems.	**0.689**

Table 7: Animal Welfare with Factor Loadings, 2006

	Animal Welfare
I am concerned about farm animals being mistreated.	**0.723**
I avoid products on account of animal welfare issues.	**0.650**
Farm animals should be raised in natural living conditions.	**0.811**
Farm animals should have the opportunity to be alone.	**0.697**
Farm animals should have a clean living environment.	**0.654**

Table 8: Pro-Environment with Factor Loadings, 2006

	Pro-Environment
It makes me sad to see natural environments destroyed.	**0.763**
Unique environments should be protected at all costs.	**0.794**
One of the most important reasons to conserve is to preserve wild areas.	**0.828**
Wild plants and animals have a right to live unmolested by humans.	**0.799**
We must prevent any type of animal from becoming extinct, even if it means sacrificing some things for ourselves.	**0.749**
I am willing to make personal sacrifices for the sake of slowing down pollution even though the immediate results may not seem significant.	**0.706**
Natural Ecosystems have a right to exist for their own sake, regardless of human concerns and uses.	**0.795**