Number 5/2004/p.65-82 www.CAFRI.org

Current Agriculture, Food & Resource Issues

A Journal of the Canadian Agricultural Economics Society

Profiling Consumer Trend-setters in the Canadian Healthy-foods Market

Gale West
Professor,

Bruno Larue
Canada Research Chair in International Agri-food Trade,

Centre de recherche en économie agroalimentaire (CREA), Institut des nutraceutiques et aliments fonctionnels (INAF), Faculté des sciences de l'agriculture et de l'alimentation, Université Laval

This paper was presented at the Canadian Agricultural Economics Society workshop "The Economics of Food and Health" (Vancouver, May 2003). Papers presented at CAES workshops are not subjected to the journal's standard refereeing process.

The Issue

The agri-food industry faces new challenges as consumer demand for new, healthier foods increases. Media headlines frequently mention health benefits from certain foods and food components, and consumers are more health conscious because they are aging. They realize their food choices can reduce their risk of developing chronic illnesses such as cancer and heart disease. The competitive advantages for firms who are the first to bring their food innovations to market will depend in part on the efficacy of their marketing strategies. Firms that can identify and target those consumers who are most interested in trying new foods with enhanced functional health properties will likely be the most successful. This paper identifies attitudinal and sociodemographic characteristics that influence a consumer's desire to be among the first to try innovative functional foods.

Implications and Conclusions

This study confirms that many previous findings regarding factors that determine consumer innovativeness apply to adoption of innovative functional foods. Consumers who are the most interested in foods with enhanced functional health properties are those who believe strongly in the link between food and health and who already believe in

current nutritional content claims. Our findings also reveal that consumers who have negative attitudes toward GM foods are not interested in being among the first to try new functional foods and that older consumers were not more interested in functional foods than were younger consumers. These, and other findings from this study, should help food manufacturers make better decisions regarding functional-food product development and marketing.

Background

One of the latest food industry trends is the development and marketing of functional foods and nutraceuticals (e.g., foods and food components such as eggs with omega-3 or milk with conjugated linoleic acids). These innovative, nutritionally enhanced food products, which may help prevent or treat chronic illnesses such as cancer or heart disease, are regularly appearing on grocery shelves in Canada and around the world. Health Canada (2002) has argued that this growth is due to two dominant phenomena. First, medical, nutritional and food scientists continue to make major discoveries of the numerous links between foods or food components and the promotion of health or the prevention of diseases. Second, the demographic reality of population aging is making businesses and consumers more health conscious. Thanks to increased media coverage of health issues, aging consumers are more preoccupied by purported links between nutrition and health, and they have become more proactive when making food and health–related consumption decisions (Hickman, Gates and Dowdy, 1993; Kurtzweil, 1998). There is strong evidence that the consumption of nutritional supplements has been increasing in the general population since the 1980s, probably because of increasing knowledge of links between nutrition and health (Schutz et al., 1982; Wolfe, 2002; Wilkes, Bell and Kravitz, 2000).

Food marketers and government authorities are encouraging the circulation of certain types of information regarding possible links between foods or food components and health promotion or disease prevention (Andrews, Netemeyer and Burton, 1998; Health Canada, 2002; Freimuth, Hammond and Stein, 1988; Pratt and Pratt, 1995). For governments, the goal is to fundamentally change human food choice behaviour. This goal is not only economically driven (i.e., healthy workers and savings on health care expenditures), but also morally driven from the standpoint that improving food choices is good for individual citizens and for society (resulting in welfare benefits). For industry, profits will accrue to firms at the avant-garde of new healthy-food product development. These firms will likely benefit from numerous competitive advantages in the marketplace, but to realize those benefits they need to market their new products to the consumers who are most likely to adopt them.

For decades, scholars have been studying the adoption and diffusion of innovations. Findings reveal that even when innovations have advantages that seem obvious to inventors and marketers, consumers do not necessarily rush to exploit those advantages.

This is in part due to consumer scepticism regarding manufacturers' use of dubious marketing ploys. Labelling laws have traditionally been passed not only with the intent of minimizing dubious marketing claims, but also with the objective of preventing possible injury caused by inappropriate product use. While food labelling laws have the same basic intent, they take the idea of consumer protection much, much further. Food labelling laws are now formulated to help promote health and even prevent the occurrence of disease by allowing food manufacturers to make certain diet-related health claims for food products that meet government requirements to qualify for such claims (Health Canada, 2003).

Five factors are theorized to affect the diffusion and adoption of innovations: product attributes, consumer attributes, communication channels, the social system and time (Dowling, 1999). In the case of healthy-food innovations, the product attribute may result from adding a health claim to a conventional food product based on its traditional nutritional composition (e.g., lycopen in tomatoes) or creating a new, enhanced product through some form of food fortification process (e.g., calcium-enriched orange juice, GM golden rice). Either way, the use of a health claim may enable manufacturers to charge higher prices to reflect the added value of the health property. Psychologists have found that consumers are either innately risk averse or novelty seeking. Depending on the positive versus negative content of messages they receive, from media or from their social entourage, consumers will be naturally inclined to either adopt or reject foods marketed with new health claims.

The timing of adoption has been conceptualized at both the micro and macro levels. At the macro level, time is defined as the "rate of adoption" and is actually measured as the "rate of diffusion" within a given population of interest. At the micro level, researchers define time in terms of an individual consumer's decision to adopt or reject an innovation. Researchers have focused on determining the characteristics of consumers who are likely to be among the first to purchase innovative products. If one assumes that at any given point in time the distribution of innovation adopters takes the form of a normal bell-shaped curve (Dowling, 1999), then it follows that 2.5 percent of consumers are truly "innovators", while the next 13.5 percent are "early adopters". These two groups combined are truly trendsetters, forging a societal-level movement toward the adoption of innovative products. The next 34.0 percent form the "early majority" (i.e., those who adopt before the majority). Rogers (1995) suggests that those who follow the "early majority" should be characterized as being consumers who are either sceptical by nature or traditionalists by conviction.

The current study takes a micro-level perspective on the adoption and diffusion of innovations. We hypothesize that consumers' health-related attitudes and behaviours, in conjunction with their food-related attitudes and behaviours and sociodemographic characteristics, will predict their propensity to be among the earliest adopters of nutritionally enhanced food products as they become available on the market. The analysis is a valuable contribution in that there are very few studies that have attempted to

analyse or predict consumer response to food product innovations. Given the pressing objectives of both government food policies and the food manufacturing industry to promote functional foods and nutraceuticals, results from this study are timely indeed.

Conceptual Framework

Previous studies on consumer innovativeness have consistently found positive relationships between innovativeness and ability to deal with abstractions, rationality, ability to cope with uncertainty, and favourable attitudes toward change and toward science (Engle, Blackwell and Miniard, 1995). Health claims on food product labels are, in fact, abstract messages. Consumers have no way of knowing whether a given food component is actually present in the food in sufficient quantities to affect their health, nor can they know that consuming the product will reduce their probability of developing an illness. The food industry, however, hopes that such claims will appear to be credible and that they will invoke some level of consumer fear of developing an illness in the future. Meta-analyses of fear-appeals research that was conducted during the 1970s and '80s found substantial support for a positive relationship between fear and persuasion (Sutton, 1982; Boster and Mongeau, 1985; Block, 1999). The greater the level of induced fear, the greater the intention to engage in a more healthful behaviour. Health claims that are currently permitted on food labels in Canada and the United States are not really designed to arouse intense fear, but rather to appeal to consumers' beliefs that they can reduce their risk of developing an illness by consuming certain foods.

Protection motivation theory has often been used to explain consumer decisions to engage in health-related behaviours (Rogers, 1983). According to this theory, consumers attempt to assess the potential severity of illness outcomes, the probability of developing an illness, and their own level of belief in the efficacy of the solution recommended in the message. Eagly and Chaiken (1993) reviewed numerous studies using protection motivation theory and concluded that intentions to comply with health-related messages are greater when the perceived threat is severe, when the person feels vulnerable to the threat, and when the recommendation is perceived as being efficacious.

Based on these previous studies, we hypothesize that consumers who read food labels, believe nutrition messages on food labels and believe that food can affect health will be more likely to be healthy-food innovators. Consumers who are worried about developing chronic illnesses and who are already taking food supplements should also be more likely to be innovators; however, those who are sceptical of food messages from government and industry sources should be less likely to be innovators. We also hypothesize that consumer knowledge and attitudes toward other types of innovative food products, such as GM foods, will affect the probability that they will be interested in purchasing new foods with functional health claims.

With older age comes a greater risk of developing a chronic illness and an increased interest in nutrition/health-related messages (Burton and Andrews, 1996; Elbon et al.,

2000; Jensen and Kesavan, 1993; McArthur, Chamberlain and Howard, 2001). Seniors appear to be among the greatest consumers of vitamin, mineral and herbal supplements (Ferland et al., 1998; Halon et al., 1992), and they strongly believe that that these products can improve their health, longevity and mental capacity and protect them against many chronic illnesses (Yen, 1998). Many studies have also begun to document a positive relationship between age and use of nutrition labels. However, consumer studies have had mixed results using age as a predictor of innovativeness (Engle, Blackwell and Miniard, 1995). We predict that increased age will increase the probability of being a healthy-food innovator.

Women have consistently been found to be more interested in foods in general and to read and use nutrition labels to a much greater extent than men (Elbon et al., 2000; Guthrie et al., 1995; Nayga, 1997, 2000; McArthur, Chamberlain and Howard, 2001). As such, most advertisements for foods and food supplements usually target women (Hickman, Gates and Dowdy, 1993; Hill and Radimer, 1996; Lohmann and Kant, 2000; Pratt and Pratt, 1995). It has been fairly well documented that the relationship between education and the use and understanding of nutrition labels is positive (Bryd-Bredbenner et al., 2001; Burton and Andrews, 1996; Elbon et al., 2000; Fuan, Miniard and Barome, 2000; Guthrie et al., 1995; Levy and Fein, 1998; Nayga, 1997, 2000). Highly educated consumers are more conscious of links between nutrition and health and more motivated to use nutrition labels (Guthrie et al., 1995); compared to lower educated consumers, they more frequently read nutrition labels and are more likely to say that the information on nutrition labels is useful (Nayga, 1997). Research on consumer innovativeness has consistently found a positive relationship between education and innovativeness (Engle, Blackwell and Miniard, 1995). Thus we hypothesize that women and more highly educated consumers are more likely to be healthy-food innovators. Many studies have shown that people often compare prices of foods while grocery shopping. However, those who are the most inclined to compare prices are often of lower income. Given that new healthy-food products are likely to be priced higher than those that make no health claim, it could be anticipated that people who often compare prices would be less likely to be interested in new healthy-food products.

Jensen and Kesavan (1993) found that presence of children in the household positively influences the consumption of milk and dairy products, presumably for the health of the children. McArthur, Chamberlain and Howard (2001) found that households where children are present make greater use of nutrition information on food labels. Thus one might expect households with children to be more interested in innovative nutritional products. Nayga (1997) found that Americans in the North, Northeast and Mid-west were less interested in foods and food labels. He hypothesized that these differences may be related to differences in exposure to media, lifestyle habits or the rural nature of the population distribution. Most studies of consumer innovativeness have found that having a commercial (urban) rather than a subsistence (rural) orientation is positively related to

innovativeness. We hypothesize that consumers in urban households are more likely to be healthy-food innovators.

Data and Methods

This study's objective is to identify and measure the impact of variables conditioning a consumer's likelihood of being among the first to purchase new healthy-food products. The analysis is basically exploratory in nature. Our data were obtained from a Canada-wide telephone survey conducted in the spring of 2001 with a representative sample of 1,008 household food shoppers that were selected using a random digit dialling technique. For more detailed information about this study, we refer readers to West et al. (2002). The questionnaire included three leadership indicators that were adapted from the Goldsmith and Hofacker (1991) consumer innovativeness scale. The three binary questions (1=yes, 0=no) asked respondents whether they would be very likely to buy new nutritionally enhanced foods, whether they consider themselves to be among the first to purchase such new foods, and whether they usually ask others about such new foods before purchasing them. This measure embodies the three main conceptual definitions of consumer leadership (i.e., likelihood of adoption, willingness to innovate, and independence in purchase decision making). The leadership index has four possible categories of innovativeness: 0=laggers, 1=late adopters, 2=early adopters, and 3=innovators. Respondents in the first category are the least likely to try new nutritionally enhanced foods, while respondents in the fourth category are the most enthusiastic about new nutritional food products. Seven percent of the consumers in our sample are categorized as innovators and 27 percent as early adopters (figure 1). The probability of being in one or another of the leadership categories can be decomposed through ordered probit or logit estimators, which are well suited to categorical survey data. The final model includes three health-related attitudes and behaviours, seven food-related attitudes and behaviours, and six sociodemographic characteristics.

The ordered probit estimation technique was developed to analyze responses expressed as ordinal rankings (i.e., 1,2,…,J). These values are not interval in nature, but reflect categories of arbitrary width. Hence a score of 1 might correspond to a statement like "somewhat disagree" or various combinations of qualitative statements. The ordered regression model is structured around a latent variable $y_i^* = \beta x_i + \varepsilon_i$. The relationship between the observed y_i and the unobserved y_i^* is a function of cutoff points ($\mu's$), which are estimated along with the regression coefficients (β) such that $y_i = 1$ if $\mu_0 < y_i^* \le \mu_1$, $y_i = 2$ if $\mu_1 < y_i^* \le \mu_2 \ldots y_i = J$ if $y_i^* > \mu_{j-1}$. Assuming that $\varepsilon_i \sim N(0,1)$, we define *F* and *f* as the cumulative and density of the standard normal distribution. The probabilities that the latent variable falls in a given interval are: $\Pr[y_i = 1] = F[\mu_1 - \beta' x_i]$, $\Pr[y_i = j] = F[\mu_j - \beta' x_i] - F[\mu_{j-1} - \beta' x_i]$ for the first J-1 intervals, while for the last/highest interval we have $\Pr[y_i = J] = 1 - F[\mu_{J-1} - \beta' x_i]$.

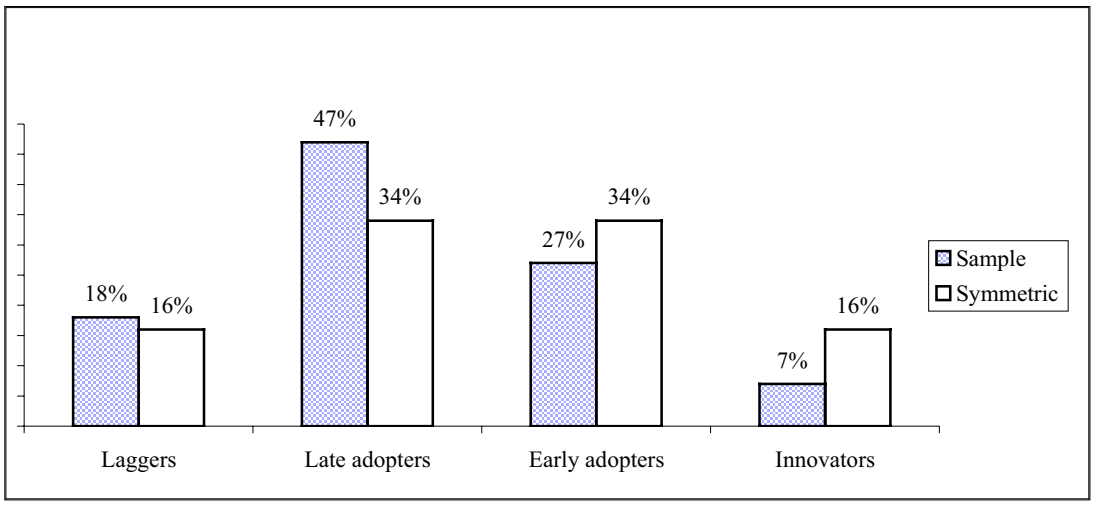

Figure 1 Sample distribution versus a symmetric distribution of consumer food leadership

Because a constant is included among the regressors, the first cutoff point is normalized at zero. The estimated cutoff points must have confidence intervals that do not overlap. A multiplicative heteroscedastic specification can be introduced by positing that $Var(\varepsilon_i) = \left[\exp(\gamma' z_i)\right]^2$ where z_i is a vector of variables, usually also in x_i, and γ is a vector of coefficients. A likelihood ratio test can be computed to test whether this heteroscedastic specification is warranted.

The estimated coefficients of the ordered probit are not, by themselves, very informative. A positive coefficient implies a rightward shift in the distribution of responses. Assuming there are J categories, this means that the probabilities of a response falling in the first and last categories decrease and increase respectively. The sign and magnitude of the changes in the probabilities associated to the intermediate categories (2 to J-1) cannot be inferred from a glance at the estimated coefficients. To make better sense of the results it is imperative to report on category-specific marginal effects, $\partial \Pr(y_i = j)/\partial x_{ik} = \beta_k\left(f(\mu_{j-1} - \beta' x_i) - f(\mu_j - \beta' x_i)\right)$, also known as quasi-elasticities $\left(\partial \Pr(y_i = j)/\partial x_{ik}\right)x_{ik}$ or probabilities. It is apparent that the direction of the effect of the k^{th} explanatory variable depends not only on the sign of β_k, but also on the density differential. The maximum likelihood estimates of (β, γ, μ) were obtained with LIMDEP 7.0.

Results

The estimation results are reported in table 1. The estimated coefficients for the index function, the variance function and the thresholds are reported along with the one-tailed p-values. Reporting p-values in the table makes it easier to ascertain whether the corresponding coefficients are significantly greater or smaller than zero regardless of

Table 1 Summary of Ordered-PROBIT Estimation Results

Index function for probabilities		
Variable (X)	β	**One-tailed p-value**
One (constant)	0.707838	0.0415
Health-related attitudes and behaviours		
Believe food choices can prevent chronic illness	0.091854	0.0218
Worried may develop cancer &/or heart disease	0.042130	0.0300
Regularly take vitamin, mineral &/or herbal supplements	0.150841	0.0016
Food-related attitudes and behaviours		
Read label before purchase of new food products	0.041145	0.1514
Compare prices of foods while grocery shopping	-0.003497	0.4638
Believe current nutrient content claims	0.110977	0.0018
Sceptical gov't & industry food safety messages	-0.027390	0.1669
Actual knowledge of food production methods	-0.004097	0.4384
Self-rated knowledge of GM foods	0.088490	0.0461
Negative attitude toward GM foods	-0.054691	0.0080
Sociodemographic characteristics		
Age group	0.017345	0.2842
Gender (0=male)	-0.278118	0.0015
Education	-0.065632	0.0966
Presence of children in the household (0=none)	0.112377	0.0801
Rural or urban household (0=rural)	0.282753	0.0016
Dummy-Maritime provinces	0.239520	0.0849
Dummy-Québec	0.189536	0.0340
Dummy-Prairie provinces	-0.131198	0.1356
Dummy-British Columbia	-0.162252	0.1128
Variance function		
Variable (Z)	γ	**One-tailed p-value**
Believe that food choices can prevent chronic illness	0.139273	0.0002
Actual knowledge of food production methods	-0.045827	0.0120
Education	-0.067398	0.0380
Threshold parameters		
Thresholds	μ_i	**One-tailed p-value**
μ_1	1.39728	0.000
μ_2	2.58763	0.000
% of correct predictions : 50%		

one's prior conception as to what constitutes an adequate level of significance. As mentioned in the previous section, it is important to note that the coefficients of an ordered probit regression do not convey much information by themselves. As shown in Greene (1997, p. 929), a statistically positive coefficient implies a rightward shift of the distribution of the latent variable. In this case, this implies an increase in the probability of

being among the most prone to purchase innovative, nutritionally enhanced foods. The effect on the probability of being in the least prone category unambiguously falls, while nothing can be said about the probabilities of being in the intermediate categories.

The positive and significant coefficient for the belief that food choices can prevent chronic illnesses confirms that consumers who strongly believe that foods can affect health are more likely to be healthy-food innovators. Similarly, the propensities to worry about cancer and heart disease and to consume food supplements correlate positively with the probability of being a consumer who will be among the first to purchase new healthy-food products. Consumers of vitamins, minerals and/or herbal supplements probably regard nutritionally enhanced foods as either complementary or more enjoyable alternatives that will help them to achieve some target level of nutrient intake for health purposes.

The coefficients on the variables measuring propensities to read food labels before purchasing new foods and to compare food prices while grocery shopping are not statistically significant. Reading new food labels or comparing prices has no impact on the probability of being in the healthy-food innovator or lagger categories. As expected, the strength of belief in the accuracy and reliability of nutrient content claims on current food labels has a significant positive coefficient. However, the variable capturing degree of scepticism toward food safety information emanating from government and industry sources is negative, but not statistically significant. Evidently consumer scepticism toward food safety information has little bearing on willingness to try new nutritionally enhanced foods. Perhaps consumers do not closely align issues surrounding food safety with issues of nutrition. Food safety sceptics are thus neither more nor less willing to try new nutritionally enhanced foods.

Knowledge about food production methods is measured using six binomial questions regarding conventional, organic and genetically modified (GM) foods and food production practices. In the ordered probit analysis, neither knowledge about food production nor educational attainment significantly predicts the probability of being an innovator, but they are important conditioning variables in the variance function, as is believing that food choices can prevent illness. These results are somewhat surprising since it was hypothesized that better informed or more educated consumers would be among those most likely to be leaders in the market for new nutritionally enhanced foods. Given that the coefficient for the consumer's self-rated knowledge about GM foods is significant and positive, it appears that actual knowledge is less important to food leadership than perceived knowledge. The more a consumer thinks they know about foods and food production processes, the more likely they are to be highly motivated to purchase new nutritionally enhanced foods. The coefficient on negative attitude toward GM foods reveals that consumers who are averse to GM foods tend to be less enthusiastic about purchasing new nutritionally enhanced foods.

Table 2 Marginal Effects* for Each Category of Leadership

Variables	ΔP_1	ΔP_2	ΔP_3	ΔP_4
Believe food choices prevent chronic illness	-0.0166	-0.0196	0.0212	0.0151
Worried develop cancer or heart disease	-0.0076	-0.0090	0.0097	0.0069
Take vitamin, mineral, herb supplements	-0.0273	-0.0323	0.0348	0.0248
Read label before purchase new food products	-0.0074	-0.0088	0.0095	0.0068
Compare prices while grocery shopping	0.0006	0.0007	-0.0008	-0.0006
Believe current nutrient content claims	-0.0201	-0.0237	0.0256	0.0183
Sceptical gov't & industry food safety info.	0.0050	0.0059	-0.0063	-0.0045
Self-assessed knowledge of GM foods	-0.0160	-0.0189	0.0204	0.0146
Negative attitude toward GM foods	0.0099	0.0117	-0.0126	-0.0090
Age group	-0.0031	-0.0037	0.0040	0.0028
Gender (0=male)	0.0420	0.0686	-0.0560	-0.0546
Education	0.0119	0.0140	-0.0151	-0.0108
Presence of children in household (0=none)	-0.0173	-0.0275	0.0232	0.0216
Rural or urban (0=rural)	-0.0606	-0.0475	0.0698	0.0383
Québec versus Ontario	-0.0385	-0.0349	0.0460	0.0274

* Marginal effects for dichotomous variables were computed as the difference between the probabilities evaluated at the two possible values of the variables.

It is surprising that age group has no statistically significant link with the likelihood of being a nutritionally enhanced–food innovator. It was hypothesized that older consumers would be more interested in these types of foods than younger consumers, but this is not the case. Our results also suggest that women are less innovative when it comes to new nutritionally enhanced foods than are men; that metropolitan consumers are more prone to try new nutritionally enhanced foods; and that the presence of children makes a household's primary grocery shopper more willing to purchase new nutritionally enhanced foods. From a glance at the regional dummy variables, it is apparent that Québec is the only region exhibiting a statistical difference in relation to the Ontario benchmark. This suggests that Québec consumers are likely to be among the first to try new foods with enhanced nutritional properties.

In terms of model fit, the explanatory variables are jointly significant with a p-value of zero. This is not surprising given that many of the variables are individually significant. The success rate in correctly predicting the category in which each respondent actually belongs is 50 percent. This percentage is affected by the number of categories used in the construction of the dependent variable. If we had had fewer leadership categories, our success rate would have increased, but it would have rendered the interpretation of the results more cursory. As is often the case, the model "over-predicts" the more common categories (i.e., early and late adopters) and has problems predicting the rarer categories (i.e., innovators and laggers).

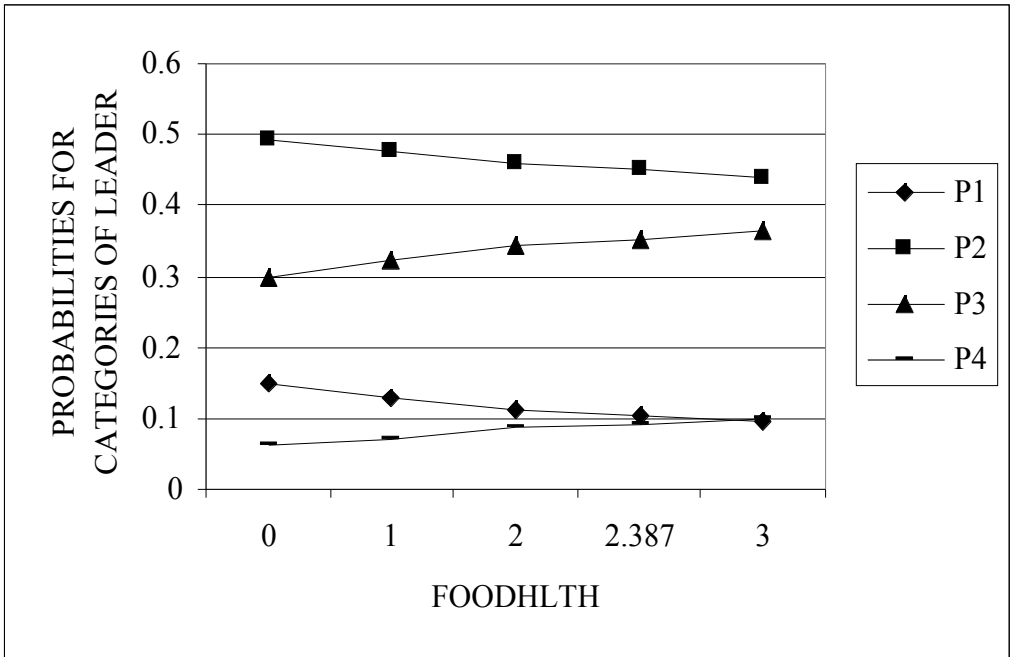

Figure 2 Leadership probabilities as a function of appreciation of the link between health and food consumption

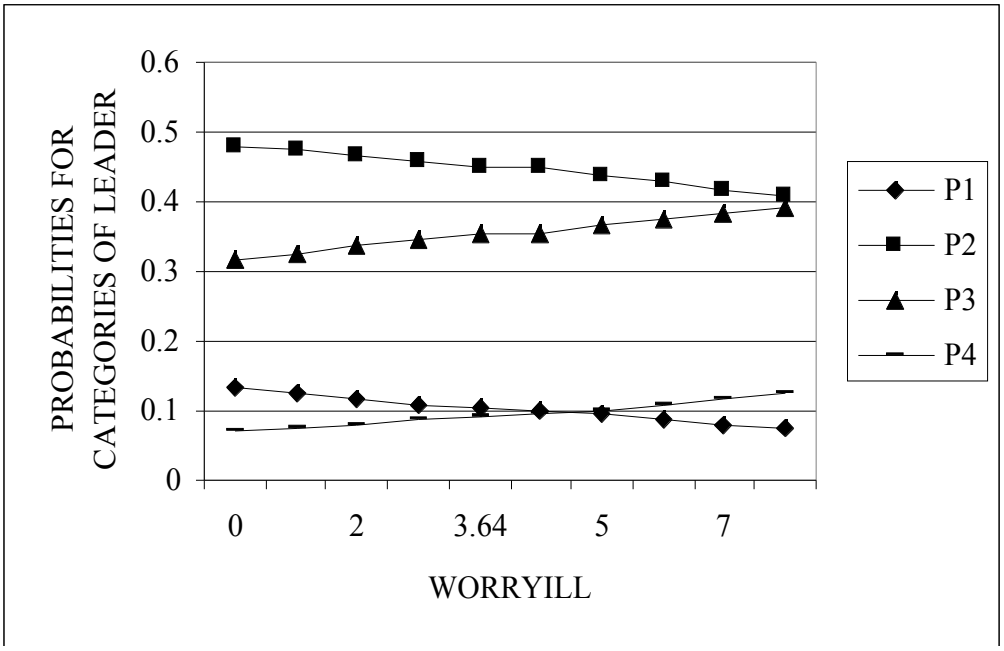

Figure 3 Leadership probabilities as a function of degree of worrying over illness

The discussion so far has been strictly limited to the direction and statistical significance of the effects of the independent variables on the probabilities of being in the first and fourth categories of the food leadership measure. The marginal effects for the independent variables at each category of the dependent variable are reported in table 2.

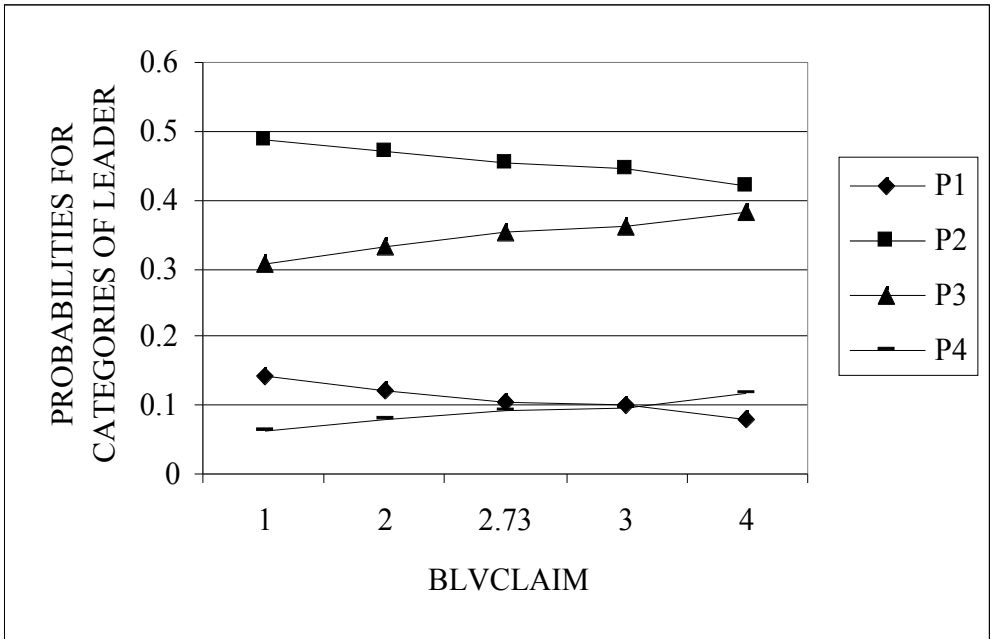

Figure 4 Leadership probabilities as a function of strength of beliefs in nutrient claims

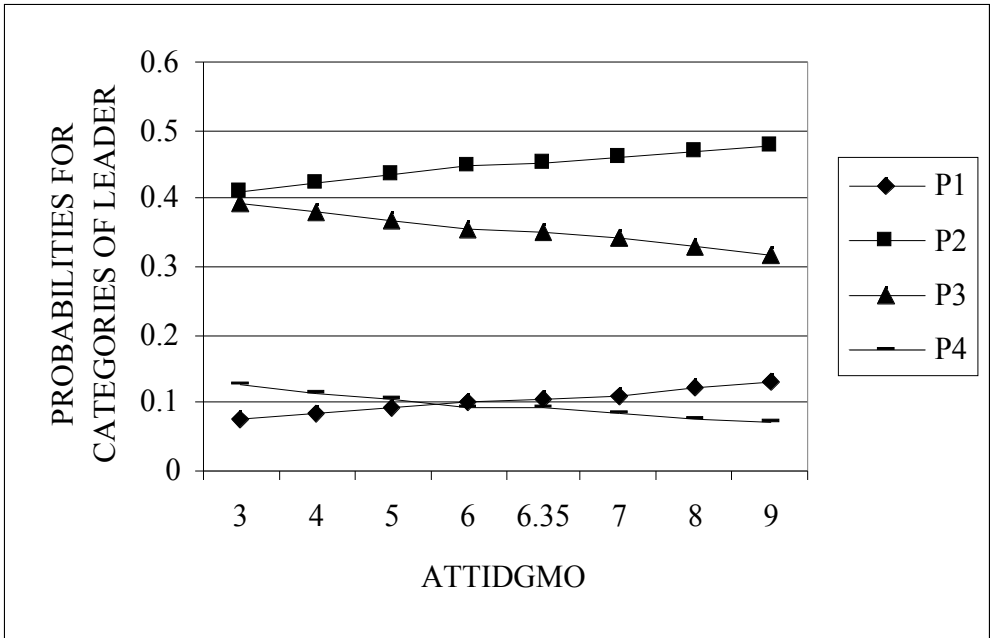

Figure 5 Leadership probabilities as a function of negative attitude toward GM foods

They were computed at the means for the non-binary variables and at specific values of the binary variables (i.e., for a woman living with children in an urban area). Though probabilities must lie within a 0-1 interval and changes in probabilities must be even smaller, the marginal effects in the current study are quite small. In fact, their absolute values never exceed 0.07. This is due in part to the large number of explanatory variables

in the model. The reported marginal effects are also quite uniform across categories. The most pronounced effects are generally on the probability of being in the third category (i.e., early adopters). Gender is the exception, as its strongest effect is on the probability of being in the second group (i.e., late adopters). Women are found to be more apprehensive than men toward new nutritionally enhanced foods, and this is reflected in the increase in the probability of being in the second group.

Marginal effects are derivatives of probabilities evaluated at specific values of the independent variables. Since the magnitude of the increase or decrease in probability depends on the values at which the derivative is evaluated, it is often insightful to see how the effect of a particular variable changes over its distribution. For this reason, it is convenient to plot the probabilities of each category of leadership in terms of a given explanatory variable. Figure 2 illustrates the probabilities that an urban woman living with children will be in a given category of leadership at five different levels of believing that food choices can prevent chronic illness, and while holding other continuous variables at their respective sample means. The measure for belief that food affects health has a minimum of 0 (do not believe), a mean of 2.387, and a maximum of 3 (strongly believe). Figure 2 shows that belief has a positive effect on the probabilities for categories 3 and 4 (early adopters and innovators) and a negative effect on the lowest categories (late adopters and laggers). As noted above, the changes in probabilities are relatively small. Given the makeup of the selected profile and especially the relative importance of gender, the probability of being in the second category (late adopters) is high over the entire range of belief in the influence of food on health. Hence, other variables in the model must change for categories 1, 3 and 4 to exhibit higher probabilities than category 2. This outcome also reflects the model's in-sample forecasting performance (i.e., most respondents are in categories 2 and 3 and, as such, the model tends to "over-predict" these categories and "under-predict" categories 1 and 4). Figures 3, 4 and 5 illustrate changes in probabilities in terms of increasing degrees of worrying about developing illnesses, believing in nutrient content claims, and being averse to GM foods. Figures 3 and 4 are similar to figure 2 in that increases in the explanatory variables cause the probabilities for categories 1 and 2 (3 and 4) to fall (increase). The opposite effects are shown in figure 4. Aversion toward GM foods tends to diminish interest in being among the first to try new nutritionally enhanced foods.

Conclusions and Implications

As our population continues to age and as scientists continue to document links between health promotion and foods with certain functional components (e.g., omega-3, lycopen, antioxidant vitamins, linoleic acids, phytoestrogens, etc.), there will be increasing social pressure on food manufacturers to develop and market foods with enhanced functional properties. As these new products come onto the market, they must first attract food innovators. If the diffusion process is successful, the early and then the late adopters will

come on line, creating a new social norm of more healthful eating habits. This is the ultimate goal of government and the ambition of the food industry. Should this social movement succeed, governments may realize decreased health care costs and increased social welfare benefits for their citizens, while the food industry enjoys higher profits.

This research confirms many of the findings from previous studies on both consumer innovativeness and the adoption and diffusion of innovations. As protection motivation theory suggested, believing strongly in the efficacy of food choices as a means to diminish the risk of developing chronic illnesses and believing in the credibility of nutrition content claims that are currently present on numerous food labels increased the probability that a consumer would be among the first to try newly developed, nutritionally enhanced food products. Also in accordance with protection motivation theory, consumers who felt more threatened or vulnerable to the risk of developing either cancer or heart disease and those who were already acting to reduce health risks by taking supplements were also more interested in trying foods with new functional health properties. If consumer belief in the health benefits of foods and in the credibility of health claims on food labels were undermined, consumers who have the greatest potential of becoming leaders in the healthy-food market would likely become disinterested in these foods. Protecting consumer confidence in the health efficacy of foods and the credibility of diet-related health claims should remain an utmost priority for governments and food manufacturers.

To date, consumers have had no reason to question the safety of nutritionally enhanced foods because there have been no major food safety scares concerning the nutritional fortification of foods. Thus, in this study, it is not too surprising that being sceptical of food safety information from government and industry sources had no significant impact on the probability of being a leader in the nutritionally enhanced–food market.

There is some evidence from this study that the process used to produce a new functionally enhanced food could play a determining role in consumer willingness to be among the first to try the product. This evidence is concordant with at least one previous study (Larue et al., 2003). Negative attitudes toward GM foods were found to negatively affect interest in nutritionally enhanced foods. Should negative attitudes toward GM foods increase, consumers may shy away from other types of food innovations, including functional foods. There are two possible ways for the food industry to respond to this situation. One is to actively promote positive attitudes toward GM foods; another is to focus greater effort on the development of functional foods using more traditional food fortification processes, including cross-breeding to enhance the concentration of functional components present in conventional foods.

Neither educational attainment, nor reading new food labels before purchasing, nor actual knowledge about foods and food production methods had any significant power to predict who would or would not be among the food innovators in our study. In contrast, self-rated knowledge about GM foods had a significant and positive effect on the

probability of being an innovator. This suggests that the acquisition and retention of more detailed, factual knowledge about foods could be less influential in a consumer's decision to purchase an innovative food product than their general perception of their own knowledge. Food innovators may not need to give consumers a great deal of factual information about nutritionally enhanced foods, but consumers will need sufficient general information to develop a strong belief that they are knowledgeable enough to make informed decisions.

Given that price comparison shopping had no significant impact on the probability of being a leader in the functional-food market, it is quite possible that consumers will be less price sensitive in their purchase decisions. Previous research has found that Canadian consumers might be willing to pay as much as 65 percent more than the going market price for foods when those foods have a value-added functional health property (West et al., 2002). Food manufacturers should be able to charge higher prices for foods with the added value of a health claim.

In terms of demographic profiling, it appears from this study that those most willing to be innovative in the nutritionally enhanced–food market are men, metropolitan consumers, consumers with children present in the household and consumers residing in the province of Québec. While women may often be more knowledgeable about foods and make more household food decisions, this study suggests that they are more hesitant when faced with novel foods. In our data, 46 percent of the women sampled said they would consult with friends, neighbours or relatives before purchasing the latest nutritionally enhanced foods, while only 30 percent of the men in the sample said they would do so (χ^2=17.6; d.l.=1; p=0.000). It is surprising that older consumers did not appear more willing to innovate in the new healthy-foods market. Baby boomers and older consumers are not necessarily the best target markets for new nutritionally enhanced foods. At this time, consumers of all age groups are equally likely to be either functional-food innovators or laggers.

The food industry should proceed with great caution when developing and marketing innovative food products with enhanced functional properties. Any diet-related health claim that lacks sufficient scientific evidence to warrant the claim could significantly undermine consumer confidence. While the advantages of functional-food components may seem obvious to scientists and marketers, consumers will not exploit those advantages if they do not believe that foods and food components can indeed help promote health and prevent the chronic diseases that they fear. Consumers will need to be constantly reassured, perhaps through government regulation, that diet-related health claims are not dubious marketing ploys, but are rather based on sound, scientific discoveries of the effects of certain foods and food components on the promotion of health and the prevention of diseases.

References

Andrews, J.C., R.G. Netemeyer and S. Burton. 1998. Consumer generalization of nutrient content claims in advertising. *Journal of Marketing* 62: 62-75.

Block, L.G. 1999. Fear appeals and persuasion. In *The Elgar Companion to Consumer Research and Economic Psychology,* by P.E. Earl and S.Kemp, pages 239-244. Cheltenham, UK: Edward Elgar Publishing.

Boster, F.J. and P. Mongeau. 1985. Fear-arousing persuasive messages. *Communication Yearbook* 8: 330-75.

Bryd-Bredbenner, C., L. Alfieri, A. Wong and P. Cottee. 2001. The inherent educational qualities of nutrition labels. *Family and Consumer Sciences Research Journal* 29(3): 265-280.

Burton, S. and J.C. Andrews. 1996. Age, product nutrition and label format effects on consumer perceptions and product evaluations. *Journal of Consumer Affairs* 30(1): 68-89.

Dowling, G. R. 1999. Consumer innovativeness. In *The Elgar Companion to Consumer Research and Economic Psychology,* by P.E. Earl and S. Kemp, pages 111-115. Cheltenham, UK: Edward Elgar Publishing.

Eagly, A. and S. Chaiken. 1993. *The Psychology of Attitudes*. Fort Worth, TX: Harcourt Brace Jovanovich.

Elbon, S.M., M.A. Johnson, J.G. Fischer and C.A. Searcy. 2000. Demographic factors, nutrition knowledge, and health-seeking behaviors influence nutrition label reading behaviors among older American adults. *Journal of Nutrition for the Elderly* 19(3): 31-48.

Engle, J.F., R.D. Blackwell and P.W. Miniard. 1995. *Consumer Behavior*, 8th edition. Toronto, ON: The Dryden Press.

Ferland, G., D. Boivin, I. Desjardins, M. Gaudreault and L. St-Denis. 1998. Personnes âgées. In *Manuel de Nutrition Clinique,* edited by D. Chagnon Decelles, M. Daigneault Gélinas, L. Lavallée Côté and E. Blain, parts 2.5-1 to 2.5-6. Montréal, PQ: Ordre Professionnel des Diététistes du Québec.

Freimuth, V.S., S.L. Hammond and J.A. Stein. 1988. Health advertising: Prevention for profit. *American Journal of Public Health* 78: 557-561.

Fuan, L., P.W. Miniard and M.J. Barome. 2000. The facilitating influence of consumer knowledge on the effectiveness of daily value reference information. *Journal of the Academy of Marketing Science* 28(3): 425-436.

Goldsmith, R.E. and C. Hoffacker. 1991. Measuring consumer innovativeness. *Journal of the Academy of Marketing Science* 19: 209-221.

Greene, W.H. 1997. *Econometric Analysis,* 3rd edition. Upper Saddle River, NJ: Prentice Hall.

Guthrie, J.F., J.J. Fox, L.E. Cleveland and S. Welsh. 1995. Who uses nutrition labelling and what effects does label use have on diet quality? *Journal of Nutrition Education* 27(4): 163-172.

Halon, J.T., G.G. Fillenbaum, B. Burchett, W.E. Wall, C. Service, D.G. Blazer and L.K. George. 1992. Drug-use patterns among black and nonblack community-dwelling elderly. *Annals of Pharmacotherapy* 26(May): 679-685.

Health Canada. 2003. *Nutrient content and diet-related health claims*. Printed in July 2003. http://www.hc-sc.gc.ca/english/media /releases/2003/2003_01bk2.html.

Health Canada. 2002. *Produits nutraceutiques/aliments fonctionnels et les allegations relatives aux effets sur la santé liées aux aliments*. Printed in September 2002. http://www.hc-sc.gc.ca/food-aliment/ns-sc/ne-en/health_claims-allegations_sante/f_nutra-funct_foods.html.

Hickman, B.W., G.E. Gates and R.P. Dowdy. 1993. Nutrition claims in advertising: A study of four women's magazines. *Journal of Nutrition Education* 25(5): 227-235.

Hill, J.M. and K.L. Radmier. 1996. Health and nutrition messages in food advertisements: A comparative content analysis of young and mature Australians' women's magazines. *Journal of Nutrition Education* 28(6): 313-320.

Jensen, H.H., T. Kesavan. 1993. Sources of information, consumer attitudes on nutrition and consumption of dairy products. *Journal of Consumer Affairs* 27(2): 357-376.

Kurtzweil, P. 1998. Raising milk consumption. *FDA Consumer* 32: 6-21.

Larue, B., G.E. West, C. Gendron and R. Lambert. 2004. Consumer response to functional foods produced by conventional, organic or genetic manipulation. *Agribusiness: An International Journal* (Forthcoming).

Levy, A.S. and B.S. Fein. 1998. Consumers' ability to perform tasks using nutrition labels. *Journal of Nutrition Education* 30(4): 10-217.

Lohmann, J. and A.K. Kant. 2000. Comparisons of food groups and health claims appearing in food advertisements in 3 popular magazine categories. *Journal of the American Dietetic Association* 100(11): 396-1399.

McArthur, L., V. Chamberlain, A.B. Howard. 2001. Behaviors, attitudes and knowledge of low-income consumers regarding nutrition labels. *Journal of Health Care for the Poor and Underserved* 12(4): 415-428.

Nayga, M.R. 2000. Nutrition knowledge, gender and food label use. *Journal of Consumer Affairs* 34(1): 97-112.

Nayga, M.R. 1997. Impact of sociodemographic factors on perceived importance of nutrition in food shopping. *Journal of Consumer Affairs* 31(1): 1-9.

Pratt, C.A. and C.B. Pratt. 1995. Comparative content analysis of food and nutrition advertisements in *Ebony, Essence,* and *Ladies' Home Journal*. *Journal of Nutrition Education* 27(1): 11-17.

Rogers, E.M. 1995. *Diffusion of Innovations*. New York, NY: Free Press.

Rogers, R.W. 1983. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In *Social Psychophysiology,* edited by J.T. Cacioppo and R.E. Petty, pages 153-76. New York, NY: Guilford Press.

Rothman, A.J. and P. Salovey. 1997. Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychological Bulletin* 121: 3-19.

Schutz, H.G., M. Read, R. Bendel, V.S. Bhalla, I. Harrill, J.E. Monagle, E.T. Sheehan and B.R. Standal. 1982. Food supplement usage in seven western states. *The American Journal of Clinical Nutrition* 36: 897-901.

Sutton, S.R. 1982. Fear-arousing communications: A critical examination of theory and research. In *Social Psychology and Behavioral Medicine,* edited by J.R. Eiser, pages 303-37. New York, NY: John Wiley & Sons.

West, G.E., C. Gendron, B. Larue and R. Lambert. 2002. Consumers' valuation of functional properties of foods: Results from a Canada-wide survey. *Canadian Journal of Agricultural Economics* 50(4): 541-558.

Wilkes, M.S., R.A. Bell, R.L. Kravitz. 2000. Direct-to-consumer prescription drug advertising: Trends, impact and implications. *Health Affairs* 19(2): 110-128.

Wolfe, S.M. 2002. Direct-to-consumer advertising – Education or emotion promotion? *The New England Journal of Medicine* 346(7): 526-526.

Yen, P.K. 1998. What elders think about food. *Geriatric Nursing* 16(4): 187-188.