ESSAYS ON CONSUMER PURCHASE DECISIONS AND HEALTH AND NUTRITION INFORMATION ON FUNCTIONAL FOODS

DISSERTATION

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By

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ABSTRACT

Functional foods have received increasing attention from consumers and food producers and manufacturers over the past years, yet few studies have examined economic and marketing issues that are related to foods with additional health benefits beyond basic nutrients. This dissertation consists of three papers that employ different techniques to understand consumer behavior in this domain.

The first essay applies a choice experiment to examine consumer valuation of various attributes of functional foods, using a statewide mail survey. Results indicate that consumers place positive value on health benefits and ingredient naturalness. Moreover, they are willing to pay higher prices for products having these attributes. The data also reveal that taste preferences tend to vary across consumers. Individual characteristics that tend to affect preferences include age, education, and income level. Past purchase behavior for functional foods, organic foods, and natural foods also has significant influence on preferences.

The second essay uses the Elaboration Likelihood Model as a theoretical framework to understand the role of health claims in consumer assessment of products. Previous research and theory related to the role of health claims in persuasive messages has portrayed health claims as having little effect on consumers' attitudes. The present

research, however, suggests this conclusion may be premature. A new conceptualization of the role of health claims in persuasion is proposed. Practical significance of the laboratory studies is discussed in light of recent changes in product design as well as changes in FDA rules regarding label claims.

The third essay focuses on the Food and Drug Administration (FDA)'s recently amended policy on food labeling. This policy allows different qualified levels of health claims on product labels, based on the strength of scientific evidence supporting the claims. This essay examines whether consumers understand and can differentiate between these qualified health claims. Results show that people do not perceive significant differences between the different levels of qualified claims. An additional experiment suggests that a visual aid may be an important device to help consumers understand the scientific basis supporting a claim.

Dedicated to my parents, my brothers, and Pavida Limpun

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PUBLICATIONS

Research Publication

1. Teratanavat, Ratapol, Victoria Salin, and Neal H. Hooker. 2005. Recall Event Timing: Measures of Managerial Performance in U.S. Meat and Poultry Plants. Agribusiness. Forthcoming.

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INTRODUCTION

With increasing awareness of health issues, functional foods have become a topic of increasing importance for the food industry over the past decade. Such foods are commonly described as products that provide additional health benefits beyond basic nutrients. Given promise of high demand and the ability to place various health claims on product labels within the new FDA regulation, the food industry has strong incentives to develop and market functional foods. These specialty products have a possibility of high profit margin because of economies of scale and brand extension of conventional products. It is not surprising, therefore, that in recent years the number of functional foods has increased substantially. Several economic and consumer research issues emerge through this increase in the demand and supply of foods with additional health benefits. Understanding such issues requires novel analytical, methodological, and theoretical frameworks.

Studies in this dissertation use functional food products that are not yet available in the market. Studies one and two focus on a tomato juice that contains soy protein, whereas study three focuses on a wheat cracker containing soy protein. These products were chosen because it has been shown that nutrients in tomato, soy, and wheat products help prevent the risk of several diseases including certain types of cancers and heart

disease. Benefits of these products are considered important to public health as cancers and heart diseases are known to be major causes of morbidity and mortality in the U.S.

The ***first*** study focuses on understanding factors affecting consumer purchase decisions for functional foods. A discrete choice experiment based on a random utility framework is used to examine how consumers value functional foods and make trade-offs among product attributes. Data were collected from approximately 1,700 households in Ohio through a mail survey. A conditional logit model and a mixed logit model were applied to reveal consumer preferences and willingness to pay. The issue of taste heterogeneity among consumers was addressed by dividing respondents into various subgroups based on individual characteristics. Estimated coefficients were compared across subgroups.

The ***second*** study considers the role(s) of claims shown on the front label of food packages on consumer product evaluation, using a behavioral laboratory experiment. Understanding these roles has implications for both public policy and food manufacturers who use health and nutrition information as a tool to market their products. The focus of this study is to understand how consumers use different kinds of information on the front label to form product judgments. A series of experimental studies with undergraduate students as participants were conducted. Analysis of variance (ANOVA) was used to examine the interaction between information on the front label and the Nutrition Facts panel.

The ***third*** study addresses consumer understanding of new types of food labeling being considered by the FDA. Health claims can now be ranked based on the quality and

quantity of scientific evidence publicly available. This study aims to examine whether consumers can differentiate between these multiple levels of health claims. Each level has different disclaimer statements, supported by different levels of scientific evidence. It is also to determine how a report card, which indicates the level of the claims, helps consumer understanding various levels of qualified health claims. The data were collected through experimental laboratory studies with undergraduate students at the Ohio State University as participants.

ESSAY 1

USING A CHOICE EXPERIMENT TO EXAMINE CONSUMER PURCHASE DECISIONS AND INDIVIDUAL PREFERENCES FOR FUNCTIONAL FOODS

1.1 INTRODUCTION

Functional foods have become a topic of increasing importance for the food industry over the past decade. Despite the lack of a legal definition by the Food and Drug Administration (FDA), these foods are commonly described as products that provide additional health benefits beyond basic nutrients. The International Food Information Council (IFIC) Foundation has conducted a series of quantitative and qualitative studies, examining trends in consumer attitudes toward functional food. Analysis of data collected in 1998, 2000, and 2002 revealed that consumers have become more interested in, and want to learn more about, functional foods (IFIC, 2004). Several studies have suggested an increasing consumer awareness of health, diet, and disease relationships and high interest in self-care treatments and prevention (Blaylock et al. 1999; Bush and William, 1999). Nonetheless, aggregate food consumption data provide little evidence that consumers have changed their eating habits to consume more healthy food to meet the Food Guide Pyramid Recommendations (Huston and Finke, 2003; McNamara et al., 1999; Nayga and Capps, 1999; Putler and Frazao, 1993).

Consumers are the most important segment of the food system and they ultimately determine the success or failure of products (Asp, 1999). Food manufacturers must develop marketing strategies that serve consumer needs and wants. Many producer groups try to add value to their products by differentiating generic commodities or developing alternative products or services. Given limited resources and budgets, food manufacturers require assistance in setting optimal marketing plans based on their understanding of consumer behavior (Lusk and Hudson, 2004). Because functional foods are emerging products that often require extensive research and development using innovative technology, food manufacturers want to ensure sufficient demand exists and that their return on investment will be justified. Yet, such marketing decisions must be made under uncertainty. Assume a new functional food offers attributes (e.g., health benefits) not available in any existing products within the same product category. The food manufacturer must examine how consumers decide, if they are likely to try this new offer, and how they will evaluate and select between conventional foods and this new functional food.

The objective of this study is to examine the consumer decision-making process, especially in determining whether consumers will consider buying a new functional food that is introduced to the market and to identify factors that may affect demand. It also determines the effect of demographic and individual characteristics on consumers' choice decisions. Consumer decision making for functional foods is compared to conventional foods. A trade-off analysis among perceived product attributes, based on a stated preference approach, is conducted using a choice experiment. This choice experiment,

consistent with random utility theory and Lancaster's theory of consumer demand, enables the examination of consumer preferences and valuation of food attributes.

This study uses a hypothetical functional food (i.e., tomato juice containing soy protein) that has specific nutrient levels, which may help to reduce the risk of certain cancers and heart disease. Four attributes were included to assess their relative importance - health benefits, organic ingredients, source of nutrients, and price. The experimental design was conducted to assign attributes in different choice sets. Data were collected from approximately 1,700 households in Ohio through a mail survey. A conditional logit model and a mixed logit model were then applied to assess consumer preferences and willingness to pay. The issue of taste heterogeneity among consumers was addressed by comparing responses from various subgroups based on individual characteristics. The next sections provide a literature review and theoretical framework. The econometric model and data collection process are then presented, followed by results and discussions.

1.2 LITERATURE REVIEW

1.2.1 Trade-Off Decisions among Product Attributes

How consumers perceive product attributes is a critical factor in the food choice process (Kupiec and Revell, 2001). Many studies have been conducted to examine how consumers value different product attributes in various food products. Taste, health, convenience, naturalness, and wholesomeness are shown to be fundamental quality criteria that determine consumers' food preferences (Bech-Larsen, Grunert, and Poulsen,

1999). Harris (1997) evaluated consumer preferences for taste, convenience, and nutritional content by considering purchase behaviors of frankfurters using a hedonic model. The hedonic methodology was applied to draw inferences about consumer perceptions of different product attributes. It is suggested that certain consumers value taste more highly than nutrition when purchasing food, at least for certain products.

Blaylock et al. (1999) suggested that consumers face many trade-offs in their food and diet choices such as those between nutrition and taste, nutrition and price (does it cost too much to eat healthy?), nutrition and convenience, and/or between short-term costs (in terms of time, money, and perceived sacrifices in taste) and uncertain long-term benefits of healthy eating. If consumers do not value the nutritional quality of foods more than taste, convenience, or price, then they may not choose functional foods or more generally healthy diets, regardless of knowledge levels.

Moon and Balasubramanian (2002) examined the effect of knowledge and awareness of health benefits of soy protein on consumer decisions to purchase and consumption intensity. They demonstrated that perception of health benefits, taste, and convenience are the main attributes that affect the decision to buy soy-based products. The decision of how much to consume is affected by perceptions of health benefits and the convenience of food preparation.

Huston and Finke (2003) examined the role of time in healthy diet choices. The decision to eat a healthy diet often involves subversion of other food characteristics (e.g., flavor, price, or convenience) in favor of healthfulness. The motivation to choose a more healthy diet depends upon the parameters which guide any investment decision. More

importantly, the opportunity cost of realized present utility for uncertain future utility will influence investment in future health and well-being through activities such as diet choice, exercise, medical care, and sleep patterns among other factors.

Poulsen (1999) showed that certain consumers are willing to pay more for functional foods if they are aware of the associated health benefits. Maynard and Franklin (2003) applied a contingent valuation method and found that consumers are willing to pay premiums for certain health attributes (e.g., Conjugated linoleic acid (CLA)'s cancer fighting characteristic). However, the survey conducted by Jonas and Beckmann (1998) suggested that consumers expected the price of functional foods to be the same as that of conventional foods. No additional price for the claimed health effects was seen to be justified. They also found that taste and price are of greater importance than the product's functional benefits. Many consumers perceived that functional foods are unnatural or impure because of added nutrients used to meet the claim of health benefits; thus these consumers expressed strong reluctance toward modification and fortification of foods.

Many qualitative studies have been conducted in recent years to examine consumer attitudes towards, and how consumers perceive different attributes of, functional foods. Schmidt (2000) reported results of a national phone survey in which more that 95% of consumers believed certain foods have benefits that go beyond basic nutrition and may reduce the risk of certain diseases or improve their overall health. Bhaskaran and Hardley (2002) conducted focus groups and reported that people consider health attributes while shopping for food. They also evaluate whether these functional foods satisfied their needs in terms of the other attributes and prioritized accordingly. The

characteristics of a particular functional food product under evaluation are only important to shoppers who are seeking out a product with the particular claimed health attributes or benefits. Although consumers are aware of such health benefits, they still evaluate all other product attributes, based on their perceptions, such as taste, naturalness, appearance, and price (Childs and Poryzees, 1997; Frewer, Scholderer, and Lambert, 2003).

From the existing literature, it is implied that, even though consumers have high intention to purchase functional foods when they become available, they still make decisions whether to purchase conventional foods based on a set of criteria which include health benefits in addition to other product attributes. It is interesting to quantitatively identify how consumers value these different attributes, both in absolute and relative terms, when making purchase decisions.

1.2.2 Heterogeneity in Consumer Preferences for Functional Foods

In recent years, many food manufacturers have developed and marketed functional foods in response to increasing consumer concern and interest in the link between diet and health (Hasler et al., 2004; Singletary and Morganosky, 2004). However, the market for functional foods remains relatively small as prices for these products are generally higher than conventional foods (Childs, 1997). The main characteristic of functional foods is the health benefit from one or more substances that may help prevent or treat certain diseases. Thus, particular groups of people will likely be more interested in and willing to pay premium prices for, these food products (Maynard and Franklin, 2003). The bi-annual survey conducted by IFIC suggested that several demographic

factors such as age, gender, education, marital status, and health contribute to certain targets for functional foods (Pitman and Reinhardt, 2000; Schmidt and Pitman, 1999).

Different demographic characteristics of consumers tend to have significant influences on consumer perceptions about the importance of choosing a healthy diet. Maynard and Franklin (2003) found that households with children and health conscious consumers expressed higher willingness to pay for functional food products. Poulsen (1999) found that older respondents and women react more positively toward functional foods compared to other respondents. IFIC survey data identifies several consumer groups who are interested in functional food; these include 55-64 years old, college educated, high income, and users of dietary supplements (Pitman and Reinhardt, 2000; Schmidt and Pitman, 1999). Nayga and Capps (1999) examined the relationship between socio-demographic factors and an individual's perception of the importance of choosing healthy diets. They suggested that understanding such perceptions is an important step in changing dietary behaviors and nutrition policies. Jayanti and Burns (1998) showed that people with different levels of health motivation react differently through their diet choices.

1.2.3 Different Approaches to Economic Valuation

Figure 1.1 illustrates various economic estimation techniques used to value goods and services. Revealed preference and stated preference methods are the two main approaches that have been commonly used in the economic valuation of market and non-market goods (Garrod and Willis, 1999). The revealed preference approach, including the

travel-cost and hedonic price methods, evaluates product demand by examining purchases of related goods in the private market place. This approach is appropriate when a market exists for those goods, in which the data are obtained from actual market behavior or based on actual choices made in observable situations. The traditional view of economic choice is that valid data only result from observing actual choices (Morikawa, Ben-Akiva, and McFadden, 2002).

The stated preference approach, including the contingent valuation method (CVM) and conjoint analysis, measures how people value goods through explicit questions. Stated preference data are collected by presenting hypothetical scenarios to respondents and asking for their preferences. The basic idea is that relative importance scales on different product attributes can be derived on the basis of responses to such hypothetical questions (Bates, 1988). Although responses from the stated preference approach may not be valid for forecasting actual behavior due to their unknown bias and error properties, such responses often contain useful information on trade-offs among attributes. In particular, stated preference data provides useful information when new products or attributes are introduced, in which cases revealed preference data is not yet available (Morikawa, Ben-Akiva, and McFadden, 2002; Kroes and Sheldon, 1988).

Adamowicz, Louviere, and Williams (1994) and Ben-Akiva, Morikawa, and Shiroishi (1991) discuss the advantages of the stated preference approach, as compared to the revealed preference approach. First, the stated preference approach can be applied to elicit preferences for non-existing attributes and alternatives. Also, the stated preference approach does not encounter the problem of multi-collinearity among attributes. Though

revealed preference data are observed from real behavior, it suffers from the fact that not all quality attributes can be included in the model because of collinearity problems.

The analysis of stated preference data may be questioned, however, because of the uncertain reliability of elicited information from hypothetical scenarios as the context and format of the hypothetical setting can greatly affect consumer responses. Ben-Akiva et al. (1994) and Carlsson and Martinsson (2001) suggest that the validity and stability of choice model estimations depends on the clarity of the questionnaire and the setting of the experiment. It is important that researchers pay attention to response format, question phrasing, and information provided to the respondent, in order to avoid potential biases.

1.2.4 Contingent Valuation Method vs. Conjoint Analysis

Among the stated preference approaches, the contingent valuation method (CVM) has been frequently applied to value non-market goods such as recreation, wildlife, or environmental quality (Haab and McConnell, 2002). The name contingent valuation is derived from the nature of the method, in which responses from individuals are contingent upon the occurrence of a hypothetical situation (Garrod and Willis, 1999). CVM involves the use of a survey instrument to elicit how respondents are willing to trade-off between a non-market good and money income in a hypothetical market. The value of a non-market good can be inferred from the marginal rate of substitution between income and the good. CVM has also been applied in food safety studies, particularly to assess how much consumers are willing to pay to reduce or avoid a particular risk (Buzby, Skees, Ready, 1995; Hensen, 1996; Kuchler and Golan, 1999).

Another method that follows the stated preference approach is conjoint analysis. It can also be called an attribute-based model, functional measurement, or trade-off analysis, and is based on the random utility framework. It is a method that estimates the structure of consumer's preferences given his/her overall evaluation of a set of attributes that are pre-specified (Green and Srinivasan, 1978). Respondents are presented a set of alternatives characterized by different levels of attributes and prices. By observing consumer responses to different alternatives, researchers can estimate preferences for each attribute of the product (Habb and McConnell, 2002).

Although both CVM and conjoint analysis are based on the stated preference approach, these two methods are different in certain aspects. Whereas CVM focuses on a precise scenario and attempts to gather information about each respondents' choice regarding that particular scenario, conjoint analysis attempts to understand the respondent's preferences over the attributes of the overall scenario, rather than any specific attribute. Ryan (2004) compared WTP estimates generated from a dichotomous choice CVM and conjoint analysis, using the same subject group and found that welfare estimates were not significantly different, using the two methods. Thus, conjoint analysis can be used as an alternative or complement to CVM in order to elicit individuals' willingness to pay.

Alpizar, Carlsson, and Martinsson (2003) and Carlsson and Martinsson (2001), however, report that, in recent years, researchers have chosen conjoint analysis over CVM for several reasons, including the reduction of some of the potential biases of CVM, more information from each respondent compared to CVM, and the possibility of testing

for internal consistency. Adamowicz et al. (1998) showed that conjoint analysis provides a richer description of the attribute trade-offs that individuals are willing to make and results in a smaller variance for welfare values than CVM.

1.2.5 Various Techniques in Conjoint Analysis

Conjoint analysis is a study of individual evaluations of a designed set of multi-attribute alternatives. It has been suggested that this method reflects consumers' decision making process in actual purchase situations (Halbrendt, Wirth, and Vaughn, 1991; Kupiec and Revell, 2001). Consumers are presented with a range of product alternatives with different sets of attributes; then are asked to rank the scenarios, rate the scenario on a cardinal scale, or choose the preferred scenario. The measure of importance of product attributes can be derived from the range of the part-worth over the levels of those attributes (Green and Srinivasan, 1978; Manalo and Gempesaw, 1997). It can be used to estimate trade-off ratios among attributes and predict future market demand, either for existing products or services in conjunction with changes in attributes or for an entirely new product or service (Ben-Akiva et al., 1994; Louviere, 1991).

Conjoint analysis can be conducted using different approaches based on response modes or data collection, including judgment data (i.e., rating and ranking conjoint) and choice data (i.e., choice experiment) (Louviere, 1988). Judgment data is an evaluative ranking or rating of a set of multi-attribute alternatives obtained from individuals. Choice data identify one and only one of a set of alternatives as the highest or best within a fixed set of resources. Judgment data may not contain information about choice behavior and

may not satisfy various assumptions necessary to forecast choice behavior. Different conjoint approaches such as rating, ranking, or choice experiments, share many aspects such as the estimation of utility functions and the scaling of part-worth utilities. Nevertheless, choice experiments differ from rating or ranking conjoint analysis in terms of the underlying behavioral and statistical theory, experimental design, and application method (Harrison, Oxayan, and Meyers, 1998; Louviere, Fox, and Moore, 1993).

Rating and ranking conjoint approaches have been commonly used in marketing and economics studies to identify the parameters (part-worth utilities) of additive utility models for individuals. Halbrendt, Wirth, and Vaughn (1991) applied a rating conjoint approach to analyze purchase preferences for mid-Atlantic seafood. Manalo and Gempesaw (1997) asked respondents to rank different oyster alternatives with various attributes such as source, price, and inspection information. Harrison, Oxayan, and Meyers (1998) used the ranking conjoint method to examine consumer preferences over price, form, and flavor attributes of underutilized small crawfish. Holland and Wessells (1998) determined the average importance and value of three attributes (seafood inspection, production methods, and price) for fresh salmon, based on the ranking approach. Kupiec and Revell (2001) applied ranking conjoint analysis to examine the nature of consumer judgments about product quality for farmhouse Cheddar cheeses based on various product attributes including usage, appearance, flavor, and price.

The choice experiment is another type of conjoint analysis that can be used to predict consumer choices. Louviere and Woodworth (1983) integrated concepts from conjoint analysis and discrete choice theory and developed the choice experiment

approach that enables researchers to simultaneously study the choice process and attribute trade-off or evaluation process. This technique requires experimental designs to place choice objects into sets. Through stated preferences, the choice experiment allows consumers to make decisions about products based on several attributes (Lusk and Fox, 2000). The choice experiment is consistent with random utility theory and Lancaster's theory of consumer demand. Individual choice experiment questions are typically framed in a manner that closely resembles consumer purchase decisions in typical shopping experiences (Louviere, 1988; Louviere, Hensher, and Swait, 2000).

Previous studies have shown that response formats affect parameter estimates in conjoint analysis. Ben-Akiva, Morikawa, and Shiroishi (1991) investigated the reliability of stated preference ranking data and reported significant differences among choice models for different ranks and potentially significant biases in simple pooling of ranking data. Boyle et al. (2001) used a split-sample design to evaluate the convergent validity of three response formats (rating, ranking, and a choice question) used in conjoint analysis experiments. If respondent preferences are transitive across conjoint response formats, then ranking data should be recoverable from rating data and choose-one preferences should be recoverable from rating or ranking data. They found that three response formats generate different statistical information regarding preferences and thus the convergent validity of three response formats was not established.

Among the three formats, it is suggested that the choice experiment results in a better understanding of the consumer decision making process because it simulates real choice environments more closely while imposing no order or metric assumption on the

response data. Instead of asking subjects to rate or rank a single set of alternatives, this method provides subjects with different sets of alternatives and asks them to choose among the options or allocate resources among alternatives in each set. People may rate or rank a group of alternatives but never actually choose any of them, given their budget constraint (Adamowicz et al., 1998; Haaijer, Kamakura, and Wedel, 2001; Hanley, Wright, and Adamowicz, 1998).

1.2.6 Applications of Choice Experiments

The choice experiment technique has become popular in the marketing, economics, transportation, and psychology literatures in recent years. Adamowicz et al. (1998) applied a choice experiment, through a series of questions with more than two alternatives, to estimate individual preferences over attributes of an environmental issue, including mountain caribou population, wilderness area, recreation restrictions, forest industry employment, and changes to provincial income tax. Hanley, Wright, and Adamowicz (1998) used a choice experiment to examine public preferences for alternative forest landscapes. Hensher (1991) used a discrete choice model to identify community choice between alternative traffic management schemes. Hearne and Salinas (2002) applied a choice experiment to analyze preferences of national and international tourists in relation to the development of the Barva Volcano Area in Costa Rica. Massimiliano (2003) analyzed stated choices over hypothetical incremental changes in museum attributes.

The application of choice experiments has also extended to agribusiness research, as firms are increasingly interested in producing and selling differentiated goods and services with values not currently established in well-functioning markets. Lusk and Fox (2000) used consumers stated preferences through a choice experiment to examine the importance of different product attributes including price, marbling, tenderness, use of growth hormones, and use of GM feed in US consumer beef steak purchasing decisions. Hearne and Volcan (2002) used a choice experiment to elicit Costa Rican consumer preferences for different attributes of organic and conventional vegetables, including label, appearance, size, and price, in a hypothetical market. Several studies have used this technique to examine consumer valuation of genetically modified (GM) products. Burton and Pearse (2002) applied a choice modeling approach to identify consumer preferences for various hypothetical forms of genetic modifications in beer made from barley (conventional vs. GM) and yeast (conventional vs. GM) with different prices. Burton et al. (2001) and James and Burton (2003) use choice modeling to examine conditions under which British and Australian consumers, respectively, are willing to purchase GM foods.

Currently, only a few studies have looked at consumer valuation for functional food. West et al. (2002) characterized consumers' attitudes, beliefs, knowledge, and willingness to pay for functional food, using a phone survey of approximately 1,000 Canadian households. They found that consumers believe in a strong relationship between food choice and disease prevention and consumers are willing to pay a price premium for food that offers a health benefit such as anti-cancer. Using the same dataset, Larue et al. (2004) reported that many consumers are not willing to pay more for GM and

organic foods regardless of the presence of functional health properties. It still remains a question, however, how preferences for different types of foods vary across demographic and individual groups. Further studies are required to better understand consumer needs and attitudes, price-sensitivity issue, and individual preferences for these products.

1.2.7 Fundamentals of Choice Experiments

A choice experiment approach is a structured method of data generation that relies on designed choice tasks to help reveal factors influencing choices (Hanley, Wright, and Adamowicz, 1998; Huber and Zwerina, 1996; Louviere, Hensher, and Swait, 2000). It involves the use of experimental design to construct choice sets. Correct specification of choice sets from which an individual selects is critical to the success of a choice experiment (Blamey, Louviere, and Bennett, 2001). Several factors that should be considered in designing choice sets include attribute and level selection, experimental design, and inclusion of an opt-out option (Alpizar, Carlsson, and Martinsson, 2003; Mazzotta and Opaluch, 1995). These factors are discussed in the following sections.

1.2.7.1 Attribute and Level Selection

Choice experiments can provide valuable information regarding how consumers may choose if they are informed about attributed and associated benefits. Choice sets typically contain what researchers believe to constitute a minimal set of choice alternatives relevant to the population of consumers. Numbers of alternatives and attributes are varied across empirical applications, but most studies have used three

alternatives and five or six attributes. For example, Burton et al. (2001) examined consumer attitudes to GM foods using a choice experiment. Their choice sets included five attributes (i.e., level of weekly food bill, form of production technology used, level of chemical use, structure of food system, and food health risk) and three alternatives. Mazzotta and Opaluch (1995) explored the relationship between the cognitive ability of decision makers and the difficulty of decisions and suggested that the inclusion of more than five attributes may lead to a severe detriment of the quality of data collected due to task complexity.

Attributes included in choice experiment studies should appropriately reflect the competitive environment of alternatives available and be relevant to consumers and/or decision makers (Blamey, Louviere, and Bennett, 2001). The scenarios should also be reasonably realistic. As the values increasingly diverge from individuals' experiences or from what appear plausible, stated preference responses can be expected to become less reliable (Fowkes and Wardman, 1988). A series of focus group or other qualitative studies can be used to obtain information about relevant attributes and to simplify the task of making selections from a series of choice sets (Alpizar, Carlsson, and Martinsson, 2003). It is also important to ensure that individuals interpret information and questions in the way intended by researchers. Failure to understand that choices may have been framed by respondents in a different context can lead to misleading results (Blamey et al., 2000; Rolfe and Bennett, 2001).

The size of choice sets (the number of alternatives in choice sets and the number of choice sets assigned to each respondent) is influenced by the nature of research

problem, experimental design, and limits to human cognition. It has proven difficult to design practical choice experiments involving more than six choice alternatives (Batsell and Louviere, 1991; Swait and Adamowicz, 2001). Hensher, Stopher, and Louviere (2001) investigated the effects of different numbers of choice sets on response variability and model parameters. They found that the design of 16 choice sets for each respondent seems to be sufficient especially with large sample sizes and that there may be fatigue effects with a design of more than 32 choice sets.

1.2.7.2 Experimental Design – Optimal Design/ Efficiency

Experimental design is concerned with how to create choice sets in an efficient way, which involves how to combine attribute levels into profiles of alternatives and how to place such profiles into choice sets (Alpizar, Carlsson and Martinsson, 2003; Batsell and Louviere, 1991). A choice design is efficient when the parameters of the choice model are estimated with maximum precision and have the smallest variance (Zwerina, Huber, and Kuhfeld, 2004). Efficiency of a choice design will be such that each attribute level occurs equally often (or at least nearly equally often) for each attribute of each alternative across all choice sets and that each attribute is independent of one another (Kuhfeld, 2004).

A traditional approach to designing a choice experiment is factorial design. A full factorial design, which consists of all possible combinations of factor levels, allows all main effects and interaction effects to be estimable and uncorrelated. However, it is too cost-prohibitive and tedious to have respondents consider all possible combinations

(Kuhfeld, 2004). Researchers often use a fractional-factorial design, which has fewer runs than a full factorial design, although some effects will become confounded when they are not distinguishable from each other. A special type of a fractional factorial design is an orthogonal array, in which all estimable effects are uncorrelated. The orthogonal array is both balanced and orthogonal, and hence 100% efficient and optimal. Several studies have used an orthogonal array in designing choice experiments (Adamowicz et al., 1998; Burton et al., 2001; Green, 1974; Halbrendt, Wirth, and Vaughn, 1991; Hearne and Volcan, 2002; Kupiec and Revell, 2001; Lazari and Anderson, 1994; Louviere and Woodworth, 1983).

Orthogonal arrays are however restricted to certain numbers of attributes and choice sets and available for only relatively small numbers of very specific problems. There are also situations when orthogonal arrays are not practical. For example, not all combinations of factor levels are feasible or make sense. Some researchers may attempt to modify numbers of attributes and attribute levels in order to fit some known orthogonal arrays; however, this approach is undesirable and inefficient.

Given the limitations of orthogonal arrays, a new experiment design technique, called an optimal design, has been developed and applied in several choice experiment studies (Huber and Zwerina, 1996; Zwerina, 1997). This optimal design can be characterized by four properties, including level balance, orthogonality, minimal level overlap, and utility balance. First, level balance requires that the levels of each attribute occur with equal frequency. For example, each level of a three-level attribute should occur in precisely one-third of the cases. Second, orthogonality requires that the level of

each attribute vary independently of one another. Third, minimal level overlap requires that the probability that an attribute level repeats itself in each choice set should be as small as possible. Lastly, utility balance requires that the utilities of each alternative within choice sets have the same value or are as close as possible. These properties are useful in understanding what makes a choice design optimal and efficient. Improving one of these properties, holding others constant, improves design efficiency.

Kuhfeld, Tobias, and Garratt (1994) suggest that the goal of the optimal design is to minimize the variance and covariance of parameter estimates, while maintaining as many of the optimal design properties as possible. In some instances, it may not be feasible to create a design that satisfies all four principles. For example, level balance and orthogonality are often conflicted so that one property cannot be satisfied without offsetting the other. Zwerina, Huber, and Kuhfeld (2004) outlined a general strategy for the computerized construction of efficient choice design. This method optimizes the correct criterion of minimizing estimation error rather than following linear design principles. This method also generates choice designs that accommodate any anticipated parameter vector and can accommodate virtually any level of model complexity. This study will follow Zwerina, Huber, and Kuhfeld's approach to derive optimal choice sets.

1.2.7.3 Opt-Out or No-Choice Option

An opt-out option is an alternative that does not vary from one choice set to another. There are two main formats for an opt-out option, "no purchase" and "my current brand". A no-purchase format is appropriate when including it enhances task

realism or when a research objective is to measure market penetration. A current brand format is appropriate when the research objective is to determine which attributes a new product must have to induce consumers to switch from their current brand (Banzhaf, Johnson, and Mathews, 2001; Batsell and Louviere, 1991).

The inclusion of an opt-out alternative allows respondents to indicate that under the circumstances described in the choice set, they would prefer not to choose or purchase any of the alternatives shown. Including this constant option in the choice sets avoids forced choices. This makes the choice task more realistic as, while shopping, consumers can choose not to purchase the good at all or choose to purchase their usual brand (Lusk and Schroeder, 2004). Restricting respondents to hypothetical alternatives may change the salience of attributes relative to a real market choice; such forced choices will result in biased estimates of demand, and hence willingness to pay (Carson et al., 1994).

Blamey, Louviere, and Bennett (2001) discuss reasons that respondents choose an opt-out option. Respondents may do so when none of the alternatives appears to be attractive, when they expect to find better alternatives by continuing to search, or when they are uncertain about the range of potential alternatives. In these cases, including an opt-out option will reduce the potential problem of forced choices. Alternatively, respondents may choose an opt-out option to avoid difficult selection tasks. It is important to assess whether respondents choose this option because it is a higher utility alternative or because they want to avoid difficult choices (Haaijer, Kamakura, and Wedel, 2001).

The decision whether or not to include this opt-out option or a base case scenario should be guided by whether or not the current situation and/or non-participation is a relevant alternative (Alpizar, Carlsson, and Martinsson, 2003). In this study, the opt-out option was included in the choice set to simulate a real shopping environment where consumers can choose not to buy any products. Data were analyzed to examine the characteristics of respondents who chose the opt-out option and to determine whether respondents followed the same decision making process between choosing any product alternatives and choosing the opt-out option.

1.3 THEORETICAL FRAMEWORK

A discrete choice model is chosen to examine how consumers value functional foods and make trade-offs among product attributes. This model allows the linkage of individual consumer demand to underlying attributes of the product of interest (Anderson, De Palma, and Thisse, 1989; Mojduszka, Caswell, and Harris, 2001). It provides an ideal framework for describing demands for differentiated products, since it deals explicitly with a population of heterogeneous consumers who make mutually exclusive choices from a set of substitutable goods. The model starts from the underlying assumption that each consumer chooses a single option that yields the greatest utility (Ben-Akiva and Lerman, 1993; McFadden, 2001; Train, 2003). Utility is only known by the consumers and cannot be observed directly by firms or researchers. Firms only observe certain attributes of alternatives available to consumers and some consumer characteristics, other aspects that may affect consumer choices cannot be observed. If firms make assumptions

about the distribution from which the taste parameters are drawn, they will be able to forecast demand by modeling the probability of purchase (Anderson, De Palma, and Thise, 1992).

The random utility model represents the fundamental approach for the econometric analysis of consumer choice within a discrete choice multi-dimensional environment. It is based on the hypothesis that individuals make choices according to attributes of alternatives along with some degree of randomness (Adamowicz, Louviere, and Williams, 1994; Massimiliano, 2003; McFadden, 1986; 2001). The model suggests that consumer's utility is represented by two components, a deterministic and a random component. The deterministic component is a function of observable product attributes, following Lancaster's characteristic theory that recognized how consumers select among different food attributes when choosing diets (Lancaster, 1966). The deterministic portion of consumer's utility can be modeled as a function of these product attributes. Consumers assign a value to each product attribute, sum these values for each product, and select the product that has the highest total value. The random component captures variations in choices due to within- and between-individual variance, omitted variables, and measurement errors (Bates, 1988). Different discrete choice models can be obtained from various specifications and assumptions about the distribution of the unobserved portion of utility (Batsell and Louviere, 1991). Specific models (i.e., a conditional logit model and a random parameter logit model) that are applied in this study will be discussed in the econometric model section.

1.4 METHODOLOGY

1.4.1 Hypothetical Product and Attributes

This study used a still hypothetical functional food product - tomato juice containing soy protein. This product is in a research and development phase by a research team at the Ohio State University. Tomato and soy products, respectively, contain lycopene and isoflavones. It has been shown that these products, independently, may help prevent the risk of several diseases including prostate cancer and heart disease (Nguyen and Schwartz, 1999; Sirtori and Lovati, 2001). Giovannucci et al. (2002) conducted a longitudinal survey study during 1988 to 1998 with 51,529 U.S. male health professionals aged 40-75 years and reported that frequent consumption of tomato products is associated with a lower risk of prostate cancer. Brouns (2002) indicated the link between the consumption of soy isoflavones and the prevention of several diseases, including heart disease, type II diabetes, osteoporosis, and certain cancers. It is expected that the consumption of tomato products containing soy should help promote good health and/or reduce the risk of having these diseases, perhaps in a synergistic manner.

As suggested by Alpizar, Carlsson, and Martinsson (2003) and Fowkes and Wardman (1988), an attribute-screening study was conducted to obtain information about relevant attributes to be included in the choice experiment. Three hundred and twenty six undergraduate students with a business major participated in this study. The concept of the tomato juice containing soy was explained. Participants were asked to describe attributes that were important to them through structured questions. Over 98 percent suggested that taste was the most important attribute, more than 70 percent considered

health benefits and price when deciding whether to purchase this product. Approximately 30 percent suggested that organic ingredients and naturalness were important attributes for this new product. The participants were also asked how much they were willing to pay for this new functional food if it were available in a local supermarket given that the price of conventional juice products was $3.00 per pack (6 cans, 8 fl. oz. /can). The average willingness to pay estimate was $3.50; approximately 20 percent were willing to pay between $3.00 and $4.00, 25 percent were willing to pay more than $4.00.

From the results of the attribute-screening study, four characteristics were included to assess their relative importance (i.e., health benefits, organic ingredients, source of nutrients, and price). It is interesting to examine how consumers value and make trade-offs among these attributes, particularly when the price of this new product is likely to be higher than conventional tomato juice.

Note that even though product taste was perceived as the most important attribute consumers consider when making choice decisions, it is difficult to vary taste across product alternatives in a hypothetical choice set due to its subjective perception. Thus, taste is not included as one of product attributes in this study; it reflects the situation when consumers encounter various new products that they have never tried. Their purchase decision relies on other attributes of the products and their price.

Various attributes included in this study are shown in table 1.1. The first attribute is the health benefit. Even though the existing literature shows that consumers value and are willing to pay premium prices for health benefits (Maynard and Franklin, 2003; Poulsen, 1999), no study to our knowledge has compared consumer valuation between

single and multiple health benefits of functional food. This is an important issue as the new generation of functional foods aims to offer multiple health benefits to consumers (IFIC, 2004; Sloan, 2002). Thus, three levels of the "health benefits" were included and compared – no health benefit, single health benefit (i.e., rich in nutrients that may reduce the risk of prostate cancer), and multiple health benefit (i.e., rich in nutrients that may reduce the risk of prostate cancer and heart disease).

Several studies show that consumers relate organic and/or natural foods to functional foods (Ohr, 2002; Sloan, 2004; Squires, Juric, and Cornwell; 2001). Many consumers perceived that organic and/or natural foods are healthier than conventional foods and thus are willing to pay premium prices for these products. Two levels were included for these two attributes. For "organic", this study compared food that was *organically* produced (i.e., no use of synthetic chemicals such as pesticides and fertilizers) and food that was *conventionally* produced (i.e., it may involve some pesticides or fertilizers when it is grown, handled, and/or processed). For "source of nutrient", this study compared nutrients that are from *natural sources* (e.g., use of a special type of tomato that has a high level of lycopene) and nutrients that are *fortified* (e.g., additional lycopene is enriched in tomato juice). Four levels of price are included ranging from $3.00 to $4.50.

1.4.2 Choice Experiment Design

Since the functional food used in this study is a new venture, no secondary data from actual markets is available to estimate consumer demand for this product. A choice

experiment is applied to examine trade-offs between food quality attributes and to estimate market share for this novel product. This study followed the computerized construction of efficient choice design, suggested by Zwerina, Huber, and Kuhfeld (2004). Four alternatives, including an opt-out option, were selected for each choice set. The first alternative is called a *conventional tomato juice*. The second alternative is called *tomato juice plus*, which offers an additional health benefit from higher levels of lycopene. The third alternative is called *tomato juice plus with soy*, which offers further (potentially synergistic) health benefits of lycopene and isoflavones. The last alternative is the opt-out option (i.e., respondents can choose none of these alternatives).

With four attributes (3, 2, 2, and 4 levels, respectively), there were 48 combinations of the product. An orthogonal array (i.e., 100 percent efficient design) is available for 24 and 48 choice sets. However, asking respondents to complete 24 or 48 choice sets was seen to be too intensive of a task likely to result in consumer fatigue (Hensher, Stopher, and Louviere, 2001). Further, there was a constraint in terms of number of choice sets that could be included in the mail survey instrument. Thus, a total of eight choice sets were selected. Considering these attribute levels and constraints on the number of choice sets, an optimal design was derived with a goal of obtaining an efficient choice sets with minimum variance among parameter estimates – achieved by applying a SAS Macro Program (Kuhfeld, 2004; Kuhfeld, Tobias, and Garratt, 1994).

The optimal design of choice sets is shown in table 1.2. It is noted that some of alternatives may not be realistic (i.e., the conventional product with no health benefit and fortified nutrient). Louviere (2001) suggested that such “implausible” alternatives (i.e.,

alternatives containing levels of attributes that may be counter-intuitive to most respondents) should still be included in the choice set in order to satisfy properties of the optimal design and to confirm whether respondents carefully assess choice tasks.

These eight choice sets were randomly assigned into two versions. Each version has four choice sets and every respondent received either one of the two versions. A round of expert review, a focus group, and a pretest were employed to evaluate and review each choice design (Alpizar, Carlsson, and Martinsson, 2003; Blamey et al., 2000; Rolfe and Bennett, 2001). First, the draft of the choice set design was reviewed by a team of experts from various disciplines, including physicians, nutritionists, and food scientists, who were affiliated with the overall project. Following this, a focus group, using eight graduate students as participants, was conducted to clarify and simplify instructions, question wording, and format of choice questions to ensure all texts could be easily understood and followed by the general public. Finally, the revised design was pre-tested using 68 undergraduate students. Results suggested that respondents were able to understand and follow the instructions and complete the choice tasks, see table 1.3. The final version of the choice set design is shown in APPENDIX A.

1.4.3 Econometric Models

Following Adamowicz et al. (1998), Ben-Akiva and Lerman (1993), and McFaddedn (1986), the n^{th} consumer is faced with discrete choices between a conventional food and functional foods, given various attributes presented in each choice set. The overall utility derived from alternative j is represented as

$$U_{nj} = V_{nj} + \varepsilon_{nj} \qquad j = \text{alternative 1, 2, 3, and 4} \qquad (1.1)$$

where U_{nj} is the n^{th} consumer's utility when choosing alternative j; V_{nj} is the deterministic component of the utility function based on product attributes for alternative j; ε_{nj} is the stochastic component of the utility function.

The discrete choice model provides a conceptual framework for modeling choice behavior. The n^{th} consumer will choose alternative j if $U_{nj} > U_{nl}$ for all $l \neq j$. The probability that the n^{th} consumer chooses alternative j is given by

$$L_{nj} = \text{prob}\{j \text{ is chosen}\} = \text{prob}\{V_{nj} + \varepsilon_{nj} \geq V_{nl} + \varepsilon_{nl} \text{ ; for all } l \in C_n\} \qquad (1.2)$$

where C_n is the set of all possible alternatives for the n^{th} consumer.

Assume that the observable utility component (V_{nj}) is a linear function of perceived product attributes (x) and there are k attributes for each alternative, then the functional form of this utility component becomes

$$V_{nj} = \sum_{k=1}^{K} \beta_k x_{njk} = \beta' X_{njk} \qquad k = \text{attribute 1, 2, 3, and 4} \qquad (1.3)$$

where x_{njk} is the k^{th} attribute value for the j^{th} alternative for the n^{th} consumer and β_k represents the coefficient to be estimated which represents the value the consumer places on that particular attribute.

McFadden (1974) applied a conditional logit model to explore such discrete choice decisions, assuming the error term to be independent among choice alternatives and individuals with a type I extreme value distribution. This model estimates the effect of choice-specific variables (i.e., product attributes are explanatory variables) on the probability of choosing a particular alternative (dependent variable). The probability that individual *n* chooses alternative *j* becomes

$$L_{nj} = \frac{\exp(\beta' X_{njk})}{\sum_{l} \exp(\beta' x_{nlk})} \tag{1.4}$$

Parameters in this model can be estimated using numerical methods such as Newton's or the maximum likelihood estimate (Batsell and Louviere, 1991; Greene, 2000).

The conditional logit model is a standard multinomial logit model that analyzes discrete choice data and it can be derived from utility maximization. However, this model does not accommodate preference heterogeneity among consumers. The coefficients of variables that enter the model are assumed to be the same for all people, implying that different people with the same observed characteristics have the same values (i.e., attribute valuation) for each factor entering the model. It also imposes a restrictive assumption, independence of irrelevant alternatives (IIA) (Ben-Akiva and Lerman, 1993; McFadden 1986; Haaijer and Wedel, 2001). The IIA assumption states that the ratio of the probability for any two alternatives is independent of the existence and attributes of any other alternatives or it does not depend on irrelevant alternatives. A change in the

attribute of one alternative changes the probabilities of the other alternatives proportionately such that the ratios of probabilities remain the same. In other words, it is assumed that the errors are independently distributed across alternatives. Furthermore, the conditional logit model assumes that unobserved factors are independent in situations with repeated choices for each decision maker. This substitution pattern can be unrealistic in many settings (Brownstone and Train, 1999; Train, 1999).

A mixed logit model, also called a random-parameter logit, is a generalization of the standard multinomial logit model that does not exhibit the restrictive IIA property and explicitly accounts for correlation in unobserved utility over repeated choices by each respondent. It generalizes the conditional logit model by allowing the parameter associated with each observed variable to vary across consumers (Revelt and Train, 1998; Train, 1998). The mixed logit model is a highly flexible and relaxes the three limitations of conditional logit models by allowing for random preferences, unrestricted substitution patterns, and correlation in unobserved factors over time (Train, 2003).

Consumer heterogeneity is an important issue in food marketing, particularly when firms focus on specialized niche products for which target consumers' preferences are quite different from the aggregate market. It is important to relax the IIA assumption because opinions about health properties, organic and GM food products are expected to vary greatly among respondents (Larue et al., 2004). Using a mixed logit model, the marginal utilities for attributes can vary across respondents following specified distributions; thus it is possible to identify how preferences for various attributes vary in a population (Lusk and Hudson, 2004).

The specification for a mixed logit model is similar to a conditional logit model, except that the coefficients are varied across the population rather than being fixed (Train, 1998). In the mixed logit model, the coefficient vector for each respondent (β_n) can be expressed as the sum of the population mean (b) and individual deviation (η_n).

$$\beta_n = b + \eta_n \tag{1.5}$$

Thus, the utility function becomes

$$U_{nj} = b' X_{nj} + \eta_n' X_{nj} + \varepsilon_{nj} \tag{1.6}$$

where the unobserved portion of utility is $\eta_n' X_{nj} + \varepsilon_{nj}$, which is correlated over alternatives; thus it does not impose the IIA property.

It is assumed that preferences vary across the population of concern following a density denoted $f(\beta|\theta)$, where θ are the parameters of the distribution (e.g., the mean (b) and standard deviation (η_n) of various attributes in the population). Since researchers do not observe actual preferences of individuals, the probability assigned to an individual is the integral of L_{nj} over all possible values β of weighted by the density of β. In other words, the mixed logit probability is a weighted average of the logit formula evaluated at different values of the parameters, with the weight given by the density function (Train, 2003). The mixed logit probability for the individual's choice is

$$Q_{nj}(\theta) = \int L_{nj}(\beta) f(\beta|\theta) d\beta \quad (1.7)$$

When each respondent is required to complete multiple choice sets, it is likely that decisions made by each respondent will be correlated over choice sets; such correlations can be explicitly modeled in the mixed logit model. To model an individual's sequence of choices, let *j(n,t)* denote the alternative that individual *n* selects from the t^{th} choice set. If β is fixed, the probability of individual *n*'s observed sequence of choices is

$$S_n(\beta) = \prod_t L_{nj(n,t)t}(\beta) \quad (1.8)$$

Because β_n is assumed to be a random parameter varying across respondents, the mixed logit probability can be derived by integrating the probability over all values of β.

$$P_n(\theta) = \int S_n(\beta) f(\beta \mid \theta) d\beta \quad (1.9)$$

The goal is to estimate the population parameters (θ) that describe the distribution of individual parameters which represent individual preferences for each attribute. The log likelihood function with a sequence of choice sets is

$$LL(\theta) = \sum_n \ln P_n(\theta) \quad (1.10)$$

With random parameters, the conventional likelihood estimation cannot be used because the probability integration (i.e., equation 1.9) cannot be solved analytically. This problem nonetheless can be solved by approximating the probability through simulation and then maximizing the simulated log-likelihood function.

McFadden and Train (2000) show that any random utility model can be approximated to any degree of accuracy by a mixed logit model with an appropriate choice of variables and mixing distribution. $P_n(\theta)$ can be approximated by a summation over randomly chosen values of β. For a given value of θ, the value of β is drawn from its normal distribution. Using this draw of β, $S_n(\beta)$ is calculated. Let R be the number of draws or repetitions of estimation β, then $SP_n(\theta)$ is the simulated probability of individual n's sequence of choices and it is an unbiased estimator of $P_n(\theta)$.

$$SP_n(\theta) = (1/R) \sum_{r=1,2,...,R} S_n\left(\beta^{r|\theta}\right) \tag{1.11}$$

where $\beta^{r|\theta}$ is the r^{th} draw from $f(\beta|\theta)$.

The number of draws required to secure a stable set of parameter estimates depends on several factors. As model specification becomes more complex in terms of the number of random parameters, the treatment of preference heterogeneity around the mean, as well as the inclusion of correlations among attributes and alternatives, so the number of required draws increases. It is suggested that models are estimated over a range of draws (e.g., 25, 50, 100, 250, and 500) in order to confirm the stability/precision of results (Hensher and Greene, 2003).

The simulated log-likelihood function is constructed as

$$SLL(\theta) = \sum_{n} \ln (SP_n (\theta)) \qquad (1.12)$$

The estimated parameters are those that maximize this simulated log-likelihood function. The simulation provides a numerical approximation to integrals, with different methods offering different properties and being applicable to various types of integrands. In the case of the mixed logit model, the partial simulation/partial closed form expression is used to estimate the probability of the outcome, which is an integral of an indicator for the behavioral outcome over all possible values of the unobserved factors (Train, 2003).

In this study, both parameters (β) from a conditional logit model (equation 1.4) and parameters (θ) from a mixed logit model (equation 1.12) are estimated and compared, using the NLOGIT 3.0 program.

The random parameters provide a rich array of preference information. They define the degree of preference heterogeneity through the standard deviation of the parameters. The highly significant estimates of the standard deviations of coefficients imply that parameters do indeed vary in the population. The goodness-of-fit of the model can be measured by a likelihood ratio index, see equation 1.13. This measure is a summary statistic indicating the accuracy with which a model approximates the observed data (Maddala, 1983). A likelihood ratio index close to 1 indicates strong explanatory power of the model.

$$Likelihood\ \ Ratio\ \ Index = 1 - \frac{SLL(\theta)}{SLL(\theta = 0)} \tag{1.13}$$

where $SSL(\theta)$ is the simulated likelihood function of the estimated parameter and $SSL(\theta=0)$ is the simulated likelihood function when coefficients equal zero.

Parameter estimates obtained from a mixed logit model should not be interpreted as stand-alone parameters but must be assessed jointly with other linked parameter estimates (Hensher and Greene, 2003). Indeed, they do not have a direct interpretation, other than their sign or statistical significance. However, the parameters can be combined to identify monetary values associated with changes in each attribute level. A willingness to pay estimate can be derived by determining the price difference necessary to invoke a trade-off between two alternatives

$$p_k = -\frac{\beta_k}{\beta_{price}} \tag{1.14}$$

p_k is the part-worth associated with a unit increase in the attribute k. It can be interpreted as the maximum amount that the respondent would be willing to pay in order to receive/avoid that particular attribute of the product characteristics (Burton et al., 2001; James and Burton, 2003; Lusk and Schroeder, 2004).

The estimates of mean coefficient and standard deviation of coefficient also provide information on the share of the population that place a positive value and negative value on each product attribute (Larue et al, 2004).

$$\%\, Share\ \ of\ \ Positive\ Valuation\ = 1 - \int_{-\infty}^{0} \phi(x)\ d\,x \tag{1.15}$$

$$\%\, Share\ \ of\ \ Negative\ Valuation\ = \int_{-\infty}^{0} \phi(x)\ d\,x \tag{1.16}$$

where x is a random parameter and $\phi(x)$ is the probability density function of x.

To investigate how choice responses vary across respondent characteristics, Swait and Louviere (1993) outlined a test to examine whether coefficients between subsets of populations are different, using the likelihood ratio test (see below). The data can be divided into different subgroups, for example based on demographic and individual characteristics; and parameters estimated and compared for each subgroup. Hearne and Salinas (2002) and Massimiliano (2003) used this approach to determine heterogeneity in taste and preference across demographic groups.

$$-2\,[Ln\,(pooled\ \ data) - Ln\,(subgroup\ 1) - Ln\,(subgroup\ 2)] \sim \chi 2(d.f.) \tag{1.17}$$

where the degree of freedom (*d.f.*) equals numbers of parameter estimates for each group.

1.4.4 Data Collection

A mail survey of nearly 3,500 randomly selected Ohio households was conducted in June 2004. This instrument was part of a broad Ohio Survey of Food, Agriculture, and Environmental Project collaboratively conducted by research teams in the Department of Human and Community Resource Development (HCRD) and the Department of Agricultural, Environmental, and Development Economics (AEDE), at the Ohio State University. This project was jointly funded by HCRD, the Ohio Agricultural Research and Development Center (OARDC), the Initiative for Future Agriculture and Food Systems (IFAFS) group, and the College of Food, Agriculture, and Environmental Sciences.

The purpose of the survey was to assess Ohioans' attitudes and behavior with regard to various issues related to food, agriculture, and the environment. The survey was 10-pages long and it covered several topics, such as attitudes about pets and livestock animals, food and health, food choice decisions, awareness of and experience with Ohio State University extension, and household management and environmental activities, see APPENDIX B. Of interest for this study are measures of food choice decisions, consumer attitudes and behavior toward health and diet, and demographic characteristics.

A sample list was generated by a private vendor, Experian Direct Tech. A sample of 3,500 Ohio households was selected and stratified according to county status to ensure sufficient responses from both rural and urban citizens of the state. The total sample frame includes approximately 7.9 million Ohioans residing in core metropolitan counties (i.e., counties with more than 50,000 residents residing inside the urbanized area), 1.2

million residing in fringe metropolitan counties (i.e., counties with less than 50,000 residents residing inside the urbanized area), and 2.2 million residing in non-metropolitan counties. A map of Ohio counties with different metropolitan status is shown in figure 1.2. The stratification scheme includes two strata. The first stratum consists of 1,750 households who reside in core metropolitan counties. The second stratum consists of 1,750 households who reside in fringe metropolitan and non-metropolitan counties.

Dillman's Tailored Design Method (Dillman, 2000) was used to guide the data collection process. Up to five contacts were made with each respondent, including a pre-notification letter, the initial survey package, a reminder postcard, a replacement survey, and a second reminder postcard, see table 1.4.

Pre-notification letters were sent to each household two weeks before the initial survey was mailed, explaining the purpose of the study and informing the household that they would be receiving a survey in the mail. The initial survey package included a cover letter, two one-dollar bills affixed to the cover letter, and a questionnaire with a business reply envelope. The first reminder postcard was sent approximately two weeks after the initial survey package. A replacement survey was mailed out one week after the reminder postcard and consisted of a letter reiterating the importance of participating in the study and a replacement survey with a business reply envelope. Another reminder postcard was sent to non-respondents three weeks after the replacement survey as a final appeal encouraging them to complete and return the survey. The data collection was completed on September 1, 2004.

Given the sample of 3,500 households and 245 undeliverable surveys, the total response rate was 54.7 percent. Out of the returned surveys (1,781), 77 households did not respond to the choice set questions and are excluded from the data set. The adjusted data set provides information from 1,704 households (52.4% response rate). Demographic and other individual characteristics of respondents are shown in tables 1.5 and 1.6.

To assess the representativeness of the sample, demographic characteristics of survey respondents were compared to 2000 census statistics for Ohio and the US population, see table 1.5. The characteristics of survey respondents are similar to Ohio and US populations in terms of gender, marital status, education, and household income. The sample is somewhat older and included a smaller proportion of African American respondents compared to the statewide population and less Hispanic/ Latino and Asian respondents compared to the US population. Another difference between the sample and more general populations is that a larger proportion of sample respondents reported residing in owner-occupied housing units.

Other individual characteristics measured included attitude and behavior toward health and diet (see table 1.6). Respondents have relatively high self-rated scores on their awareness and interest about healthy foods. Approximately 50 percent of respondents reported a family history with heart disease and cancer. More than half reported that they have never or seldom purchased organic or natural foods, whereas more than 70 percent reported that they have occasionally or frequently purchased foods that provide health-promoting or disease-fighting benefits beyond basic nutrition.

1.5 RESULTS

1.5.1 Choice Decision

Table 1.7 illustrates the percentage of respondents choosing alternatives 1 to 4 for each choice set scenario. It is shown that respondents have different preferences with regard to product attributes. Each alternative in each choice set is chosen by at least 10 percent of respondents. Three hundred and thirty observations (19.4% of total respondents) chose the opt-out option for all four choice sets. It is likely that they consistently selected this alternative without any consideration of the attribute levels being presented. If these observations are included in the dataset, it may violate the explicit assumption of the choice modeling approach that observed choices are conditioned by attribute levels (James and Burton, 2003).

Burton et al. (2001) suggested that respondents who selected “none of these products” for all choice sets should be excluded from modeling. To include them in the analysis and to attempt to explain such decisions on the basis of attribute levels may lead to biased estimates. A Hausman test is applied to examine whether coefficients for the two data sets (i.e., all observations and those excluded opt-out observations) are different. Results lead to the rejection of the hypothesis that there is no systematic difference in coefficients between two datasets, see table 1.8. Results are consistent for both the conditional logit model and the mixed logit model, which implies that respondents who selected “none of these products” alternatives for all choice sets did not follow the same decision process when selecting as other respondents and thus should be excluded from the model.

1.5.2 Comparing Conditional Logit Models and Mixed Logit Models

Table 1.9 shows estimation results from the conditional logit and mixed logit models. Traditionally, the conditional logit model has been applied in discrete choice studies to explain factors that influence choice decisions (McFadden, 1974). This model is quite restricted because it imposes the independence of irrelevant alternatives (IIA) property. The mixed logit model (Revelt and Train, 1998; Train, 1998) is a generalized discrete choice model that allows for heterogeneity in individual preferences and correlations between attributes and choice sets.

The likelihood ratio index is used as a measure of goodness of fit to compare results from the conditional logit and the mixed logit model (Greene, 2000; Revelt and Train, 1998). The index ranges from zero to one, where a higher index score represents a model with better fit. It is shown that the likelihood ratio index increases substantially by allowing parameters to vary (table 1.9). This finding indicates that the explanatory power of the mixed logit model is greater than that of the conditional logit model.

The estimates of the standard deviation of coefficients are all statistically significant at $p = 0.05$, implying that preferences for health benefits, organic ingredients, and naturalness are heterogeneous and vary across individuals. As a result, it is more appropriate to use a mixed logit model with random parameters than a conditional logit model with fixed parameter. The mean coefficients of the random parameters are each statistically significant, except for organic ingredients. This finding implies that the detected interpersonal variation does not cancel out attribute effects by leading to zero means for coefficient estimates for health benefits and naturalness. Positive signs on the

mean coefficients indicate that respondents, on average, place a positive value on that attribute. In other words, despite statistically significant inter-individual differences, there exists significant aggregate effects for key health benefits, and naturalness.

In this model, price is treated as a fixed variable (i.e., homogeneous among respondents) as its effect is expected to negatively and uniformly impact the utility of all respondents (Larue et al., 2004). Results from table 1.10 indicate that price has a negative coefficient estimate, suggesting that respondents prefer a product with a lower price. A dummy variable for the last alternative is included in the model to account for the "none of these products" option (Haaijer, Kamakura, and Wedel, 2003). The negative parameter estimate indicates that this option has a lower overall utility than the base product.

1.5.3 Estimates of Willingness to Pay (WTP) and Valuation Shares

Table 1.10 presents WTP estimates from both the conditional logit and mixed logit models. It is shown that WTP estimates for each product attribute differ across discrete choice models; this indicates that model selection is important and tends to have a significant effect on the implications of parameter estimates. Results from the mixed logit model suggest that, on average, respondents are willing to pay $0.93 more for *single health benefit*, $0.28 more for *multiple health benefits*, and $0.41 more for *naturalness* when the base product is regular tomato juice priced at $3.00 per pack. It is noted that the standard deviations of the WTP estimates are relatively high (i.e., the variation in coefficients is fairly substantial), implying that people tend to respond quite differently and are considerably heterogeneous in preferences and valuations for these attributes.

Even though the mean WTP for *single health benefit* is higher than that for *multiple health benefits*, there are certain groups of respondents who place higher value and are willing to pay more for *multiple health benefits* as shown by higher estimate of standard deviation. Meanwhile, the WTP estimate for *organic* characteristics ranges from -$2.07 to $1.86. It is shown that more than two-thirds of respondents place a positive value on *single health benefit* and *naturalness*, whereas about half of respondents place a positive value on *multiple health benefits* and *organic* characteristics (table 1.10).

1.5.4 Effects of Demographic and Individual Characteristics

To examine the effect of consumer characteristics on choice decisions and consumer preferences, the data is divided into different subgroups based on demographic and other individual information (i.e., gender, age, education, income, family disease history, and food consumption patterns) and then a mixed logit model is estimated for each subgroup, see table 1.11. Using the test outlined by Swait and Louviere (1993), see table 1.12, results lead to the rejection of the hypotheses that each subgroup share the same coefficient estimates, which implies that preference and attribute valuation are heterogeneous and vary across demographic groups. The only exception is the family history of cancer, where parameter estimates are not statistically significant ($p > 0.05$) between respondents whose family members have been diagnosed with cancer and respondents with no family members diagnosed with cancer.

Comparing male and female respondents, all male respondents placed a positive value on *single health benefit*, *multiple health benefits*, and *naturalness,* see table 1.13.

They were a very homogeneous group and they were willing to pay a $0.40 - $0.70 premium for these attributes. However, data reveal that male respondents did not place a positive value for *organic ingredients*. To the contrary, results from female respondents are mixed. More than two-thirds of the female respondents placed a positive value on *single health benefit* and *naturalness* attributes, whereas half placed a positive value on *multiple health benefits* and *organic ingredients*. The range of WTP estimates for females is much broader, which implies that their preferences for these attributes are more heterogeneous. Differences in attribute valuation may be due to the health benefits of this product (i.e., to reduce the risk of prostate cancer) being more relevant to male respondents. However, of those female respondents who responded positively, they were more willing to pay more for such attributes. In addition, results from this study are consistent with previous studies that found female respondents are more concerned with pesticide residues and are more likely to purchase organic or natural produces even if they cost more (Schmidt and Pitman, 1999; Thompson, 1998).

It has been suggested that respondents in different age groups and other social groups have different preferences for many food attributes (for example see Pitman and Reinhardt, 2000; Poulsen, 1999; Schmidt and Pitman, 1999). As can be seen in table 1.14, younger respondents (i.e., less than 35 years old and between 35 and 60 years old) are willing to pay more for *single health benefit*, *multiple health benefits*, and *organic ingredients*, whereas older respondents (i.e., over 60 years old) are willing to pay more for the *naturalness* attribute. The range of WTP estimates is much broader for the older respondents for all food attributes. It is also suggested that more of the younger

respondents placed a positive value on *health benefits* and *organic attributes* than older respondents. Results imply that the concept of food with added health benefits is more accepted by younger respondents. In order to maintain good health and/or prevent the risk of diseases, they were more willing to try food products with new functional attributes. Meanwhile, older respondents are also concerned about their own health and take preventative roles in their food purchase decisions, but they tend to choose products that offer health benefits from natural sources, rather than buying functional food products (Childs, 1999; Gilbert, 1997).

Education level also tends to affect preferences and food selections, see table 1.15. Respondents with higher education levels have a higher percentage of positive valuations and are willing to pay more for these product attributes. Income level also tends to affect preferences and food choice decisions, see table 1.16. Respondents with higher income levels tend to be willing to pay more, although the range of WTP estimates is relatively broad for all income levels. These findings are similar to previous studies that suggest people with higher education and income are more aware of benefits of functional food or organic food and are more willing to pay for these types of foods (Childs and Poryzees, 1997; Schifferstein and Ophuis, 1998; Schmidt and Pitman, 1999).

It is shown that people who are more health conscious and regularly purchase foods from natural or health food stores tend to be a target market for functional foods or organic foods (Gilbert, 2000; Schmidt, 2000; Squires, Juric, and Cornwell, 2001). However, data reveal that the family history of cancer does not affect consumers' choice decisions, whereas family history of heart disease has a negative impact on consumer

valuation of product attributes, see table 1.17. Results are rather surprising as respondents whose family members have been diagnosed with cancer and/or heart disease should have a higher awareness/interest and should react more positively to foods that may help prevent these diseases.

It is also suggested that respondents who occasionally or frequently purchase functional foods, organic food, or natural food are willing to pay more for the product, as compared to respondents who never or rarely purchase these food groups, see table 1.18-1.20. Thus, product familiarity and consumption patterns or eating habits tend to have a significant effect on how consumers evaluate and value these attributes.

1.6 CONCLUSIONS

Understanding factors that consumers consider when selecting food is important in forming optimal strategies to encourage improvement in consumer eating habits. More precise forecasts of the demand for novel functional foods will also help food manufacturers decide whether further research and development is justified. If sufficient demand exists, food manufacturers also need to understand the underlying decision making processes of consumers to most effectively segment and market these products.

Results from this study suggest that consumer preferences for an example functional food vary considerably. A mixed logit model is used to examine this preference heterogeneity for multiple attributes of a still hypothetical functional food product. More than half of the respondents place positive values and are willing to pay a premium price for the products' health benefits and for a natural functional tomato juice.

This finding is consistent with Childs and Poryzees (1997), who suggested that consumers prefer more natural means of delivery for nutritional enhancements. Meanwhile, respondents do not perceive organic ingredients to be a key element for this new concept of tomato juice. This information is important for firms in deciding which attributes to include in their new products during the research and development phase.

It is surprising to find that respondents prefer *single health benefit*, which offers a potential cancer-fighting benefit, to *multiple health benefits*, which may jointly provide heart disease-fighting and cancer-fighting benefits. This does not necessarily imply that consumers value a product with a single health benefit more than a product with multiple health benefits. Instead, consumers may perceive that tomato and soy is not a good combination for a juice product. However, it is too soon to simply draw a conclusion that consumers would turn down this new product concept. Consumers may not be familiar with the product or be too concerned about taste of this tomato juice with soy, as shown by low valuation relative to other tomato juices. This result posts a challenge for researchers developing a new product that not only provides multiple health benefits but also offers good taste and other key attributes that are important to consumers when making purchase decisions.

It was expected that different demographic groups would react differently to this functional food. People who are more interested in this product tend to have higher education and income levels; this result is consistent with other studies (Childs, 1999; Pitman and Reinhardt, 2000; Schmidt and Pitman, 1999). Results here also indicate that product familiarity plays a significant role of consumers' food choices. Consumers who

regularly purchase and consume food groups such as functional foods, organic foods, and food with natural ingredients react more positively and are more interested in this product, as compared to those who never purchase these types of food. With regard to gender differences, male respondents tended to have similar preferences, whereas female respondents' preferences were more heterogeneous but women were willing to pay higher premium prices for health benefits and naturalness of this product. It is quite surprising to find that younger respondents place higher value for these attributes and are willing to pay more for them even though older respondents tended to have similar taste preferences with regard to this product concept.

It can be shown that a choice experiment with an appropriate design and an appropriate econometric model can be applied to capture consumer preferences and valuations for an emerging concept in the food industry. This study illustrated that consumers value health attributes of functional foods and that they are willing to pay more for these products. Such results provide a good incentive for food manufacturers to develop and introduce healthy products into the market. This method is also helpful to identify characteristics of consumers who are more interested and more likely to purchase these products. It would be interesting to employ similar techniques to consider additional product attributes and ask consumers to complete more choice sets to enable further precision. Such an extension to this research would provide more information about consumer preferences and help better understand their decision-making processes.

It would also be interesting to apply other flexible logit models to confirm the results of the mixed logit model with regard to taste heterogeneity. Other generalized

logit models that can be used to account for consumer heterogeneity include the multinomial probit (MNL), heteroscedastic extreme value, hierarchical Bayes, or latent class estimators. These models also relax the restrictive IIA assumption. It is suggested that these models offer alternative ways of capturing unobserved heterogeneity and other potential sources of variability in unobserved sources of utility (Banzhaf, Johnson, and Mathews, 2001; Bjorner, Hansen, and Russell, 2004; Fowkes and Wardman, 1988; Greene and Hensher 2003; Provencher and Bishop, 2004).

Attributes	Levels
Health Benefits	1. No health benefit 2. Single health benefit - Rich in nutrients that may reduce the risk of prostate cancer 3. Multiple health benefits - Rich in nutrients that may reduce the risk of prostate cancer and heart disease
Organic	1. Conventional ingredients 2. Organic ingredients
Source of Nutrients	1. Natural 2. Fortified nutrients
Price	1. $3.00 2. $3.50 3. $4.00 4. $4.50

Table 1.1: Attributes and Levels for the Choice Experiment

Choice Set	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	No health benefit Organic ingredients Natural $4.00	Single health benefit Organic ingredients Fortified nutrients $4.50	Multiple health benefits Conventional ingredients Natural $3.00	None of these products
2	No health benefit Organic ingredients Fortified nutrients $3.00	Single health benefit Organic ingredients Natural $4.00	Multiple health benefits Conventional ingredients Fortified nutrients $4.50	None of these products
3	No health benefit Conventional ingredients Fortified nutrients $4.00	Single health benefit Conventional ingredients Natural $3.00	Multiple health benefits Organic ingredients Natural $3.50	None of these products
4	No health benefit Organic ingredients Fortified nutrients $3.50	Single health benefit Organic ingredients Fortified nutrients $3.00	Multiple health benefits Conventional ingredients Natural $4.00	None of these products
5	No health benefit Organic ingredients Natural $3.50	Single health benefit Conventional ingredients Fortified nutrients $4.00	Multiple health benefits Organic ingredients Natural $4.50	None of these products
6	No health benefit Conventional ingredients Natural $4.50	Single health benefit Conventional ingredients Fortified nutrients $3.50	Multiple health benefits Organic ingredients Fortified nutrients $3.00	None of these products
7	No health benefit Conventional ingredients Natural $3.00	Single health benefit Organic ingredients Natural $4.50	Multiple health benefits Conventional ingredients Fortified nutrients $3.50	None of these products

Table 1.2: Optimal Choice Set Design

Evaluation of Choice Design Instrument	Disagree	Neutral	Agree
1. The information provided about different tomato juice products is easy for me to understand.	11.8%	14.7%	73.5%
2. The information provided about different tomato juice products is too much.	64.7%	19.1%	16.1%
3. The information provided about different tomato juice products is too complicated.	79.0%	10.4%	10.5%
4. It is clear to me how each tomato juice product is different, based on the information provided.	22.0%	11.8%	66.2%
5. It is easy for me to follow the instructions provided.	9.0%	4.5%	86.6%
6. The instructions provided are confusing.	86.5%	9.0%	4.5%
7. It is clear to me how each product option is different in each scenario.	19.4%	9.0%	71.6%
8. The choice scenarios are confusing.	72.0%	13.2%	14.7%
9. Four choice scenarios are too many for me.	80.3%	12.1%	7.5%
10. By looking at different product attributes, it is easy for me to make choices between the three tomato juice products.	22.1%	16.2%	61.8%
11. I consider all product attributes when I make choice decisions for these tomato juices.	28.0%	16.2%	55.9%
12. I need to put a lot of effort into making a choice decision for these tomato juices.	69.1%	14.7%	16.2%

Note: Total observations = 68.

Table 1.3: Pretest Results for Choice Set Design

Item/ Schedule	Date
Pre-notification letter	June 13, 2004
Initial survey	June 21, 2004
First reminder postcard	July 2, 2004
Replacement survey	July 19, 2004
Second reminder postcard	July 28, 2004
End data collection	September 1, 2004

Table 1.4: Mail Survey Schedule Following Dillman's Tailored Design Method

Variable	Respondents from Survey	Ohio	United States
Gender			
Female	51.2%	51.4%	50.9%
Male	47.8%	48.6%	49.1%
Age			
Less than 35 years old	18.6%	48.1%	49.5%
Between 35 and 60 years old	54.2%	34.6%	34.2%
More than 60 years old	27.2%	17.4%	16.2%
Education			
High school or less	48.3%	53.2%	48.2%
College degree or some college	36.7%	39.5%	42.8%
Graduate degree or higher	15.0%	7.4%	8.9%
Ethnic Background			
African American	4.2%	11.5%	12.3%
Asian	0.9%	1.2%	3.6%
Hispanic/ Latino	0.6%	1.9%	12.5%
Indian American	0.7%	0.2%	0.9%
White	90.2%	85.0%	75.1%
Marital Status			
Now Married	65.8%	54.5%	54.4%
Never Married	14.9%	26.2%	27.1%
Divorced/ Separated	10.6%	12.2%	11.9%
Widowed/ Widower	7.0%	7.1%	6.6%
Household Annual Income Level			
Less than $35,000	36.5%	42.5%	41.4%
Between $35,000 and $50,000	18.9%	17.3%	16.5%
Between $50,000 and $75,000	22.8%	20.4%	19.5%
More than $75,000	21.8%	19.8%	22.5%
Residential Status			
Own	81.0%	69.1%	66.2%
Rent	19.0%	30.9%	33.8%

Note: Demographic characteristics of Ohio and the United States are from U.S. Census Bureau, Census 2000.

Table 1.5: Demographic Characteristics of Respondents Compared to Ohio and US Populations

Variable	Mean	Std. Dev.
Health-Diet Awareness/Interest Index	3.70	0.66
My eating habits are healthier than others I know		
I consider myself health conscious		
I am interested in using food to maintain good health		
I am interested in using food to prevent disease		
I am knowledgeable of the health benefits of foods I eat		
I usually look for health information when I buy food products		
Disease - Family History		
Heart Disease (1= Yes; 0 = No)	0.50	0.50
Cancer (1= Yes; 0 = No)	0.51	0.50
Frequency of Purchase - Organic Food		
Never	0.18	0.38
Seldom	0.43	0.49
Occasionally	0.33	0.47
Frequently	0.07	0.25
Frequency of Purchase - Food that provide health-promoting or disease-fighting benefits beyond basic nutrition		
Never	0.05	0.22
Seldom	0.20	0.40
Occasionally	0.48	0.50
Frequently	0.27	0.44
Frequency of Purchase - Natural Food		
Never	0.36	0.48
Seldom	0.35	0.48
Occasionally	0.20	0.40
Frequently	0.09	0.28

Notes:

1. Total observations = 1,704.
2. Health-diet awareness/interest index is calculated from the mean score of six five-point-scale items (strongly disagree – strongly agree).

Table 1.6: Summary Statistics of Individual Characteristics

% of Total Respondents	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Choice Set 1	11%	43%	22%	24%
Choice Set 2	33%	14%	33%	20%
Choice Set 3	27%	28%	19%	26%
Choice Set 4	11%	39%	24%	26%
Choice Set 5	24%	12%	36%	28%
Choice Set 6	14%	35%	27%	24%
Choice Set 7	16%	23%	35%	26%
Choice Set 8	29%	25%	17%	29%

Notes:

1. Alternative 1 - 3 contains different product attribute combinations. Alternative 4 is "None of these products".
2. 330 Observations (19.4%) chose “None of these products” for all 4 choice sets.

Table 1.7: Choice Decision - Frequency among Four Alternatives

	Log Likelihood Function		Chi-Square Statistics	$\chi 2(20)$
	All observations	Exclude those opt-out observations		
Conditional Logit Model	-9,205.9	-6,802.8	4,806.2	67.5
Mixed Logit Model	-7,141.5	-5,728.7	2,825.6	67.5

Note: $-2[Ln(pooled\ data) - Ln(subsample)] \sim \chi 2(\#\ Parameter\ Estimate)$

Table 1.8: Hausman Test to Compare Results from Two Population Groups

Variables		All Observations				Exclude Opt-Out Observations			
		Conditional Logit Model		Mixed Logit Model		Conditional Logit Model		Mixed Logit Model	
Random Parameters									
Single Health Benefit	Mean Coefficient	0.372 (0.036)	*	0.508 (0.120)	*	0.385 (0.037)	*	1.111 (0.102)	*
	Standard Deviation of Coefficient			3.627 (0.122)	*			2.610 (0.100)	*
Multiple Health Benefits	Mean Coefficient	0.353 (0.037)	*	-1.017 (0.193)	*	0.370 (0.037)	*	0.430 (0.137)	*
	Standard Deviation of Coefficient			5.999 (0.253)	*			4.255 (0.180)	*
Organic Ingredients	Mean Coefficient	-0.026 (0.030)		-0.440 (0.095)	*	-0.032 (0.030)		-0.061 (0.060)	
	Standard Deviation of Coefficient			2.044 (0.103)	*			1.226 (0.084)	*
Naturalness	Mean Coefficient	0.231 (0.031)	*	0.296 (0.079)	*	0.241 (0.031)	*	0.479 (0.051)	*
	Standard Deviation of Coefficient			1.626 (0.114)	*			0.783 (0.109)	*
Fixed Parameters									
Price	Coefficient	-0.527 (0.028)	*	-1.394 (0.046)	*	-0.548 (0.029)	*	-1.162 (0.047)	*
None of these product	Coefficient	-1.531 (0.102)	*	-4.788 (0.173)	*	-3.024 (0.112)	*	-5.294 (0.177)	*
Log Likelihood Function		-9205.9		-7141.5		-6802.8		-5728.7	
Likelihood Ratio Index		0.026		0.244		0.107		0.248	

Notes:

1. Standard errors are in parentheses.
2. * Significant at 95%.
3. 330 Observations (19.4%) chose alternative 4 for all 4 choice sets. Total observation for this set = 1374.
4. The mixed logit model is estimated using the simulated maximum likelihood method. Numbers of draws for each run = 500.

Table 1.9: Comparing Conditional Logit and Mixed Logit Models

Product Attributes	Estimated WTP from Conditional Logit Model	Estimated WTP from Mixed Logit Model				% Positive Valuation	% Negative Valuation
		Mean	Std. Dev.	Min	Max		
Single Health Benefit	$0.71	$0.93	$1.85	-$3.03	$3.48	66.5%	33.5%
Multiple Health Benefits	$0.67	$0.28	$3.30	-$5.93	$5.97	54.0%	46.0%
Organic Ingredients	-$0.05	-$0.09	$0.71	-$2.07	$1.86	48.0%	52.0%
Naturalness	$0.44	$0.41	$0.48	-$0.63	$1.50	73.0%	27.0%

Table 1.10: Estimated Willingness to Pay (WTP) and Valuation Shares for Product Attributes

Variables	Gender		Age Group			Education Level		
	Male	Female	Less than 35 Years Old	Between 35 and 60 Years Old	More than 60 years Old	High School	Some College Degree	Graduate Degree
Random Parameters								
Single Health Benefit								
Mean Coefficient	0.424 *	0.983 *	1.129 *	1.261 *	0.514 *	0.720 *	1.151 *	1.668 *
	(0.042)	(0.119)	(0.162)	(0.115)	(0.214)	(0.129)	(0.144)	(0.296)
Std. Dev. Of Coefficient	0.000	2.432 *	1.734 *	2.367 *	3.459 *	2.569 *	2.298 *	2.655 *
	(0.000)	(0.121)	(0.174)	(0.114)	(0.239)	(0.129)	(0.142)	(0.266)
Multiple Health Benefits								
Mean Coefficient	0.359 *	0.334 *	0.622 *	0.520 *	-0.545 *	-0.409 *	0.622 *	1.465 *
	(0.037)	(0.170)	(0.231)	(0.162)	(0.284)	(0.194)	(0.186)	(0.332)
Std. Dev. Of Coefficient	0.000	4.232 *	2.914 *	4.197 *	5.790 *	4.680 *	3.803 *	3.823 *
	(0.000)	(0.223)	(0.271)	(0.217)	(0.452)	(0.250)	(0.247)	(0.424)
Organic Ingredient								
Mean Coefficient	-0.014	-0.077	0.144	0.048	-0.519 *	-0.388 *	0.081	0.409 *
	(0.058)	(0.080)	(0.144)	(0.069)	(0.134)	(0.094)	(0.092)	(0.159)
Std. Dev. Of Coefficient	0.004	1.269 *	1.415 *	0.845 *	1.513 *	1.351 *	0.965 *	1.123 *
	(0.160)	(0.096)	(0.176)	(0.087)	(0.162)	(0.110)	(0.119)	(0.215)
Naturalness								
Mean Coefficient	0.258 *	0.412 *	0.365 *	0.408 *	0.583 *	0.490 *	0.362 *	0.645 *
	(0.066)	(0.067)	(0.115)	(0.064)	(0.102)	(0.074)	(0.085)	(0.161)
Std. Dev. Of Coefficient	0.020	0.732 *	0.635 *	0.729 *	0.748 *	0.459 *	0.858 *	1.226 *
	(0.286)	(0.108)	(0.209)	(0.101)	(0.189)	(0.111)	(0.157)	(0.207)
Fixed Parameters								
Price	-0.629 *	-0.934 *	-1.458 *	-1.087 *	-0.909 *	-0.944 *	-1.265 *	-1.601 *
	(0.034)	(0.059)	(0.106)	(0.056)	(0.096)	(0.059)	(0.078)	(0.159)
None of these products	-3.508 *	-4.330 *	-6.167 *	-5.026 *	-4.374 *	-4.608 *	-5.696 *	-6.444 *
	(0.141)	(0.219)	(0.378)	(0.218)	(0.357)	(0.235)	(0.281)	(0.530)

Continued

Table 1.11: Mixed Logit Model for Each Group of Respondents Based on Demographic and Individual Characteristics

Table 1.11 continued

Variables	Income Level				Family History - Cancer		Family History - Heart Disease	
	Less than $35,000	$35,000-$50,000	$50,000-$75,000	More than $75,000	Yes	No	Yes	No
Random Parameters								
Single Health Benefit								
Mean Coefficient	0.667 *	0.807 *	1.340 *	1.468 *	0.917 *	1.201 *	1.110 *	0.391 *
	(0.139)	(0.218)	(0.192)	(0.259)	(0.130)	(0.118)	(0.140)	(0.043)
Std. Dev. Of Coefficient	2.187 *	2.453 *	2.379 *	2.938 *	2.673 *	2.342 *	2.776 *	0.000
	(0.131)	(0.207)	(0.192)	(0.232)	(0.127)	(0.115)	(0.147)	(0.000)
Multiple Health Benefits								
Mean Coefficient	-0.159	-0.373	0.769 *	1.169 *	0.416 *	0.240	0.275	0.493 *
	(0.198)	(0.320)	(0.261)	(0.306)	(0.184)	(0.162)	(0.181)	(0.037)
Std. Dev. Of Coefficient	3.670 *	3.952 *	3.947 *	4.348 *	4.639 *	3.956 *	4.591 *	0.001 *
	(0.242)	(0.428)	(0.333)	(0.390)	(0.246)	(0.212)	(0.272)	(0.000)
Organic Ingredient								
Mean Coefficient	-0.285 *	0.033	-0.058	0.143	-0.137	0.086	-0.081	-0.009
	(0.095)	(0.166)	(0.130)	(0.132)	(0.078)	(0.081)	(0.084)	(0.059)
Std. Dev. Of Coefficient	1.055 *	1.144 *	1.259 *	1.110 *	1.106 *	1.096 *	1.133 *	0.418 *
	(0.113)	(0.166)	(0.163)	(0.169)	(0.094)	(0.095)	(0.115)	(0.034)
Naturalness								
Mean Coefficient	0.517 *	0.508 *	0.383 *	0.376 *	0.564 *	0.346 *	0.481 *	0.255 *
	(0.083)	(0.122)	(0.109)	(0.132)	(0.072)	(0.070)	(0.070)	(0.058)
Std. Dev. Of Coefficient	0.481 *	0.666 *	0.948 *	0.948 *	0.676 *	0.795 *	0.742 *	0.267
	(0.117)	(0.259)	(0.186)	(0.172)	(0.118)	(0.107)	(0.116)	(0.243)
Fixed Parameters								
Price	-1.029 *	-1.114 *	-1.155 *	-1.376 *	-1.011 *	-1.196 *	-1.110 *	-0.582 *
	(0.070)	(0.116)	(0.092)	(0.111)	(0.062)	(0.059)	(0.065)	(0.035)
None of these product	-4.840 *	-5.227 *	-5.291 *	-5.918 *	-4.775 *	-5.293 *	-5.315 *	-3.013 *
	(0.271)	(0.417)	(0.368)	(0.425)	(0.234)	(0.225)	(0.248)	(0.148)

Continued

Table 1.11 continued

Variables	Frequency of Purchase - Functional Food		Frequency of Purchase - Organic Food		Frequency of Purchase - Natural Food	
	Seldom or Never	Occasionally or Frequently	Seldom or Never	Occasionally or Frequently	Seldom or Never	Occasionally or Frequently
Random Parameters						
Single Health Benefit						
Mean Coefficient	0.682 *	1.089 *	0.327 *	1.073 *	0.384 *	0.958 *
	(0.199)	(0.107)	(0.039)	(0.152)	(0.037)	(0.193)
Std. Dev. Of Coefficient	2.441 *	2.566 *	0.000 *	2.460 *	0.000	2.550 *
	(0.185)	(0.100)	(0.000)	(0.126)	(0.000)	(0.145)
Multiple Health Benefits						
Mean Coefficient	-0.411	0.512 *	0.223 *	0.766 *	0.381 *	0.716 *
	(0.269)	(0.135)	(0.034)	(0.173)	(0.032)	(0.207)
Std. Dev. Of Coefficient	3.897 *	4.178 *	0.001 *	3.827 *	0.001 *	3.586 *
	(0.316)	(0.180)	(0.000)	(0.238)	(0.000)	(0.264)
Organic Ingredient						
Mean Coefficient	-0.376 *	-0.026	-0.231 *	0.312 *	-0.108 *	0.074
	(0.120)	(0.064)	(0.058)	(0.084)	(0.051)	(0.102)
Std. Dev. Of Coefficient	0.824 *	1.129 *	0.423 *	0.958 *	0.343 *	1.181 *
	(0.188)	(0.073)	(0.036)	(0.107)	(0.033)	(0.131)
Naturalness						
Mean Coefficient	0.721 *	0.394 *	0.268 *	0.355 *	0.227 *	0.473 *
	(0.115)	(0.054)	(0.056)	(0.072)	(0.054)	(0.095)
Std. Dev. Of Coefficient	0.763 *	0.657 *	0.279	0.645 *	0.251	0.524 *
	(0.221)	(0.071)	(0.216)	(0.127)	(0.190)	(0.131)
Fixed Parameters						
Price	-1.369 *	-1.045 *	-0.683 *	-0.824 *	-0.662 *	-0.721 *
	(0.091)	(0.047)	(0.033)	(0.060)	(0.030)	(0.070)
None of these product	-5.711 *	-5.037 *	-3.483 *	-4.148 *	-3.476 *	-3.568 *
	(0.344)	(0.183)	(0.144)	(0.229)	(0.130)	(0.264)

Continued

Demographic Groups	Log Likelihood Function	Chi-Square Statistics	Results
Pooled Data	-5755.92		
Gender			
Male	-3264.52	-1017.74	Reject *Ho*
Female	-3000.27		
Age			
Less than 35 years old	-996.28	101.71	Reject *Ho*
Between 35 and 60 years old	-3153.46		
More than 60 years old	-1555.32		
Education			
High school or less	-2753.49	127.82	Reject *Ho*
Some college degree	-2113.91		
Graduate degree	-824.61		
Income Level			
Less than $35,000	-1983.29	954.12	Reject *Ho*
$35,000 - $50,000	-952.68		
$50,000 - $75,000	-1251.44		
More than $75,000	-1091.45		
Family History - Cancer			
Some family members have cancer	-2858.40	12.09	Fail to reject Ho
None of family members has cancer	-2891.47		
Family History - Heart Disease			
Some family members have heart disease	-2750.83	-992.30	Reject *Ho*
None of family members has heart disease	-3501.24		
Frequency of Purchase - Functional Food			
Never or seldom purchase	-1304.14	100.93	Reject *Ho*
Occasionally or frequently purchase	-4401.32		
Frequency of Purchase - Organic Food			
Never or seldom purchase	-3911.31	-1046.20	Reject *Ho*
Occasionally or frequently purchase	-2367.71		
Frequency of Purchase - Natural Food			
Never or seldom purchase	-4668.31	-1288.07	Reject *Ho*
Occasionally or frequently purchase	-1731.65		

Note: The null hypothesis is that coefficient estimates are not different between subgroups and $\chi 2\ (20) = 67.50$ at 95% confident level.

$$-2\,[Ln\,(pooled\ \ data) - Ln\,(subgroup\ 1) - Ln\,(subgroup\ 2)]\ \sim\ \chi 2(\#\ Parameter\ Estimates)$$

Table 1.12: Comparing Coefficient Estimates for Various Groups of Respondents

Product Attributes	Male			Female		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.68	$0.01	100.0%	$1.03	$2.06	65.7%
Multiple Health Benefits	$0.55	$0.04	100.0%	$0.35	$3.97	53.1%
Organic Ingredient	-$0.02	$0.00	0.0%	-$0.10	$1.02	47.6%
Naturalness	$0.39	$0.06	100.0%	$0.45	$0.57	71.3%

Table 1.13: Comparing Estimated WTP and Valuation Shares for Male and Female Respondents

Product Attributes	Less than 35 Years Old			Between 35 and 60 Years Old			More than 60 Years Old		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.84	$0.90	74.2%	$1.14	$1.71	70.3%	$0.55	$3.13	55.9%
Multiple Health Benefits	$0.54	$1.78	58.5%	$0.40	$3.38	54.9%	-$0.48	$5.56	46.2%
Organic Ingredient	$0.07	$0.72	54.0%	$0.03	$0.54	52.3%	-$0.53	$1.17	36.6%
Naturalness	$0.23	$0.36	71.7%	$0.39	$0.45	71.2%	$0.64	$0.60	78.2%

Table 1.14: Comparing Estimated WTP and Valuation Shares for Respondents in Different Age Groups

Product Attributes	High School			College Degree			Graduate Degree		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.75	$2.28	61.0%	$0.92	$1.46	69.2%	$1.09	$1.25	73.5%
Multiple Health Benefits	-$0.45	$4.33	46.5%	$0.48	$2.65	56.5%	$0.99	$2.21	64.9%
Organic Ingredient	-$0.39	$1.06	38.7%	$0.05	$0.49	53.4%	$0.21	$0.46	64.2%
Naturalness	$0.52	$0.35	85.7%	$0.26	$0.51	66.4%	$0.43	$0.54	70.0%

Table 1.15: Comparing Estimated WTP and Valuation Shares for Respondents in Different Education Levels

Product Attributes	Less than $35,000			Between $35,000 and $50,000			Between $50,000 and $75,000			More than $75,000		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.66	$1.78	62.0%	$1.04	$1.76	62.9%	$1.12	$1.66	71.3%	$1.12	$1.64	69.1%
Multiple Health Benefits	$0.00	$3.27	48.3%	$0.27	$3.11	46.2%	$0.57	$3.10	57.7%	$0.80	$2.88	60.6%
Organic Ingredient	-$0.29	$0.72	39.4%	$0.06	$0.73	51.1%	-$0.02	$0.76	48.2%	$0.12	$0.50	55.1%
Naturalness	$0.47	$0.37	85.9%	$0.38	$0.45	77.7%	$0.32	$0.56	65.7%	$0.33	$0.47	65.4%

Table 1.16: Comparing Estimated WTP and Valuation Shares for Respondents in Different Income Levels

Product Attributes	Family History of Cancer			No Family History of Cancer			Family History of Heart Disease			No Family History of Heart Disease		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.95	$2.12	63.4%	$0.97	$1.55	69.6%	$1.02	$2.01	65.5%	$0.65	$0.05	100.0%
Multiple Health Benefits	$0.45	$4.03	53.6%	$0.19	$2.86	52.4%	$0.24	$3.56	52.4%	$0.69	$0.41	100.0%
Organic Ingredient	-$0.16	$0.75	45.1%	$0.05	$0.65	53.1%	-$0.08	$0.67	47.1%	-$0.06	$0.32	49.2%
Naturalness	$0.55	$0.52	79.8%	$0.29	$0.45	66.8%	$0.44	$0.44	74.2%	$0.42	$0.20	83.0%

Table 1.17: Comparing Estimated WTP and Valuation Shares for Respondents whose Family Members Have Been Diagnosed with Cancer and Heart Disease

Product Attributes	Seldom or Never Purchase Functional Food			Occasionally or Frequently Purchase Functional Food		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.42	$1.48	61.0%	$1.07	$1.96	66.4%
Multiple Health Benefits	-$0.43	$2.54	45.8%	$0.52	$3.51	54.9%
Organic Ingredient	-$0.28	$0.38	32.4%	-$0.04	$0.77	49.1%
Naturalness	$0.54	$0.41	82.7%	$0.37	$0.48	72.6%

Table 1.18: Comparing Estimated WTP and Valuation Shares for Respondents with Different Consumption Patterns of Functional Food

Product Attributes	Seldom or Never Purchase Organic Food			Occasionally or Frequently Purchase Organic Food		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.53	$0.13	100.0%	$1.38	$2.35	66.9%
Multiple Health Benefits	$0.32	$0.02	100.0%	$1.14	$4.10	57.9%
Organic Ingredient	-$0.34	$0.25	29.3%	$0.40	$0.76	62.8%
Naturalness	$0.40	$0.17	83.2%	$0.42	$0.58	70.9%

Table 1.19: Comparing Estimated WTP and Valuation Shares for Respondents with Different Consumption Patterns of Organic Food

Product Attributes	Seldom or Never Purchase Natural Food			Occasionally or Frequently Purchase Natural Food		
	WTP Estimates		% Positive Valuation	WTP Estimates		% Positive Valuation
	Mean	Std. Dev.		Mean	Std. Dev.	
Single Health Benefit	$0.56	$0.05	100.0%	$1.44	$2.90	64.6%
Multiple Health Benefits	$0.42	$0.36	100.0%	$1.20	$4.54	57.9%
Organic Ingredient	-$0.15	$0.19	37.6%	$0.18	$1.10	52.5%
Naturalness	$0.36	$0.14	81.7%	$0.65	$0.59	81.7%

Table 1.20: Comparing Estimated WTP and Valuation Shares for Respondents with Different Consumption Patterns of Natural Food

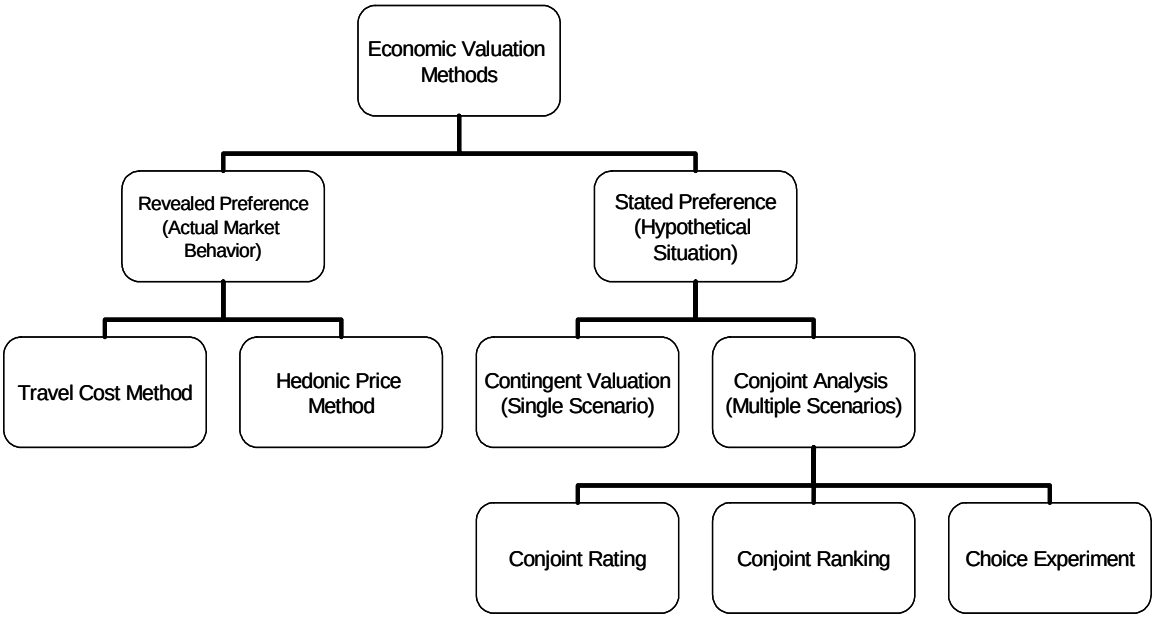

Figure 1.1: Various Economic Valuation Techniques

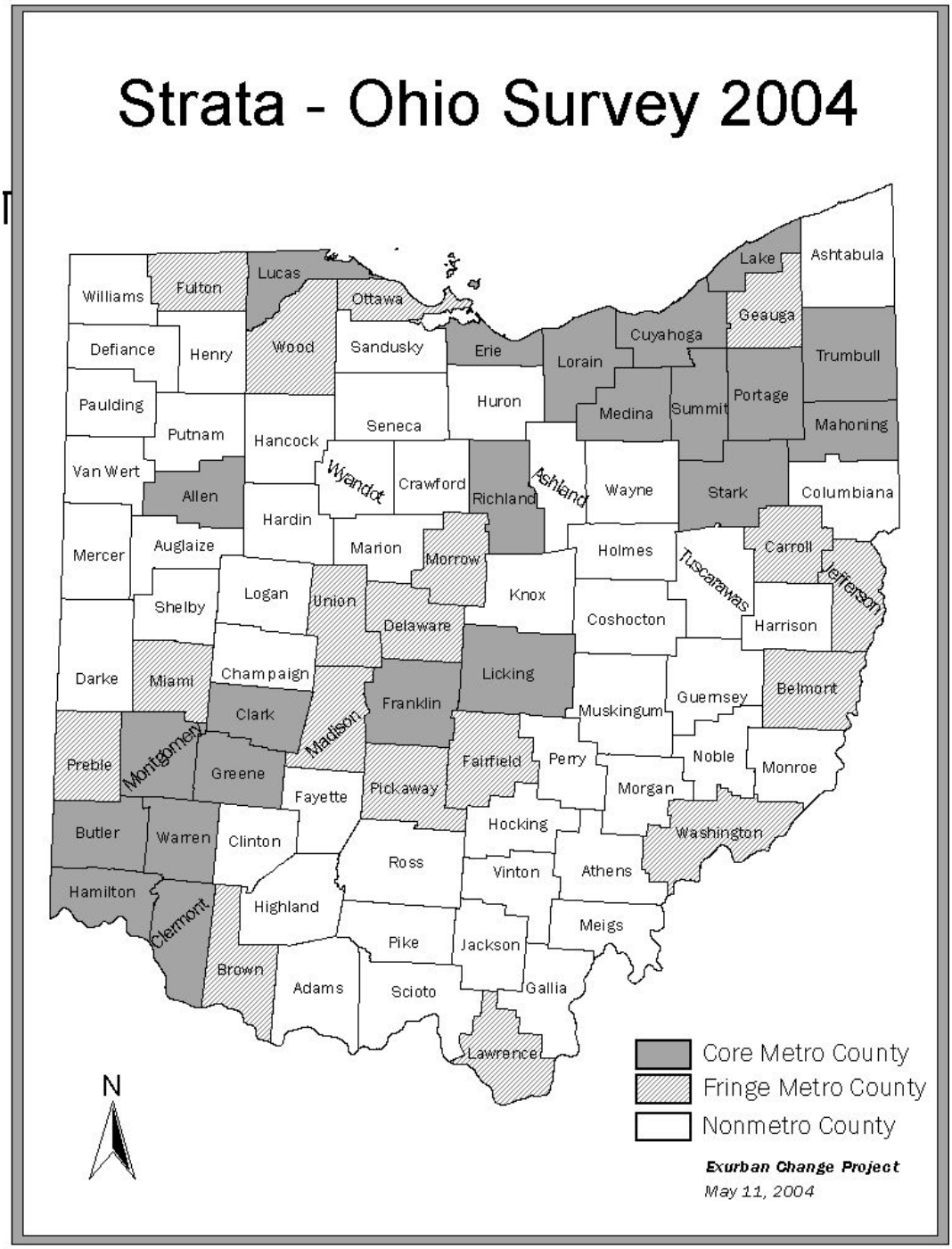

Figure 1.2: Map of Ohio Counties with Various Metropolitan Statuses

ESSAY 2

EXAMINING THE ROLE OF HEALTH CLAIMS ON FOOD LABELS: CONSUMER EVALUATIONS OF PRODUCT QUALITY

2.1 INTRODUCTION

Stimulated by the increasing complexity of marketplace offerings as well as advances in diet-disease research, studies in a variety of disciplines, including public policy, economics, and marketing, have explored how consumers are influenced by health and nutrition information on food labels (Brucks, Mitchell, and Staelin 1984; Caswell and Mojduszka 1996; Ippolito and Mathios 1993). Two main sources of health and nutrition information on food packages that are of interest include claims on the front label and the Nutrition Facts panel. The claim on the front label characterizes nutrient levels or describes a relationship between a food component and reducing risk of a disease or health-related condition, whereas the Nutrition Facts panel provides a standardized format of key nutrition information such as calories, fat, cholesterol, sodium, carbohydrates, and protein (FDA 1999).

From my review of empirical studies and review articles, it is clear that consumers consider several pieces of health and nutrition information when making food purchase decisions. They also receive such information from other sources on a regular

basis such as magazines or books, having conversations with family, friends, their doctor and health professionals, or watching news or TV programs (Feick, Herrmann, and Warland 1986). Many consumers spend time searching or reading claims on the front label and/or Nutrition Facts panel when they are in grocery stores (Balasubramanian and Cole 2002; Moorman 1996). Baltas (2001) suggested that consumers pay attention to nutrition information of different brands or products in the same category and then compare nutrient levels of each product when selecting which food to purchase. A review of the extant research, to be discussed, reveals the role of health claims in persuasion is not well understood. Of most concern are a number of inconsistent findings and a lack of any compelling theoretical framework.

This study introduces a new way to view and conceptualize the role of health claims on labels, using the Elaboration Likelihood Model as a theoretical framework. Persuasion refers to any changes in attitude that results from exposure to a communication message (Petty and Cacioppo 1986a). The objective of this study is to examine the role(s) of claims shown on the front label of food packages on consumer evaluations of a product, using a manipulation of product quality (varying the nutrient levels on the Nutrition Facts panel). Understanding the roles that a claim on the front label can play has important implications for both public policy and food manufacturers who use health and nutrition information as a tool to market their products. The following section provides a background on information provision on food labels and a literature review on consumer use and understanding of label information. The following

sections discuss the Elaboration Likelihood Model (ELM) and methodology; then results and implications are presented.

2.2 OVERVIEW OF INFORMATION PROVISION ON FOOD LABELS

The *Nutrition Labeling and Education Act* (NLEA) of 1990 and *FDA Modernization Act* (FDAMA) of 1997 developed by the Food and Drug Administration (FDA) each control claims allowed on food labels. Two of the primary goals of these regulations were to reduce consumer confusion regarding health and nutrition claims made by food manufacturers and to ensure that such claims are truthful and do not mislead consumers (Garretson and Burton 2000). The overall goal of FDA's approach is that health and nutritional information will educate consumers about the beneficial effects of certain substances in their diets, which should lead to more informed food selections and more healthful consumption patterns (Ippolito and Mathios 1993; Jensen and Kesavan 1993; Variyam and Golan 2002). Mojduszka and Caswell (2000) showed that government intervention to mandate and regulate nutrition information on food labels is necessary to ensure that more information is available to consumers.

Three categories of diet and health information are currently allowed on food packages: nutrient content claims, structure/function claims, and health claims (FDA 2003). The FDA and food manufacturers are responsible for ensuring the validity of such claims. Nutrient content claims describe the level of nutrients or dietary substances in food products using terms good source, high, or low (FDA 1994). Nutrient content claims explain the relative level of a nutrient that provides health benefits without

mentioning the relationship to a particular disease. Examples of nutrient content claims include: “good source of calcium,” “high fiber,” or “low fat.” Structure/function claims are statements about a food substance's effect on the structure or function of the body or general well being without dealing with a particular disease risk reduction or mitigation (FDA 2002). Examples of structure / function claims include: “calcium builds strong bones,” “fiber maintains bowel regularity,” or “antioxidants maintain cell integrity.”

In comparison, health claims characterize the specific relationship between nutrients or other substances in the food to diseases or health-related conditions such as fiber and certain types of cancer or soy protein and heart disease (FDA 2003). Among the different claim types, health claims provide the most explicit description of the benefits of the food. Traditionally, health claims have been permitted when based on the totality of publicly available scientific evidence using the significant scientific agreement (SSA) standard, as provided by NLEA. A claim can also be based on an authoritative statement from a scientific body of the US government or the National Academy of Sciences, following FDAMA.

A recent study (Caswell et al. 2003) concluded that the implementation of NLEA has significantly increased the use of nutrient-content claims and health claims by food manufacturers. The study also showed that manufacturers use nutrient-content claims much more frequently than health claims to communicate nutrition and health benefits of products. More than 40 percent of products carried at least one nutrient-content claim during the 1990s, whereas 1.5 percent to 7 percent of those same products carried health or healthy claims during the same period. Product labels with health claims were

relatively rare but their use is increasing (i.e., 2.1 percent in 1995 to 6.3 percent in 1999). The same pattern appears in food advertisements. Food marketers are making more substantial use of nutrient content claims in their print ads (66 percent of all claims in the sample), but very limited use of health claims (4.5 percent), despite the growing number of FDA-authorized categories of health claims (Parker 2003). We next turn to a review of the existing research on the influence of product labels on consumer attitudes and choice.

2.3 LITERATURE REVIEW

2.3.1 Effectiveness of Information Provision on Food Labels

At a macro level, economists have developed models to examine the joint influence of price, rising or falling income, and diet and health information in attempts to characterize the influence of product labels on changes in food consumption patterns (e.g., Variyam, Blaylock and Smallwood 1996; Variyam and Golan 2002). Researchers have also used survey data, such as the Continuing Survey of Food Intakes by Individuals – Diet and Health Knowledge Survey (CSFII-DHKS) and Healthy Eating Index (HEI), to assess whether consumers use health and nutrition information when making purchase decisions.

In general, consumption patterns (i.e., food choice and purchase behavior) of many food groups have been affected by increasing information on the link between diet and health, particularly following the implementation of NLEA (Variyam, Blaylock, and Smallwood 1996). Health and nutrition information on product labels also led to a

significant increase in consumer knowledge of the disease-nutrient relationship (Ippolito and Mathios 1991). Mathios (1998) used supermarket scanner data and nutrition label data during pre- and post-NLEA periods to address the consequences of eliminating explicit health claims for cooking oils. The finding was that consumers shifted purchases toward unhealthy cooking oil (high in saturated fat and low in monounsaturated fat) when producers were no longer allowed to claim the health benefit of monounsaturated fat.

Other studies looked at individual dietary behavior and found that the effect of health and nutrition information on a product label can vary from heightening awareness of diet-disease relationships, improving attitude about healthy eating, to gaining better knowledge of food compositions that lead to better food choices. Jensen, Kesavan, and Johnson (1992) suggested that health and nutrition information helped improve consumer attitudes and product awareness, leading to an increase in product demand. Moorman (1996) conducted longitudinal quasi experiments (8 months prior to and 5 months after NLEA implementation) to examine the impact of the regulation on consumers acquisition and comprehension of nutrition information at the point of sale. Nutrition information acquisition was measured as the amount of time searching per brand purchased, whereas nutrition information comprehension was measured as recall accuracy of total fat level. Results suggested that consumers spent more time searching for information and had greater comprehension of nutrition information in the post-NLEA condition than in the pre-NLEA condition. A similar finding was found in the study by Balasubramanian and Cole (2002).

Wansink (2003) examined the effectiveness of various front-sided health claims when used in combination with a full health claim on the back of a package. Using thought-listing techniques where respondents were adults and students, results suggested that combining a short health claim on the front of the package with the full health claim on the back leads consumers to more fully process (respondents generated more attribute-specific thoughts about the product) and believe (respondents rated belief of product healthfulness higher) the claim. Similarly, Bruck, Mitchell, and Staelin (1984) and Viswanathan and Hastak (2002) found that the message format of nutrition information affects consumers' perceptions of nutritional quality. It is shown that a simplified version of nutrition information is better than a complex one and the form of average and/or summary information, as compared to a percent daily value (%DV), may help consumer better understand Nutrition Facts panel and improve their judgments about nutrient contents.

2.3.2 Interaction between Health Claims and Nutrition Facts Panel Information

In response to increasing consumer and public health concerns about diet and health relationships, food scientists and food manufacturers are developing and testing foods with additional health benefits at an increasing rate (Sloan 2000; Thomson, Bloch, and Hasler 1999). Broadly categorized as functional foods, manufacturers of these foods have an incentive to provide diet and health information to consumers as a marketing communication tool. In providing such information, manufacturers must follow FDA labeling rules. Manufacturers, of course, hope that health and nutrition information will

create a favorable impression of functional foods, increasing the likelihood of consumer purchases.

The hope of manufacturers, however, may be tempered by consumer skepticism that health and nutritional claims are simply attempts to sell more products (Garretson and Burton 1993). Additionally, concerns are often voiced by consumer advocacy groups such as the Center for Science in the Public Interest and the Consumer Federation of America that health and nutrition claims on product labels are not truthful and mislead consumers. These groups argue that consumers may not fully understand claims and consumers overlook information from other parts of label when such claims are made on product packaging (i.e., the Nutrition Facts panel) (CFA 2003; CSPI 2003).

The roles of claims on the front label and nutrition information on Nutrition Facts panel have been discussed in the literature. Ippolito and Mathios (1993) suggested that information from these two sources serve different purposes for consumers. The role of information on the front label such as a health claim or a nutrient content claim is to draw consumer attention and interest about product health benefits, whereas the role of Nutrition Fact panels is to provide complete useful information in a standardized format to consumers who are interested. This view is consistent with Ford et al. (1996) suggesting that consumers perceive health claims and Nutrition Facts panel as two independent sources of product-related information which they integrate to judge overall product healthfulness. Their view is that a health claim does not influence the way in which consumers interpret nutrition information on Nutrition Facts panel and vice versa. Nevertheless, concerns are often raised that the presence of a health claim may cause

consumers to ignore or pay less attention to other sources of information on product labels.

Experimental studies have been conducted to examine how consumers process and use information contained on the Nutrition Facts panel in conjunction with various nutrient and health claims on the front label. Participants in these studies varied from college students, professional staff, to typical shoppers, with different modes of data collection applied such as classroom set ups, mall intercepts, or personal interviews. Broad ranges of dependent measures have included product belief, nutrition evaluation, attitude toward the product, and/or buying intention. Results from these studies were nevertheless inconsistent.

Some studies show that information from both front label and Nutrition Facts panel has a significant, but independent, effect on product evaluation. For instance, Ford et al. (1996) examined how a health claim influences the processing of nutrition information, using nutrient beliefs (i.e., heart, fat, sodium, and overall nutrition) as dependent variables. Respondents in the experiment were undergraduate and graduate students. Results suggest that respondents rated the product with a healthy version of nutrition facts higher than that with an unhealthy version and that there was no interaction effect between health claim and argument quality on the nutrition facts panel on all dependent measures. This study supported the independent effect model, in which the effect of nutrition information on the Nutrition Facts panel on judgments was not influenced by the presence of a health claim.

Mazis and Raymond (1997) measured consumer beliefs about a product's health-related attributes such as calcium, vitamins, protein, fat, calories, cholesterol, fiber, sodium, and heart disease following exposure to different sources of information on product labels. Their findings were similar to the study by Ford et al. (1996); respondents considered both sources of information and each belief was affected independently by the presence of claim and argument quality manipulation of the Nutrition Facts panel. For instance, when information from the two sources was inconsistent (i.e., the front label suggested low-fat, but the Nutrition Facts panel showed 11 grams of fat per serving), consumers rated nutrition beliefs much lower (i.e., less healthy) than when the only available information was the health claim on the front label.

Other studies, however, report that only nutrition information on the Nutrition Facts panel plays a significant role on product evaluation, suggesting claims on the front label have no significant effect. Mitra et al. (1999) extended the study by Ford et al. (1996) to examine how consumers with different education levels respond to health and nutrition information. Subjects were real shoppers who had, and had not, completed high school. Results suggested that, when both health claim and Nutrition Facts panel were present, only the Nutrition Facts panel had a significant main effect on product belief ratings. This may imply that health claims seem to have been ignored in the presence of other, more diagnostic information (i.e., Nutrition Facts panel). It is also shown that both less and more educated respondents demonstrated an ability to comprehend the Nutrition Facts panel and this ability was unaffected by the implied health claim. Kozup, Creyer, and Burton (2003) examined how consumers use health and nutrition information from

both product labels and restaurant menus and reported similar findings with different measures, including attitude toward a product, buying intention, perceived credibility, and disease risk measures.

Garretson and Burton (2000) extended the study by Ford et al. (1996) to examine how perceived importance of nutrition affects consumer response to health and nutrition information. Specifically, it compared a nutrient with more diagnostic information (fat) to that with less diagnostic information (fiber). Respondents were members of a (mail) statewide household research panel. Several measures were included such as attitude, buying intention, credibility, trust, and disease-risk likelihood measures. Results suggest that there was no interaction effect between health claim and Nutrition Facts panel on these measures. Various types of claims (no claim, low in fat, high in fiber, both low in fat and high in fiber, and health claim) also had no significant effect on these dependent measures.

The study by Roe, Levy and Derby (1999) nevertheless suggested that the presence of health and nutrient content claims on food packages induced respondents to truncate information search to the front label. They conducted a mall-intercept survey with real shoppers to examine how consumers acquired and used information from different areas of a food label. Regression results suggested that the presence of a health claim, and to a lesser extent a nutrient content claim, are significantly associated with a greater probability of search being limited to the front label (hereafter, truncated search) without considering information on the Nutrition Facts panel. It was also suggested that

information search behavior affects several dependent measures such as buying intention, healthiness rating, and health effect responses.

With regard to different types of claims (i.e., health claim and nutrient content claim), a review of past research reveals mixed results. Ippolito and Mathios (1990) examined the effect of information (health claims in advertising) on consumer behavior focusing on the ready-to-eat breakfast cereal market and found that health claims result in changes in consumer behavior whereas nutrient content claims did not. They suggested that the level of information needed depends on the underlying issues or benefits of products - whether they are well understood by consumers. Nonetheless, Roe et al. (1999) suggested that a nutrient content claim and health claim have similar practical effects on information processing and product evaluation. They suggested both claims tend to induce truncation. Health claims and nutrient content claims seem to provide the same effect on product evaluation and rating. It is shown that respondents did not gain more information from a health claim in the same manner as compared to a nutrient content claim. It is also suggested that the incremental information relayed by the health claim had little impact on behavior measures in this study.

2.4 THEORETICAL FRAMEWORK: THE ELABORATION LIKELIHOOD MODEL (ELM)

The inconsistency in the past literature prompts us to revisit the issue of how the presence of a health claim affects consumer evaluations of the Nutrition Facts panel by viewing and conceptualizing the role of health claims in persuasion using a different

theoretical framework. This paper applies the Elaboration Likelihood Model (ELM) to explain how consumers use and process information on product labels and to test the role of health and nutrition messages on the front label.

The ELM, developed by Richard Petty and John Cacioppo, has been applied in a large volume of cognitive/ social psychology and consumer research over the past twenty years (Petty, Cacioppo, and Heesacker 1984; Petty, Cacioppo, and Schumann 1983; Petty and Wegener 1999). It specifies the major ways in which information or message content can affect persuasion. According to the ELM, marketing communication can produce persuasion via two fundamentally different routes, a ***central route*** and a ***peripheral route***. The difference between the two routes is the relative thinking effort spent on the issues or on processing the information provided by the message. The central route is based on a thoughtful consideration of issue-relevant argumentation, whereas the peripheral route is based on affective association or simple inferences tied to issue-relevant cues in the persuasion context. Attitude changes via the central route appear to be more persistent, resistant, and predictive of behavior than do changes induced via the peripheral route.

According to one of seven postulates in the ELM, information or message content can affect the amount and direction of attitude change by serving as persuasive arguments, serving as peripheral cues, and/or influencing the extent or direction of issue and argument elaboration (Petty and Cacioppo 1986a). Elaboration is the extent to which people think about the issue-relevant argument contained in a message. They can play single or multiple roles in the persuasion process. Persuasive arguments are viewed as bits of information contained in a communication that are relevant to a person's

subjective determination, which can be either strong (favorable) or weak (unfavorable) messages. Peripheral cues refer to stimuli in the persuasion context that can affect attitudes without requiring processing of the message arguments. The information or message content can also influence the elaboration process by inducing people to think more or less carefully about persuasion messages (Petty and Cacioppo 1986b).

In this study, the ELM is used as a guide to explore the role of various messages on the front label of food packages. The focus of this study is the influence of different claim types on consumer judgments of product quality. The claim types employed were designed and pre-tested to differ in the explicitness of the relationship between the food substance(s) and disease(s). The purpose of the study is to understand whether claims induce greater (or lesser) elaboration about the product and/or whether they serve as peripheral cues. In order to examine the role of claims, two product qualities (healthy and unhealthy) are included by manipulating certain nutrient levels in the Nutrition Facts panel.

The first possible role of claims is to affect the extent to which labels induce greater elaboration regarding the product. For example, if a more explicit claim enhances argument processing, participants in two randomly assigned groups should show greater differentiation of strong from weak arguments. That is, a message with a strong argument version of Nutrition Facts (i.e., a product accompanied by a healthy version of Nutrition Facts) should enhance positive attitudes toward the product if it is scrutinized carefully. A message with a weak argument (i.e., one with an unhealthy version of

Nutrition Facts) should result in more negative attitudes toward the product if it is scrutinized carefully.

Another possible role of the claim is that of a peripheral cue. A simple cue in the persuasion context can affect attitudes in the absence of argument processing (Petty and Cacioppo 1986a). In this case, if health claims do not induce participants to more carefully scrutinize the product, participants will rely mainly on the sheer existence of claims when forming product judgments without paying attention to nutrient levels on the Nutrition Facts panel. They will hold more positive attitudes toward products when exposed to health claims, regardless of the nutrient levels on the Nutrition Facts panel.

In order to examine these ideas, in addition to measuring attitudes toward the product, it is important to assess the degree and nature of message processing by participants (Petty and Cacioppo 1986b). An increase in the extent to which a message is processed is expected to be accompanied by an increase in thoughts that reflect a detailed consideration of message content. Consistent with past research and theory, favorable thoughts elicited by a particular communication should correlate positively with attitude change, whereas unfavorable thoughts elicited by a communication should show a strong negative relationship with persuasion (Cacioppo and Petty 1981). Thus, both attitudes toward the product and cognitive responses are measured and analyzed in this study.

2.5 STUDY 1: COMPARING CONTROL CONDITIONS AND HEALTH CLAIMS

The purpose of study 1 is to examine how consumers react to a product with health claims on the front label as compared to a product with no claim. The claims

tested are those that are allowed by FDA regulations. By providing health information on product labels (i.e., health claims), consumers may be induced to more carefully scrutinize information on the Nutrition Facts panel. This prediction is consistent with an advertising-evidence interaction model suggested by Deighton (1984) and the confirmatory bias model discussed in Ford et al. (1996). Through exposure to information at different periods, consumers tend to form an expectation at an early stage of communication. Consumers then will try to confirm the expectations upon exposure to more objective information. Thus, if the information on the front label increases elaboration likelihood, participants in randomly assigned conditions are more likely to differentiate between healthy and unhealthy products. A finding of greater elaboration would suggest that certain kinds of information on the front product label can help consumers make better choices (rather than hinder or have no influence).

H1: *Participants who are exposed to an explicit health claim will evaluate the Nutrition Facts information more extensively than participants who are exposed to no such claims.*

It is also possible that that the presence of explicit claims reduces the extent of elaboration. In such a case, the information on the front label may be used as a simple cue.

H2: *Participants will use health claims on the front label as a simple cue. Thus, their evaluation of product quality will only rely on health and nutrition information on the front label.*

2.5.1 Methodology

2.5.1.1 Product and Stimuli

This study used a still hypothetical functional food product that is in a research and development phase, tomato juice containing soy protein. It has been shown that lycopene and isoflavones, which can be found in tomato and soy products, respectively, independently help prevent the risk of several maladies including prostate cancer and heart disease (Nguyen and Schwartz 1999; Sirtori and Lovati 2001). Giovannucci et al. (2002) conducted a longitudinal survey study during 1988 to 1998 with 51,529 U.S. male health professionals aged 40-75 years and reported that frequent consumption of tomato products is associated with a lower risk of prostate cancer. Brouns (2002) indicated the link between the consumption of soy isoflavones and the prevention of several diseases, including heart disease, type II diabetes, osteoporosis, and certain cancers. It is expected that the consumption of tomato products containing soy should help promote good health and/or reduce the risk of having these diseases, perhaps in a synergistic manner. Front labels and Nutrition Facts panels for this tomato juice containing soy were created. The front labels were designed to simulate typical front panels found on commercially available tomato juice products and the Nutrition Facts panels were designed to resemble nutrition information displays.

The previously discussed health and nutrition claim literature selected information about health benefits that was consistent between the front label and the Nutrition Facts panel. Our study, however, looks at cases where information from the two sources is unrelated. The two portions of the label provide completely separate sets of information regarding health benefits. The focus on the front label is on the benefit of lycopene and isoflavones (not listed on the Nutrition Facts panel), whereas the level of calories, carbohydrate, fat, and sodium are varied in the Nutrition Facts panel. This design permits an assessment of a broader measure of diet quality distinct from the claims. It is interesting to examine how consumers evaluate information from two different sources and determine whether benefits from the front panel can mask negative attributes shown on the Nutrition Fact panel.

In addition, many studies have examined effects of a single relatively well known health claim such as foods low in saturated fat and low cholesterol linked to a lower risk of coronary heart disease and/or high in fiber to a lower risk of some cancers. Lesser well known health claims may interact differently with nutrition information. How various types of health claims and different levels of nutrition information influence consumer's attitudes, intentions, and perceptions of disease risk should be explored for a range of products and contexts (Mitra et al. 1999; Kozup et al. 2003). As a result, this study uses less known health benefits (i.e., high in lycopene linked to a lower risk of prostate cancer). Also, this study examines how dual/synergistic health benefits play a role in consumer's product evaluations. This is relevant as the functional food environment is increasingly

complex with multiple food attributes delivering a range of health benefits in a single food.

2.5.1.2 Study Design

A 2 (claim information – control and health claim) x 2 (Nutrition Facts information – healthy and unhealthy version) between-subjects factorial design was applied. A controlled and randomized experimental design was employed with all independent variables manipulated and controlled - participants were randomly assigned to different conditions. Health claims were manipulated to contain explicit relationships between nutrients and diseases (i.e., "*According to the FDA, diets low in saturated fat and cholesterol that include 25 grams of soy protein a day may reduce the risk of heart disease*" and "*This product contains high levels of lycopene, and it may reduce the risk of prostate cancer*"). These are real and hypothetical health claims, respectively. This approach mirrors food science, nutrition and medical research efforts to explore the synergistic versus antagonistic impacts of multiple functional attributes in a food matrix as opposed to pharmaceutical delivery.

Information on the Nutrition Facts panel was manipulated representing a "healthy" and an "unhealthy" version. It is noted that these nutrient levels may not be realistic; this is an attempt to vary information so that the perception of nutrient levels significantly differs between the two versions. The healthy version had low calories (60g), low sodium (480mg), low carbohydrate (13g), low sugar (10g), and high Vitamin C (170% daily value). The unhealthy version had high calories (400g), high sodium

(1080mg), high carbohydrate (26g), high sugar (150g), and low Vitamin C (10% daily value). Both macro and micro nutrients were manipulated. Examples of stimulus materials are shown in APPENDIX C and APPENDIX D.

2.5.1.3 Pretest

A pretest was conducted in a separate experiment to determine consumers' perceptions of health and nutrition information on the front label and of the overall nutritional profile of the Nutrition Facts panels. Sixty seven students were presented with one of two different front labels of tomato juice containing soy (control or health claim) and one of two different versions of Nutrition Facts panel (unhealthy or healthy). These stimuli were shown on a computer screen following which participants were asked a series of questions about their perceptions of the nutrition and health information provided on the label and of product quality.

Two questions were asked to compare the information level and product benefits between the control and product with a health claim (i.e., "*this product packaging provides me enough information about the health benefits of this product*" and "*this product packaging provides me with sufficient information about product benefits to get me to purchase the product*") using seven-point scales (1=strongly disagree; 7=strongly agree). It is shown that participants received more information from the health claim than from the control (*t*-values = 2.45 for the first question and 2.55 for the second question; $p < .01$ for each).

Two other questions were asked to assess how participants evaluate the overall nutrient levels on the Nutrition Facts panel (i.e., "*how do you rate the nutritional profile of this product?*" again using seven-point scales (1=very bad; 7=very good) and "*how healthy do you believe this product's nutritional profile to be?*" (1=very unhealthy; 7=very healthy)). It is also shown that consumers perceived the product with a healthy version of Nutrition Facts panel to be better and healthier than the unhealthy version (t-values = 6.82 and 5.93, respectively; $p < .001$ for each).

Findings from this pretest confirmed that consumers receive more nutrition and health information about product benefits from the health claim than from the control version, based on the stimuli material. Also, the manipulation of nutrient levels in the Nutrition Facts panel was sufficient to affect consumers' perceptions of product quality.

2.5.1.4 Participants and Procedures

Two hundred and eight undergraduate students at a Midwestern university participated in the study, receiving extra credit for a Marketing class. They were told that "*they will read about and provide their opinion of food products*" when signing up for the study. Using computer-based assessments, participants were randomly assigned to different versions of the stimuli, but were not directed to pay particular attention to any specific part of the package information. The instructions were "*you will view labels and information about products. Imagine that you are seeing these products in the aisle of your local grocery store. Feel free to spend as little or as much time as you like viewing the information*." The front label and the Nutrition Facts panel of two products, cereal

and orange juice, were shown before participants were exposed to the labels of the product of interest. The front label was shown first, followed by the Nutrition Facts panel. Once participants finished looking at the stimulus material, the information was removed and a series of questions were asked.

2.5.1.5 Dependent Variables

2.5.1.5.1 Attitude toward the Product

One dependent variable employed in this study is a multi-item measure of overall attitude toward the product, a general evaluation of product quality. As suggested by Petty and Cacioppo (1986a), attitude can be used to measure the effect of persuasion, via the presentation of a message, on an individual's evaluation of a product. The relative effect of persuasion on changes in attitude can be measured by differences in attitude scores between conditions. The random assignment of participants to various conditions assures that on average participants in each condition begin with the same attitude.

Five items were measured, with attitude derived from the mean score. *I feel this tomato juice is* (1= very bad; 7= very good); *My opinion of this tomato juice is* (1= extremely unfavorable; 7= extremely favorable); *Consuming this tomato juice is likely to be* (1= extremely unpleasant; 7= extremely pleasant); *Consuming this tomato juice is likely to be* (1=harmful; 7= beneficial); *My attitude toward this tomato juice is?* (1= extremely negative; 7= extremely positive). Seven-point scales were used for each item where higher scores reflected higher construct values. The items used to measure attitude had a coefficient alpha of 0.82.

2.5.1.5.2 Cognitive Responses

This study used a thought-listing procedure to measure cognitive responses. Participants were instructed to type any thoughts that occurred to them. These thoughts can be classified and analyzed to determine how the label is being processed and assimilated by consumers (Wansink, 2003). Each response was separated into individual thoughts and coded by two judges. The judges were blind to the hypotheses and the treatment conditions (Cacioppo and Petty, 1981b; Sujan, 1985). Any disagreements or coding discrepancies were resolved through discussion.

In this study, these thoughts are coded as favorable and unfavorable thoughts (Cacioppo and Petty, 1981a). Favorable thoughts are statements that are positive toward or supportive of a referent. These statements mention specific desirable attributes or positive associations (e.g., low calories, low sodium, and low sugar). This category also includes statements that support the validity or value of the situation or stimulus and statements of positive affect about the referent (e.g., healthy, good, nutritious). Unfavorable thoughts are statements that are negative toward or in opposition to the referent (e.g., high calories, high sodium, and high sugar). These statements include the referent that mentions specific undesirable attributes or negative associations, challenges to the validity of the situation or stimulus (e.g., unhealthy, bad for you).

A ratio score is derived where the numerator is the difference between favorable and unfavorable thoughts and the denominator is the total thoughts (Cacioppo and Petty, 1981a). In order to adjust for individual differences in the number of thoughts, scores were divided by the total number of thoughts (Krohne et al., 2002). As suggested by

Amsel and Fichten (1990), a small positive constant (i.e., 1.0) is added to the denominator when the value approaches zero in the application of many non-linear transformations. Such a correction is generally applied equally across the entire set of the data when undefined or undifferentiated by the lack of thoughts of one valence.

$$Index\ Ratio = \frac{Positive\ Thoughts - Negative\ Thoughts}{(Positive\ Thoughts - Negative\ Thoughts) + 1} \quad (2.1)$$

$$Positive\ Thought\ Index = \frac{Positive\ Thoughts}{(Positive\ Thoughts - Negative\ Thoughts) + 1} \quad (2.2)$$

$$Negative\ Thought\ Index = \frac{Negative\ Thoughts}{(Positive\ Thoughts - Negative\ Thoughts) + 1} \quad (2.3)$$

2.5.1.6 Statistical Methods

A univariate analysis of variance (ANOVA) was conducted to test the main effect and interaction effect among independent variables on each dependent variable (i.e., attitude toward the product and the index ratio). The statistical package employed for this analysis is SAS 8.2 applying the GLM procedure (Hatcher and Stepanski 1994). This procedure is chosen because this study design involves unbalanced data for different conditions.

2.5.2 Results

2.5.2.1 Attitude toward the Product

As shown in table 2.1, results were analyzed using ANOVA with two between-group factors. This reveals a significant interaction effect between the presence of a health claim and argument quality on the Nutrition Facts panel for all observations, $F(1,204) = 10.66$, $p = .001$, the nature of the interaction is displayed in figure 2.1. Subsequent analyses indicated that there was a simple effect for argument quality when participants were exposed to the health claim, $F(1,104) = 15.08$, $p < .001$. As shown in figure 2.1, participants reacted differently to the two versions of the Nutrition Facts panel such that the mean attitude scores were higher with the healthy version and lower with the unhealthy version. The simple effect of argument quality when participants were exposed to the control proved to be non-significant, $F(1,100) = 0.57$, $p = .45$.

The means and standard deviation of the attitude measure, and numbers of participants for each condition, are shown in table 2.2. The significant interaction effect implies that a health claim on the front label tends to moderate the way participants evaluate the product. When participants received a healthy version of the Nutrition Facts panel, their attitude toward the product was more favorable when a health claim was present on the front label ($M = 4.80$) than when there was no claim ($M = 4.23$; $F(1,103) = 7.20$, $p = .008$). In contrast, when participants received an unhealthy version of the Nutrition Facts panel, their attitude toward the product was less favorable when a health claim was present on the front label ($M = 3.99$) than when there was no claim ($M = 4.39$; $F(1,101) = 3.71$, $p = .05$).

2.5.2.2 Cognitive Responses

The ANOVA results for the cognitive response data show similar patterns as the measure of attitude toward the product. This reveals a significant interaction effect between the presence of a health claim and argument quality on the Nutrition Facts panel for all observations, $F(1,204) = 3.81$, $p = .05$. The nature of the interaction is displayed in figure 2.2. Subsequent analyses indicated that there was a simple effect for argument quality when participants were exposed to the health claim, $F(1,104) = 24.73$, $p < .001$ and to the control version, $F(1,100) = 4.94$, $p = .03$. As shown in figure 2.2, participants reacted differently to the two versions of the Nutrition Facts panel such that the mean scores of the index of cognitive responses was higher with the healthy version and lower with the unhealthy version.

When participants received a healthy version of the Nutrition Facts panel, their index ratio of cognitive responses was higher when a health claim was present ($M = 0.66$) than when there was no claim ($M = 0.48$; $F(1,101) = 8.39$, $p = .005$). The correlation coefficients between attitude scale and index ratio are also calculated for each group, see table 2.3. Results suggested that the attitude score and thought index were more highly correlated for those who received a health claim on the front label ($r = 0.51$) than the same correlation for the control group ($r = 0.20$).

The difference between the correlation coefficients for the two groups was statistically significant ($p < 0.05$). Further analyses suggested that participants tended to generate more **positive** thoughts and less **negative** thoughts about the message when there was a health claim on the front label than when there was no claim, see table 2.2.

However, the same pattern did not exist when participants received an unhealthy version of the Nutrition Facts panel.

2.5.3 Discussion

The results from this study suggest that consumers more carefully evaluate product quality when a health claim is present on the product label than when there is no claim. Consumers are likely to pay more attention to information shown on the Nutrition Facts panel when they are exposed to a health claim on the front label. This evidence suggests that health and nutrition information on the front label induces consumers to more carefully scrutinize the information on the Nutrition Facts panel, which supports the first hypothesis. If it appears that a product is healthy based on nutrient levels, consumers will be more favorable and have more positive thoughts about the product. Meanwhile, if consumers realize that the product is unhealthy based on nutrient levels, consumers will be less favorable and have more negative thoughts when evaluating the product.

Since consumers react negatively to the product when the information from two sources are incongruent (i.e., the health claim on the front label suggests the benefits of the product, whereas nutrient levels as listed on the Nutrition Facts panel are not healthy), no evidence suggests that health and nutrition information on the front label serves as a peripheral cue. The second hypothesis is hence rejected. It can be implied from this study that health and nutrition information on the front label tends to enhance consumers' elaboration process when determining product quality. When a health claim is present on the front label, as compared to labels with no claim, consumers tend to pay more

attention to other sources of information e.g., the Nutrition Fact panel, perhaps to confirm their expectations about product quality developed from information on the front label (Deighton 1984). However, in reality, there are different types of claims allowed on food labels (e.g., nutrient content claims, structure/function claims, and health claims). It is thus interesting to examine how consumers react to different types of claims on the front label, which leads to study 2.

2.6 STUDY 2: COMPARING NUTRIENT CONTENT CLAIMS AND HEALTH CLAIMS

The second study examines how consumers react to different types of claims on the front label (i.e., nutrient content claim and health claim). Nutrient content claims include simple information about the nutritional profile of the product, whereas health claims contain more explicit descriptions of relationships between nutrients and diseases.

The next hypothesis tests the role on elaboration processing of the explicitness of health and nutrition information on the front label. By providing more explicit health information on product labels, consumers may be induced to more carefully scrutinize information on the Nutrition Facts panel, which is again used as an argument quality manipulation.

H3: *Participants who are exposed to a health claim will look at the Nutrition Facts information more carefully. Thus, they will react more positively to the healthy version of Nutrition Facts and more negatively to the unhealthy version of*

Nutrition Facts compared to those participants who are exposed to a nutrient content claim.

Regardless of how the information is processed, as argument scrutiny is reduced, a peripheral cue becomes more of an important determinant of persuasion. The next hypothesis explores the role of claims on persuasion as peripheral cues.

H4: *When a more explicit claim (i.e., health claim) is present, participants will take this as a cue without further elaborative processing.*

2.6.1 Study Design

A 2 (claim information) x 2 (Nutrition Facts information) between-subjects factorial design was applied. Two versions of claim information were manipulated, including a joint nutrient content claim and a joint health claim. The nutrient content claim included information on the relative nutrient content in addition to product information, i.e., *high in lycopene and isoflavones*, whereas the health claim contained explicit relationships between nutrients and diseases (the health claim version is the same as study 1). One hundred and ninety-two undergraduate students at a Midwestern university participated in the study, receiving extra credit for a Marketing class. The study procedure was the same as study 1.

2.6.2 Pretest

A pretest was conducted in a separate experiment to determine consumers' perception of health and nutrition information on the front label, comparing nutrient content and health claims. Two hundred and two undergraduate students were presented with one of two different front labels of tomato juice containing soy (nutrient content claim or health claim). Similar to study 1, two questions were asked to compare the information level of product benefits (i.e., "*this product packaging provides me enough information about the health benefits of this product*" and "*this product packaging provides me with sufficient information about product benefits to get me to purchase the product*") using seven-point scales (1=strongly disagree; 7=strongly agree). This showed that participants receive more information from the health claim than from the nutrient content claim (*t*-values = 3.74 for the first question and 5.06 for the second question; $p < .001$ for each). Findings from this pretest confirmed that consumers receive more nutrition and health information about product benefits from the health claim than from the nutrient content claim, based on the stimuli.

2.6.3 Results

2.6.3.1 Attitude toward the Product

As shown in table 2.4, results were analyzed using ANOVA with two between-group factors. The means and standard deviation of the attitude toward the tomato juice, as well as numbers of participants for each condition, are shown in table 2.5. These results reveal a significant interaction effect between claim types and information on the

Nutrition Facts panel, $F(1,188) = 5.39$, $p = .021$, with the nature of the interaction displayed in figure 2.3. Subsequent analyses indicated that there was a simple effect for argument quality when participants were exposed to a health claim, $F(1,100) = 14.22$, $p < .001$. As shown in figure 2.3, participants reacted differently to the two versions of Nutrition Facts panel such that the mean attitude scores were higher with the healthy version and lower with the unhealthy version. The simple effect for information on Nutrition Facts panel when participants were exposed to the nutrient content claim proved to be non-significant, $F(1,88) = 0.40$, $p = .53$. Data reveals that when participants received an unhealthy version of the Nutrition Facts panel, their attitude was less favorable for the product with the health claim ($M = 3.83$) on the front label than for the product with a nutrient content claim ($M = 4.36$; $F(1,88) = 5.12$, $p = .026$).

2.6.3.2 Cognitive Responses

The ANOVA results for the cognitive response data had a similar pattern as the attitude measure, see table 2.4. This reveals a significant interaction effect between claim type and argument quality on the Nutrition Facts panel for all observations, $F(1,188) = 12.34$, $p = .001$. The nature of the interaction is displayed in figure 2.4. Subsequent analyses indicated that there was a simple effect for argument quality when participants were exposed to a health claim, $F(1,100) = 95.14$, $p < .001$ and to a nutrient content claim, $F(1,88) = 10.49$, $p = .002$. Participants reacted differently to the two versions of the Nutrition Facts panel such that the mean scores of the index of cognitive responses was higher with the healthy version and lower with the unhealthy version (figure 2.4). The

correlation coefficient between the attitude score and thought index for those who received a health claim was also higher than those who received a nutrient content claim, see table 2.6. Additionally, with a healthy version of the Nutrition Facts panel, participants tended to generate more **positive** thoughts when a health claim was present ($M = 0.48$) than when a nutrient content claim was present ($M = 0.31$; $F(1,100) = 6.33$, $p = .013$). In contrast, with an unhealthy version of Nutrition Facts panel, participants tended to generate more **negative** thoughts when a health claim was present ($M = -0.23$) than when a nutrient content claim was present ($M = 0.01$; $F(1, 88) = 5.98$, $p = .016$).

2.6.4 Discussion

The results of this study are consistent with those of study 1; consumers more carefully evaluate product quality when a health claim was present than when a nutrient content claim was present. This evidence supports the third hypothesis that **more explicit** health information (i.e., health claim) induces consumers to more carefully scrutinize the information on the Nutrition Facts panel. Also, no evidence suggests that such explicit health claims serve as a peripheral cue; that is the fourth hypothesis is rejected. Consumers react more favorably and generate more positive thoughts when they realize that the product is, in fact, healthy based on the nutrient levels presented on the Nutrition Facts panel. In contrast, they react less favorably and generate more negative thoughts when they find out that information from two sources (i.e., front label and Nutrition Facts panel) are incongruent.

2.7 GENERAL DISCUSSION AND CONCLUSIONS

This paper examines the role of health and nutrition information on food labels on consumer evaluations of product quality. By manipulating nutrient levels in the Nutrition Facts panel, we are able to investigate how consumers use information on the front label and how such information affects evaluations of product quality. It is shown that consumers more carefully evaluate product quality when a health claim is present compared to labels with no claim or when a nutrient content claim is present. Consumers pay more attention to information shown on the Nutrition Facts panel when they are exposed to a health claim on the front label. Thus, following the ELM framework, this health claim is likely to enhance consumers' elaboration process when assessing product quality.

The results from this research are different from previous studies in the literature (Ford et al. 1996; Garretson and Burton 2000; Keller et al. 1997; Kozup et al. 2003; Mitra et al. 1999). Most prior experimental studies suggested that health and nutrition messages on the front label do not play a role in inducing (or reducing) the elaboration process nor serve as a cue. These studies suggest that consumers tend to rely only on nutrition information on the Nutrition Facts panel. It is worth mentioning that the time frame of these studies is relatively long, starting before the NLEA regulation was implemented. The effect of nutrition information on individual dietary behavior may vary over time due to a heightening awareness of diet-disease relationships, improving attitudes about healthy eating, and an evolving knowledge of food compositions that lead to better food choices (Jensen, Kesavan, and Johnson 1992; Kinnucan and Venkateswaran 1990).

Furthermore, the response to product labels may have evolved over time, as consumers become more familiar with NLEA labels – particularly standardized health claims and the Nutrition Facts panel. In fact, such familiarity with the labeling format may trigger consumers to pay less attention to health and nutrition information on food labels. Such divergent results from previous studies clearly require further exploration to assess to what extent consumers react differently to various health and nutrient content claims.

Even though Roe et al. (1999) suggested that respondents tend to truncate information search to the health claim on the front label, it is important to note that their study used a different approach to examine how consumers evaluate health and nutrition information on product labels. Their study focused on the effect of a claim on the actual search behavior and not persuasion as measured by attitudes toward the product. Moreover, many of the previous studies used claims which were familiar to consumers (i.e., does your heart good as a health claim or 99% fat free and low fat for a nutrition claim), whereas this paper focuses on the health benefits of lycopene and isoflavones, which may be less familiar to consumers. As suggested by Mitra et al. (1999) and Kozup et al. (2003), consumers' responses to health and nutrition information may be different when health and nutrition claims are less familiar.

This evidence confirms the argument of Ippolito and Mathios (1991) regarding labeling policy - that producers should be allowed to promote truthful health and nutrition information to consumers, though such claims should be regulated to avoid deceptive or misleading practices. One of the advantages of permitting producers to make health claims is the potential to utilize the resources of the private sector in an effort to educate

the public about diet and disease linkages. By allowing claims on product labels producers can use health attributes to compete with others. Policymakers therefore provide an incentive to producers to develop and market more healthful food products. Producers have an incentive to improve the health characteristics of their products and thus should be willing to bear the expense of communicating health messages to consumers.

Independent Variable	Degree of Freedom	Attitude Toward the Product		Cognitive Response	
		F-Value	Pr > F	F-Value	Pr > F
Main Effect					
Health Claim	(1, 204)	0.34	0.559	2.42	0.122
Nutrition Facts Panel	(1, 204)	4.79	0.029	25.90	0.001
Interaction Effect					
Claim x Nutrition Facts	(1, 204)	10.66	0.001	3.81	0.052

Table 2.1: ANOVA Results – Study 1

Attitude Toward the Product	Nutrition Facts Panel					
	Unhealthy Version			Healthy Version		
	Means	Standard Deviation	n	Means	Standard Deviation	n
Control	4.39	0.92	47	4.23	1.16	55
Health Claim	3.99	1.13	56	4.80	0.99	50

Cognitive Response	Control		Health Claim		Group Difference
	Means	Standard Deviation	Means	Standard Deviation	t-value
Unhealthy Version					
Positive Thought Index	0.592	0.185	0.576	0.220	0.38
Negative Thought Index	0.267	0.167	0.272	0.239	0.12
Healthy Version					
Positive Thought Index	0.675	0.189	0.766	0.119	2.98**
Negative Thought Index	0.191	0.184	0.104	0.121	2.88**

Table 2.2: Descriptive Statistics – Study 1

	Correlation Coefficient Between Attitude and Cognitive Response (Index Ratio)	*Z*-Score	*p*-value
Control (n = 102)	0.198	-2.55	0.011
Health Claim (n = 106)	0.508		

Note: $Z-score=\frac{z_1^{'}-z_2^{'}}{\sqrt{\frac{1}{n_1-3}+\frac{1}{n_2-3}}}$ where $z_i^{'}=0.5\left[\ln(1+r_i)-\ln(1-r_i)\right]$

(see Cohen et al., 2002)

Table 2.3: Test of Correlation Coefficient Difference between Control Group and Health Claim

Independent Variable	Degree of Freedom	Attitude Toward the Product		Cognitive Response	
		F-Value	Pr > F	F-Value	Pr > F
Main Effect					
Claim Type	(1, 188)	1.09	0.296	0.25	0.620
Nutrition Facts Panel	(1, 188)	10.09	0.002	75.09	0.0001
Interaction Effect					
Claim x Nutrition Facts	(1, 188)	5.39	0.021	12.34	0.001

Table 2.4: ANOVA Results – Study 2

Attitude Toward the Product	Nutrition Facts Panel					
	Unhealthy Version			Healthy Version		
	Means	Standard Deviation	n	Means	Standard Deviation	n
Control	4.36	1.09	44	4.50	0.94	46
Claim Type	3.82	1.15	46	4.70	1.18	56

Cognitive Response	Nutrient Content Claim		Health Claim		Group Difference
	Means	Standard Deviation	Means	Standard Deviation	t-value
Unhealthy Version					
Positive Thought Index	0.347	0.269	0.206	0.235	2.63**
Negative Thought Index	0.339	0.272	0.431	0.245	1.68*
Healthy Version					
Positive Thought Index	0.449	0.272	0.551	0.233	2.00**
Negative Thought Index	0.143	0.194	0.069	0.144	2.12**

Table 2.5: Descriptive Statistics – Study 2

	Correlation Coefficient Between Attitude and Cognitive Response (Index Ratio)	*Z*-Score	*p*-value
Nutrient Content Claim (n = 90)	0.405	-1.71	0.087
Health Claim (n = 102)	0.592		

Note: $Z-score=\frac{z_1^{'}-z_2^{'}}{\sqrt{\frac{1}{n_1-3}+\frac{1}{n_2-3}}}$ where $z_i^{'}=0.5\left[\ln(1+r_i)-\ln(1-r_i)\right]$

(see Cohen et al., 2002)

Table 2.6: Test of Correlation Coefficient Difference between Nutrient Content Claim and Health Claim

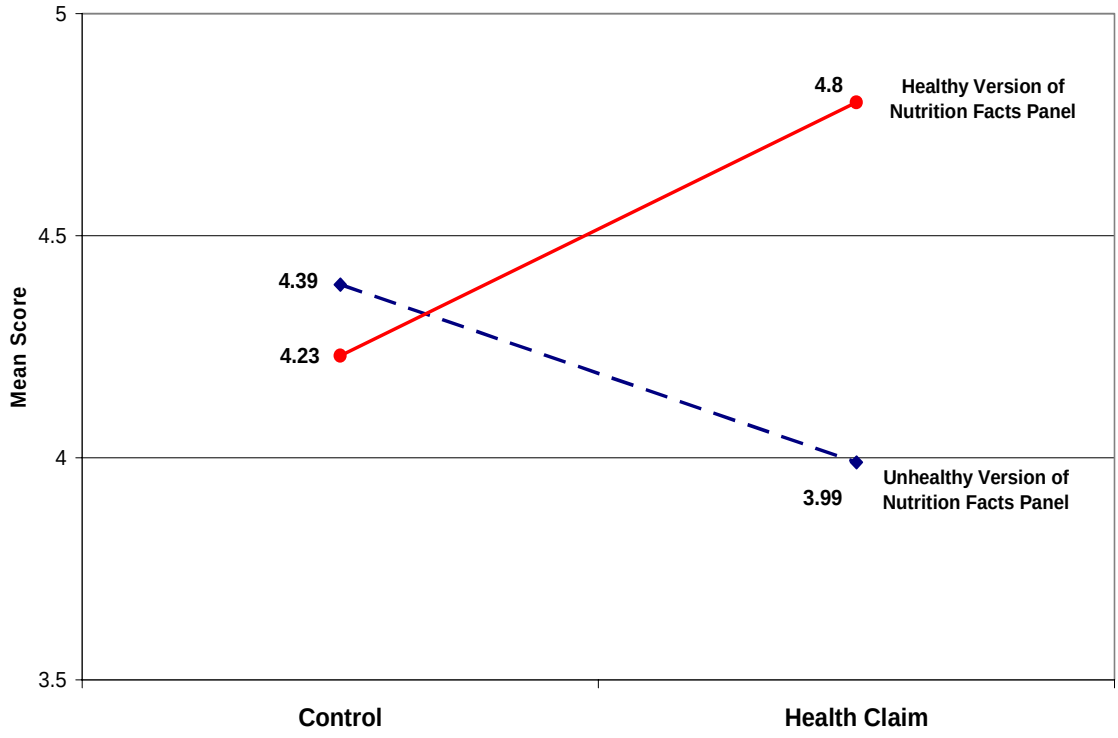

Figure 2.1: Mean Attitude Scores - Comparing Control and Health Claim

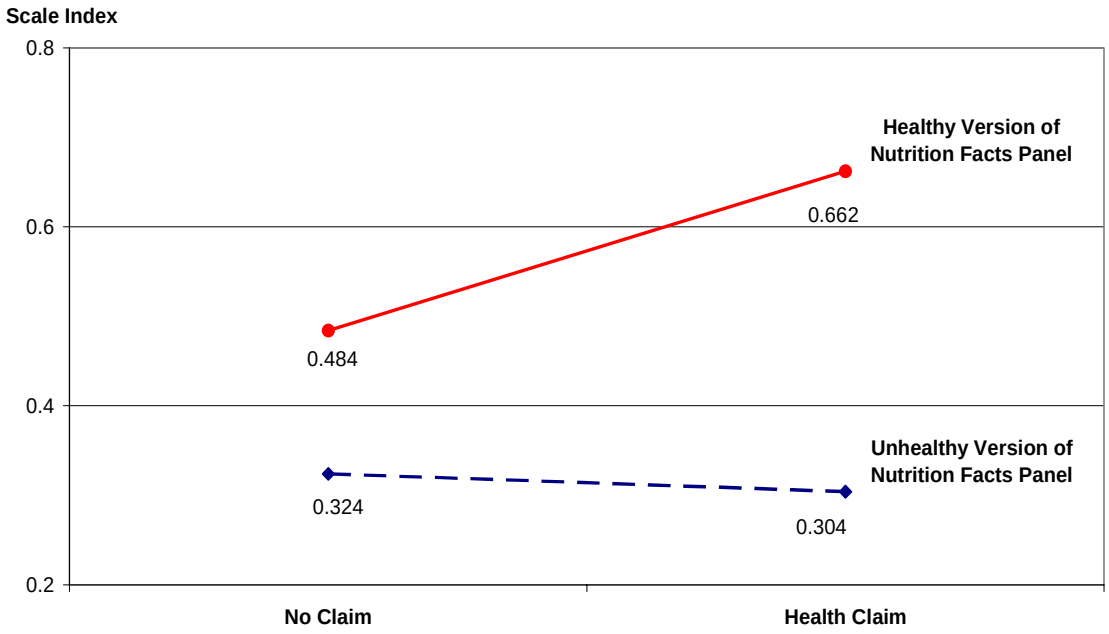

Figure 2.2: Mean Cognitive Response Scores - Comparing Control and Health Claim

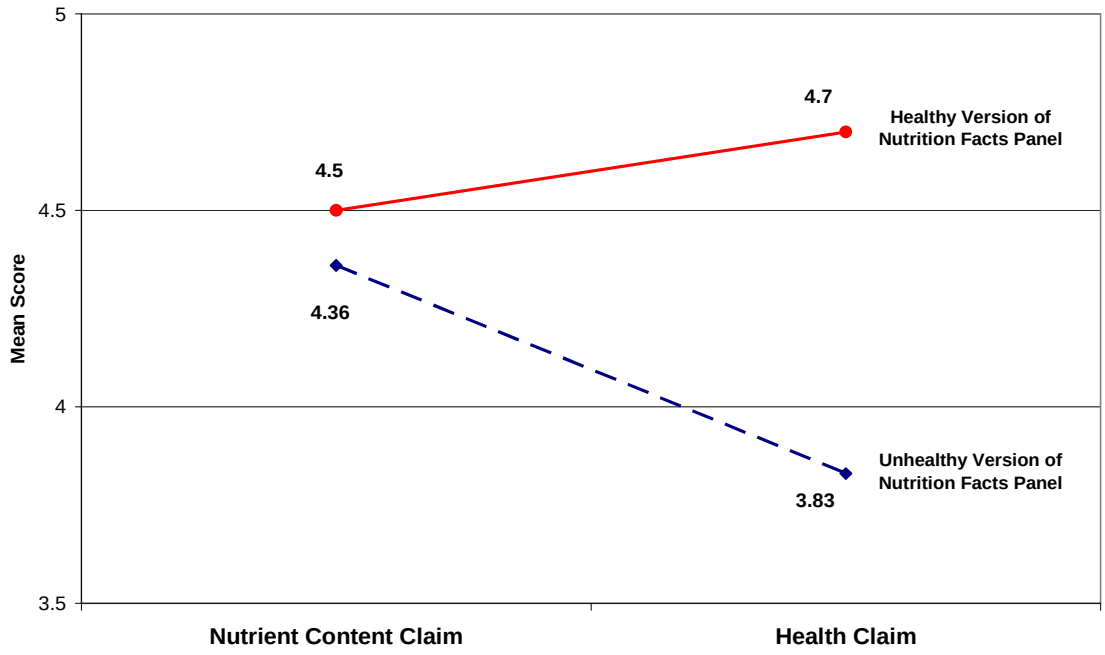

Figure 2.3: Mean Attitude Scores - Comparing Nutrient Content and Health Claims

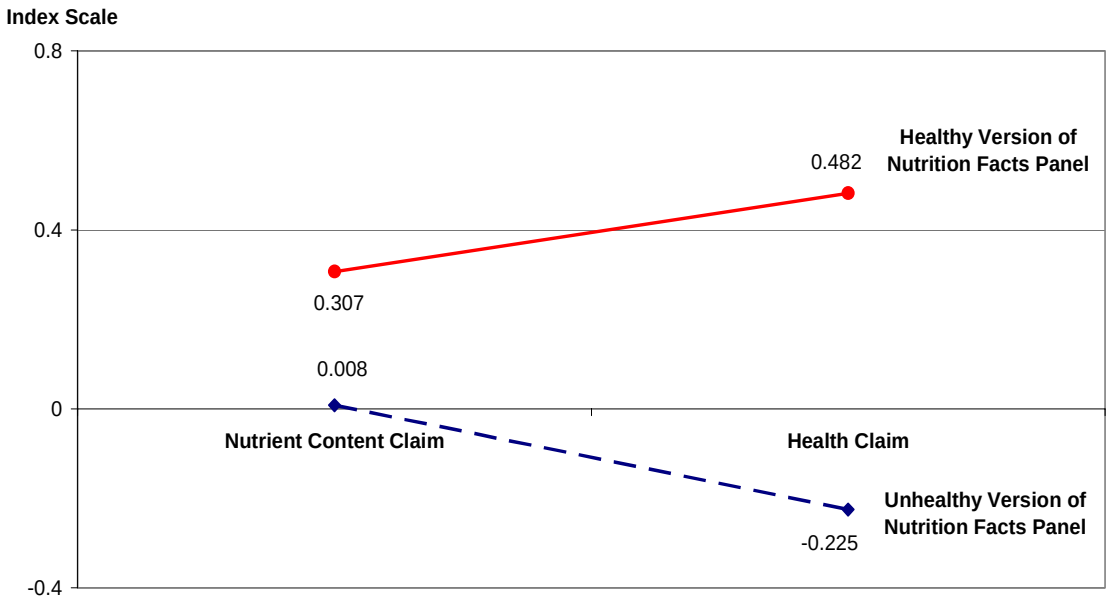

Figure 2.4: Mean Cognitive Response Scores - Comparing Nutrient Content and Health Claims

ESSAY 3

DO CONSUMERS UNDERSTAND QUALIFIED HEALTH CLAIMS? EVIDENCE FROM EXPERIMENTAL STUDIES

3.1 INTRODUCTION

The Food and Drug Administration (FDA) recently amended the way health claims on labels of conventional food and dietary supplements are reviewed. The *Pearson v. Shalala* decision had a significant impact on the way FDA regulates claims for foods and dietary supplements (Emord, 2000). With this court ruling, FDA is under a legal obligation to allow consumer access to truthful and non-misleading health claims. Meanwhile, FDA may mandate a disclaimer to clarify that the agency has not evaluated the claim. Qualified health claims are now permitted with "disclaimers" describing the weight of scientific evidence upon which the claim is based. FDA is also considering the use of visual aides such as a "report card" indicating different levels of claims. Previously, regulatory approval of a claim required "significant scientific agreement (SSA)" of the evidence as reviewed by expert panels. The new policy allows other claims to be made based on different levels of scientific support below the SSA standard.

The policy goal is to encourage firms to make accurate, science-based claims about the health benefits of their products while helping consumers prevent disease and

improve their health through sound dietary decisions using emerging improved nutrition information. This marks a break from the previous environment where a lengthy approval process was argued to provide a roadblock for food firms wanting to market foods with additional health benefits based on emerging evidence of diet to health links. Certain consumer advocacy groups, such as the Consumer Federation of America (CFA) and the Center for Science in the Public Interest (CSPI), are opposed to the new policy, suggesting that consumers will not be able to correctly differentiate the claims and will be misled into purchasing items with a health claim which has not yet passed sufficient scientific scrutiny (CFA, 2003; CSPI, 2003). FDA thus must ensure that the new policy, though it requires less scientific evidence, does not result in more misleading or false health claims.

The objective of this paper is to examine whether consumers can differentiate between the multiple levels of qualified health claims, specifically the new disclaimer language, and how consumers use a report card to help understanding the different levels of scientific evidence supporting such claims. Understanding how consumers use health and nutrition information on product labels has implications for both public policy and food managers who use health claims as tools to market their products. Additionally, this study aims to determine whether the new policy meets its objectives in providing better health information to consumers while encouraging food manufacturers to develop and introduce more healthy foods. The following section provides a background on the FDA's policy change in food labeling. The literature review and methodology are then discussed, and results and implications to public policy and marketing are presented.

3.2 FDA'S POLICY CHANGE – QUALIFIED HEALTH CLAIMS

Over the last fifteen years, FDA developed two significant policies, the *Nutrition Labeling and Education Act* (NLEA) of 1990 and the *FDA Modernization Act* (FDAMA) of 1997, to regulate health and nutrition information on food labels. Two primary goals of these regulations are to reduce consumer confusion regarding health and nutrition claims made by food manufacturers and to ensure that such claims are truthful and do not mislead consumers (Garretson and Burton, 2000). FDA's perspective is that health and nutritional information will educate consumers about the beneficial effects of certain substances in diets, which should lead to more informed food selections and more healthful consumption patterns (Ippolito and Mathios, 1993; Jensen and Kesavan, 1993). It has been shown that consumers acquire and comprehend more nutrition information following the introduction of the NLEA (Ippolito and Mathios, 1991; Moorman, 1996). Mojduszka and Caswell (2000) show that government intervention to mandate and regulate nutrition labels was necessary to ensure that more information was made available to consumers.

Recently, FDA amended the way health claims on labels of conventional food and dietary supplements are reviewed. The recommendation to allow qualified health claims was made in a task force report *Consumer Health Information for Better Nutrition Initiative* (FDA, 2003a). The Task Force was challenged to explore ways to help consumers obtain accurate science-based information about the health consequences of products. Another objective was to make available better, more easily understood, up-to-date information to consumers about how dietary choices can affect health. It also aims to

encourage companies to compete based on health and nutrition consequences, in addition to non-health-related features of products such as taste and ease of preparation (FDA, 2003b).

The resulting policy aims to provide a credible and effective framework that producers can use to apply or petition for qualified health claims. The review process of these claims will be conducted using expertise from the Agency for Healthcare Quality Research and other government agencies. All qualified claims must be pre-approved by FDA and meet a "weight of the scientific evidence" standard, including support by a credible body of scientific evidence. A petitioning company needs to demonstrate, based on a fair review by scientific experts of the totality of information available, that the weight of scientific evidence supports the proposed claim (FDA, 2002a).

Under the new policy, manufacturers of conventional foods and dietary supplements can petition FDA to allow claims explaining relationships between food substances and disease conditions even when scientific evidence does not meet the SSA standard (FDA, 2003c). With FDA's permission, qualified health claims will be ranked in different levels based on the quality and quantity of scientific evidence publicly available at the time a manufacturer submits a petition. The rank will be based on study design, study quality, and strength of the entire body of evidence. Those that meet the SSA standard, once called NLEA or FDAMA authorized claims, will now be called "unqualified health claims", in which no disclaimer is needed, and will be ranked at level "A". Qualified health claims will be ranked as levels B, C, or D when FDA concludes that scientific evidence is moderate, low, and extremely low as compared to the SSA

standard, respectively. In these cases, disclaimers are required to inform consumers about the different levels of scientific support (FDA, 2003d). Examples of these qualified health claims and disclaimers that FDA considers adopting are shown in table 3.1.

Several research questions need to be addressed given this new food policy. It is important to evaluate whether consumers accurately perceive the scientific evidence underlying a qualified health claim, and whether consumers can distinguish between the multiple levels of qualified claims (B, C and D). Even though many experimental studies have looked at how consumers react to health and nutrition information on the front label and Nutrition Facts panel, no study has yet discussed the impact on consumers of such messages or the long term impact of possibly contradictory information and disclosures. How will the lack of an authoritative evaluation of a health claim influence consumer's perceptions of the quality of label information? This study addresses these issues and provides preliminary evidence to FDA of how well consumers understand and use such qualified health claims on food labels.

3.3 LITERATURE REVIEW

Many experimental studies have been conducted to examine how consumers process and use information contained on the Nutrition Facts panel in conjunction with various nutrient and health claims on the front label (Bruck, Mitchell, and Staelin, 1984; Ford et al., 1996; Garretson and Burton, 2000; Ippolito and Mathios, 1990; Keller et al., 1997; Kozup, Creyer, and Burton, 2003; Mitra et al., 1999; Wansink, 2003). Participants in these studies varied from college students, professional staff, to typical shoppers, with

different modes of data collection applied such as classroom set ups, mall intercepts, or personal interviews. Broad ranges of dependent measures have been applied, including product belief, nutrition evaluation, attitude toward the product, and/or buying intention.

Evidence from these studies suggests that the information from both front label and Nutrition Facts panel has a significant, but independent, effect on product evaluation. For instance, Ford et al. (1996) examined how a health claim influences the processing of nutrition information, using nutrient beliefs (i.e., heart, fat, sodium, and overall nutrition) as dependent variables. Respondents in the experiment were undergraduate and graduate students. Results suggest that respondents rated the product with a healthy version of nutrition facts higher than that with an unhealthy version and that there was no interaction effect between health claim and nutrition information on the Nutrition Facts panel on all dependent measures. This study supported the independent effect model, in which the effect of nutrition information on the Nutrition Facts panel on judgments was not influenced by the presence of a health claim.

The study by Roe, Levy and Derby (1999) nevertheless suggested that the presence of health and nutrient content claims on food packages induced respondents to truncate information search to the front label. They conducted a mall-intercept survey with real shoppers to examine how consumers acquired and used information from different areas of a food label. Regression results suggested that the presence of a health claim, and to a lesser extent a nutrient content claim, are significantly associated with a greater probability of search being limited to the front label (hereafter, truncated search) without considering information on the Nutrition Facts panel.

With regard to different types of claims (i.e., health claim and nutrient content claim), a review of past research reveals mixed results. Ippolito and Mathios (1990) examined the effect of information (health claims in advertising) on consumer behavior focusing on the ready-to-eat breakfast cereal market and found that health claims result in changes in consumer behavior whereas nutrient content claims did not. They suggested that the level of information needed depends on the underlying issues or benefits of products - whether they are well understood by consumers. Nonetheless, Roe et al. (1999) suggested that a nutrient content claim and health claim have similar practical effects on information processing and product evaluation. They suggested both claims tend to induce truncation. Health claims and nutrient content claims seem to provide the same effect on product evaluation and rating. It is shown that respondents did not gain more information from a health claim in the same manner as compared to a nutrient content claim. It is also suggested that the incremental information relayed by the health claim had little impact on behavior measures in this study.

The role of disclaimers has also been discussed in the literature, mostly in the realms of food advertisements and labeling of dietary supplements (Andrews, Burton, and Netemeyer, 2000; Andrews, Netemeyer, and Burton, 1998; Wright, 1997). Marketers use disclaimer footnotes to provide consumers with supplemental information. Such information is not regarded as a part of the central message, but is used instead to clarify claims made in the main ad copy. Disclaimers are traditionally used to make affirmative and/or objective statements about products rather than to alert consumers that claims have not been tested (Mason and Scammon, 2000). They are also used to correct prior

misleading advertising, to clarify agreements such as warranties or credit conditions, or to ensure that consumers have purchase-relevant information available prior to the transaction. Disclaimers are supposed to provide consumers with better information – more information than they might otherwise get from a promotional message and/or more precise information (Foxman, Muehling, and Moore, 1988)

Mason and Scammon (2000) conducted household interviews regarding labeling information on dietary supplements and reported that consumers are not aware of the disclaimer, mandated by the *Dietary Supplement Health and Education Act* of 1994 (DSHEA), nor do they draw logical conclusions using this information. Several consumers were unaware of the lack of substantiation of health claims either because they have never read such a disclaimer or they simply misread it and thought that the FDA had evaluated such claims. It is also shown that consumers tend to misinterpret the absence of disclaimers as FDA having approved that specific brand and having evaluated its claim. Foxman, Muehling, and Moore (1988) suggested that disclaimer information is unlikely to be adequately comprehended by consumers.

With the court's decision, the new role of disclaimers on food products is to inform consumers that claims have not undergone as rigorous evaluation and thus may not be as accurate or substantiated by as much reliable scientific evidence as traditional (A) claims. The concern with the new policy is that consumers may be confused because of their familiarity with health claims that have been substantiated. The qualified claims and mandated disclaimer language would appear together and give consumers conflicting and potentially confusing label information. There is little evidence in the literature to

predict if the FDA-proposed disclaimers will effectively reduce consumer confusion about potentially misleading health claims on food and supplement labels. It has been suggested that the disclaimers will be ineffective and that the court decision raises the possibility of further consumer confusion relative to disease claims and consumer confidence in information on labels (Mason and Scammon, 2000). Thus, further research is required to help policymakers and marketers better understand what (if anything) these disclaimers mean to consumers.

3.4 STUDY 1

The purposes of study 1 are to examine the effect on consumer behavior of various qualified levels of health claims and to determine whether consumers can differentiate multiple levels of claims, specifically using the new disclaimer language. A measure of attitude toward the product is used as a proxy of consumer behavior. Consumers' attitude can be used to predict consumer behavior when a history or past behavior is not available or no longer valid to forecast future behavior (Blackwell, Miniard, and Engel, 2001). To measure consumer understanding of qualified health claims, measures of confidence in the information on health claims and the expected health benefits of the product are used as indicators of whether consumers are able to distinguish the various levels of health claims. These measures are consistent with those included in FDA's consumer studies (FDA, 2003e).

This study uses a still hypothetical functional food product, a wheat cracker containing soy protein. It has been shown that soluble fiber and isoflavones, which can be

found in wheat and soy products, respectively, independently help prevent the risk of several diseases including cancer and heart disease. Several studies suggested high fiber products such as wheat crackers are associated with healthy outcomes, specifically a lower incidence of coronary heart disease and certain cancers (FDA 1998; Keenan, 2000). Brouns (2002) indicated the link between the consumption of soy isoflavones and the prevention of several diseases, including heart disease, type II diabetes, osteoporosis, and certain cancers. The consumption of wheat crackers containing soy should help promote good health and/or reduce the risk of having these diseases, perhaps in a synergistic manner. Front labels and the Nutrition Facts panel for this wheat cracker containing soy were created. The front labels were designed to simulate typical panels found on commercially available cracker products and the Nutrition Facts panel was designed to resemble nutrition information displays (see APPENDIX E and APPENDIX F).

3.4.1 Hypothesis Testing

The first hypothesis explores the role of qualified claim levels on the front label. It is hypothesized that consumers prefer health claims based on strong science, thus meeting the SSA standard, to qualified health claims with disclaimers or no claim.

H1: Participants will react more positively (higher score on the attitude measure) to stronger levels of qualified health claims and to unqualified claims (level A).

The other two hypotheses test whether participants are able to distinguish between the different levels of qualified health claims. This element of the study also aims to explore if qualified claims mislead consumers.

H2: Participants who receive a stronger claim (e.g., level A) rate their confidence in the information on health claims higher than those who receive a weaker claim (e.g., level D) on the front label.

H3: Participants who receive a stronger claim (e.g., level A) rate their perception of the health benefits of the product higher than those who receive a weaker claim (e.g., level D) on the front label.

3.4.2 Methodology

3.4.2.1 Study Design

A one-way between-subjects factorial design was applied with five versions of claim information on the front label (i.e., a control condition and four levels of health claims). A controlled and randomized experimental design was employed with all independent variables manipulated and controlled and subjects randomly assigned to different conditions. Each claim contained explicit relationships between nutrients and diseases i.e., isoflavones - heart disease and soluble fiber - cancers, but had different disclaimers explaining the level of scientific evidence supporting the claim. A report card was also included to inform consumers about the various claim levels, ranging from level

A to D (see APPENDIX E). Claims with level A have the strongest scientific evidence available, whereas claims with level D are based on very little scientific evidence to date. Information on the Nutrition Facts panel was also created to mimic a relatively healthy version of the product (see APPENDIX F). It has low calories (77 calories), low total fat (1g), low sodium (100mg), low carbohydrates (14g), low sugars (4g), and high dietary fiber (10g).

3.4.2.2 Pretest

A pretest was conducted using 102 undergraduate students. Each student was presented with one of the five different front labels of wheat crackers containing soy (a control condition and four versions of qualified health claims). Participants were asked to pay attention to the stimulus materials and to answer a series of questions about their perceptions of the health and nutrition information provided on the label, health benefits, and their evaluation of product quality.

Two questions were asked to compare the information level and product benefits among the various levels of claims (i.e., "*this product packaging provides me enough information about the health benefits of this product*" and "*this product packaging provides me with sufficient information about product benefits to get me to purchase the product*") using seven-point scales (1=strongly disagree; 7=strongly agree). These measures suggest that participants received more information from a health claim based on stronger science (i.e., level A) ($F(4,98) = 11.69$ for the first question and 8.47 for the second question; $p < .01$ for each). Findings from this pretest confirmed that consumers

learn about product benefits when health and nutrition information is present. Also, perceptions of health benefits and the level of trust and confidence in the information vary across claim levels.

3.4.2.3 Participants and Procedures

A hundred and eighty-six undergraduate students participated in the study, receiving extra credit for a Marketing class. They were told that "*they will read about and provide their opinion of food products*" when signing up for the study. Using a computer-based system, participants were randomly assigned to receive different versions of the stimuli, but were not directed to pay particular attention to any specific part of the package information. It is important to ensure that subjects are unaware of the study focus on the persuasion effect of the stimuli in order to avoid undue attention of the subjects' toward the stimuli (Petty and Cacioppo, 1986). The instructions were "*you will view labels and information about products. Imagine that you are seeing these products in the aisle of your local grocery store. Feel free to spend as little or as much time as you like viewing the information*."

The front label and Nutrition Facts panel of two products, yogurt and tortilla chips, were shown before participants were exposed to the label of the product of interest (crackers). The front label was shown first, followed with the Nutrition Facts panel. Once participants finished looking at the stimulus material, the information was removed and a series of questions were asked.

3.4.2.4 Dependent Variables

Several multi-item scales are used as dependent variables, including attitude toward the product, confidence in the information on health claims, and perception of health benefit, see table 3.2. These measures are applied to determine whether consumers can distinguish between the various claim levels. Seven-point scales were used for each item where higher scores reflect higher construct values. The mean score is calculated for each measure. The coefficient alpha for each measure is greater than 0.80. A multivariate analysis of variance (MANOVA) and a univariate analysis of variance (ANOVA) are conducted to test main and interaction effects among independent variables on a dependent variable using the GLM procedure in SAS 8.2 (Hatcher and Stepanski, 1994).

3.4.3 Results and Discussion

Cell means and statistical results from MANOVA and ANOVA are shown in table 3.3 and table 3.4, respectively. Results from one-way MANOVA, between-groups design reveals a significant multivariate effect for attitude toward the product, confidence in the information on health claims, and perception of health benefits of the product, Wilks' lambda = 0.89, F(12,173) = 0.89; p = 0.06.

Follow-up univariate analyses reveals a significant main effect for various claim types on both attitude toward product, F(4,181) = 2.93; p = 0.02 and confidence in the information on health claims, F(4,181) = 2.74; p = 0.03. This suggests that different levels of claim information, compared to the control condition, have effects on participant's attitude toward the product and their confidence in the health information

presented. Nonetheless, the measures of expected health benefits do not vary across different levels of qualified health claim. The ANOVA failed to reveal a significant effect for various qualified health claims on respondents' perceptions of health benefits of the product, $F(4,181) = 1.19$; $p = 0.32$.

Tukey's Honestly Significant Difference (HSD) test showed that respondents reacted differently to certain levels of qualified health claims. Data revealed that respondents rated an attitude measure significantly lower when they were exposed to qualified level D than when they were exposed to qualified level B ($p < 0.05$). Respondents also rated their confidence in the health information significantly lower when they were exposed to qualified level D than when they were exposed to qualified level A ($p < 0.05$). Tukey's HSD test, nevertheless, found no significant difference comparing other pairs of qualified levels for these measures ($p > 0.05$) even though the mean plots show an increasing trend for respondent rating from the weakest claim level (i.e., level D) to the strongest claim level (i.e., level A), see figure 3.1. Results imply that there is no clear distinction between various qualified health claims. Respondents may be able to differentiate level D (the weakest claim) from other levels. However, there is no evidence to support the hypothesis that respondents evaluate the unqualified claim A and qualified claim levels, B and C differently.

Although some evidence suggests that consumers react differently to various claim levels, it is not clear whether people understand the difference in the degree of scientific support for these claims, as described in the disclaimer. Despite an increasing trend in attitude from the weakest claim (level D) to the strongest claim (level A), there is

no statistically significant difference among claim levels when using measures of respondents' confidence in the health information and their perception of health benefits of the product. Levels A, B, and C receive similar evaluations, using all measures, which may imply that consumers are not yet able to differentiate among these levels of claims. These results lead us to reject all three hypotheses.

Though the findings may suggest that consumers are not able to distinguish all four levels of health claims, it is quite clear in this study that level D (the weakest claim) receives the lowest evaluations. Consumers do not perceive the product to be healthful when the disclaimer explicitly states that there is little evidence supporting the claim with the lowest level "D" highlighted on the report card. An interesting question then arises, which is not addressed in this study. Do consumers pay attention to the disclaimer or do they simply rely on the report card and use it as a cue when evaluating the product? The fact that consumers react differently to various claims may simply be a response to the different grades assigned on the report card. This leads to study 2, which examines the role of the report card on consumer evaluations of product quality.

3.5 STUDY 2

The objectives of study 2 are to examine whether consumers pay attention to disclaimers and to determine how a visual aid such as a report card influences consumer understanding of different claim levels. It is important to determine the most effective format for presenting information about the supporting science, either with words alone or through other forms such as visual aids (FDA, 2003a). Even though FDA has not

finalized the graphic format to help consumers understand multiple levels of claims, the agency provided an example of such, see APPENDIX G, which is used in this study.

Two claim levels are assessed, level D which has the weakest level of science to support the claim and level A which meets the SSA standard. If consumers understand and use disclaimers to differentiate claim levels, they should react differently to level A and level D, even in the absence of a report card.

H4: In the absence of a report card, participants evaluate disclaimers and react more positively to the stronger claim (i.e., level A).

If consumers cannot differentiate various levels of claims through disclaimers, a visual aid (e.g., a report card) may be necessary.

H5: The presence of a report card will help consumers understand multiple levels of qualified claims being able to differentiate a stronger unqualified health claim (i.e., level A) from a weaker level of qualified health claim (i.e., level D).

3.5.1 Study Design

A 2 (two levels of health claims - level A and D) x 2 (the presence of a report card) between-subjects factorial design was applied, see APPENDIX H. A hundred and nine undergraduate students participated in the study, receiving extra credit for a Marketing class. The study procedure and dependent measures are the same as study 1.

3.5.2 Results and Discussion

Cell means and statistical results from MANOVA and ANOVA are shown in tables 3.5 and 3.6, respectively. Results from two-way MANOVA, between-groups design indicates a significant multivariate interaction effect between claim type and report card for all dependent measures, Wilks' lambda = 0.92, $F(3,103) = 2.88$, $p = 0.04$. Follow-up ANOVA also reveals a significant interaction effect for all dependent measures, including attitude toward the product ($F(1,105) = 4.55$; $p = 0.04$), respondents' confidence in the health information on the label ($F(1,105) = 6.88$; $p = 0.01$), and their perceptions of health benefits of the product ($F(1,105) = 6.04$; $p = 0.02$).

The nature of the interaction for each dependent variable is displayed in figure 3.2. Subsequent analyses of the simple effects indicated that the interaction effect between claim and report card is statistically significant for all three measures. When a report card was included, responses were different from those for labels without a report card. Respondents tended to react more negatively ($p = 0.08$) to a weak argument (level D) and more positively ($p = 0.05$) to a strong argument (level A) in the presence of a report card. In addition, the rating difference between level A and D is statistically significant when a report card was included ($p < 0.01$) but is not statistically significant when a report card was not on the label ($p = 0.13$).

The results are similar for the measures of confidence in the health information on the label and perception of health benefits of the product. For those labels with a report card, respondents rated level A statistically and significantly higher than qualified level D ($p < 0.01$). Without a report card, participants rated level A higher for the measure of

respondents' confidence in the health claims than qualified level D ($p < 0.05$); however the mean scores are not statistically significantly different for the perception of health benefits measure ($p > 0.10$).

The findings from this study suggest that a report card seems to play a significant role in differentiating a stronger version of a health claim from a weaker qualified claim. Without a report card, there is no difference in consumer responses to levels A and D, thus leading to the rejection of hypothesis 4. With a report card, however, consumers react more negatively to a weaker claim (level D) and more positively to a stronger claim (level A). A report card also moderates how people rate their confidence in the health information on the label and their perception of health benefits of the product. With the presence of a report card, the mean score is **lower** for a weaker claim (level D) and **higher** for a stronger claim (level A). This evidence provides support for hypothesis 5 suggesting differences between claim levels are strengthened by the presence of a report card.

3.6 GENERAL DISCUSSION

3.6.1 Policy Implications

Understanding consumer response to health and nutrition information on product packages is necessary when designing food labeling regulations. Consumer advocacy groups such as CSPI and CFA have expressed concern that qualified health claims will likely mislead consumers or cause more confusion. Their argument is that it is not optimal (on a label or elsewhere) to focus on the health benefits of any single food

product outside of the context of the total diet. Health can only be improved through better total diets and exercise, not just through the consumption of any single food product. The organizations also question whether FDA, with a limited budget and staff, can adequately monitor all labels to ensure the truthfulness of these qualified health claims. In addition, consumers may be confused by, or unable to correctly distinguish between, disclaimers such as *evidence is not conclusive*, *limited*, or *very limited and preliminary*. Thus, it is important that FDA takes these concerns into account to ensure that the new policy will achieve its goals.

The key issue here that needs further investigation is how to effectively provide information on the front label to consumers. FDA's goal is to permit the use of more, better, easily understood, and up-to-date scientific information on food labels about how dietary choices can affect consumers' health. Results presented here suggest that consumers are not yet able to distinguish between the four levels of health claims, each with a different disclaimer to explain the strength of science upon which the claim is based. As a result, it is important to identify the optimal number of levels of qualified health claims, perhaps two instead of four, so that consumers can distinguish and understand differences in terms of the scientific evidence of product benefits. Moreover, the agency needs to revise claim statements or use some form of visual aid to permit consumers to more easily differentiate between the multiple levels of claims. Qualitative studies such as focus groups may also be necessary to find more distinct disclaimer wording that better conveys the different levels of scientific support to consumers.

3.6.2 Marketing Implications

Qualified health claims are likely to have significant impacts on the market for foods with additional health benefits, commonly known as functional foods. In the past, it was difficult and time consuming for firms to petition for health claims. The SSA standard was seen as a major hurdle. Without health claims, the market for functional food is limited because consumers can not differentiate functional foods from conventional foods. Thus, manufacturers have no incentive to develop and introduce functional foods. The policy should encourage manufacturers to market more products with qualified health claims. In addition, the approval process under the new policy commits FDA to making decisions within nine months of the petition (FDA, 2003f). The policy should therefore provide an opportunity for producers to communicate emerging evidence of the health benefits of their functional foods to consumers. With more health information available, consumers should be able to make informed choices about the food they eat and better understand how food can impact their health.

The results of this study can help food manufacturers decide what level of health and nutrition information they should provide to consumers. In addition to understanding the petitioning procedures for different claims, food manufacturers must determine which, how, and when consumers understand and use health information in order to find the most efficient marketing communication channels. From a manufacturers standpoint, it is more costly to fund or conduct (or wait for) sufficient scientific studies required by the traditional (unqualified) FDA claim approval process. If consumers who are interested in functional foods and those who use product labels for information search do not react

differently to various health claims, it may be better for manufacturers to simply use a lower level qualified claim such as B or C, instead of the SSA-based level A.

3.6.3 Limitations and Future Research

It should be noted that this study focuses on a certain hypothetical functional food, wheat crackers containing soy, with certain health characteristics. Results may be limited and different from those for other functional foods with different benefits. It would be interesting to apply the same theoretical model capturing the effect of health and nutritional information developed in this study to other products and subjects. Consumers' reactions to different types of claims and sources of information may also be different for other diseases which they are more or less interested in (motivation). Also, it is interesting to further examine how dual/synergistic health benefits play a role in consumer product evaluations since the functional food environment has become increasingly complex with multiple food attributes delivering a range of health benefits in a single food.

Even though Ford et al. (1996) conducted a pilot test and found that students do not differ from a nationally representative sample in terms of the care with which they select what they eat and the importance they accord diet and nutrition, it is important to extend this study to different population groups. Future studies should examine how consumers with different levels of motivation and health knowledge respond to health information and whether targeted groups for this product (e.g., at risk populations or cancer and heart disease patients and survivors) react differently from groups of students

or the general population. Consumers' reactions to different types of claims and sources of information may be different for other diseases that consumers are more or less interested in.

This study was conducted using a laboratory experiment, which allowed for the control of how information was provided to participants. Using a computer experiment enables the simulation of the situation where consumers have the opportunity to spend as much time as they want in evaluating labels. Nevertheless, some may argue that such a controlled, forced exposure, environment may induce participants to pay more attention to information on product labels than during an actual shopping trip. Thus, it would be interesting to conduct further studies using a mall or grocery store intercept method using real product packaging. Additional experiments should be conducted to validate these results and to provide sensitivity measures.

Qualified Health Claim Level	Level of Scientific Evidence	Examples of Claims with Disclaimers
A	Significant scientific agreement (SSA)	Same as unqualified or NLEA/FDAMA authorized health claim. **No disclaimer is required for this level** e.g., this product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers.
B	Good to moderate level of scientific agreement	This product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers. **Although there is scientific evidence supporting the claim, FDA has determined that the evidence is not conclusive.**
C	Low level of scientific agreement	This product contains high level of soluble fiber. Some scientific evidence suggests that consumption of soluble fiber may reduce the risk of heart disease and some cancers. **However, FDA has determined that this evidence is limited and not conclusive.**
D	Very low level of scientific agreement	This product contains high level of soluble fiber and it may reduce the risk of heart disease and some cancers. **Very limited and preliminary scientific research suggests that soluble fiber may reduce the risk of heart disease and some cancers. FDA concludes that there is little scientific evidence supporting this claim**.

Table 3.1: Different Levels of Qualified Health Claims with Disclaimers

Dependent Variables	Description	Multi-Items Measures
Attitude	Measure of Attitude Toward the Product	1. My attitude toward this WHEAT CRACKER is (1 = very bad; 7= very good)
		2. My attitude toward this WHEAT CRACKER is (1=extremely unfavorable; 7=extremely favorable)
		3. My attitude toward this WHEAT CRACKER is (1=extremely negative; 7=extremely positive)
		4. Consuming this WHEAT CRACKER is likely to be (1=extremely unpleasant; 7=extremely pleasant)
		5. Consuming this WHEAT CRACKER is likely to be (1=harmful; 7=beneficial)
Confidence	Confidence of Information on Health Claim	1. How confident are you in scientific studies that consuming this WHEAT CRACKER will reduce the risk of CANCERS and HEART DISEASES? (1= Not at all confident; 7=Very confident)
		2. To what extent do scientists believe that consuming this WHEAT CRACKER will reduce the risk of CANCERS and HEART DISEASES? (1= Very little; 7=A great deal)
Benefit	Perceived Health Benefits of the Product	1. How much of a health benefit would adding this WHEAT CRACKER to your diet have on preventing you from getting CANCERS and HEART DISEASES? (1=No benefit at all; 7=A large benefit)
		2. In your view, what is the likelihood that the consumption of this WHEAT CRACKER will help reduce the risk of CANCERS and HEART DISEASES? (1=unlikely to reduce risk; 7=likely to reduce risk)

Table 3.2: Descriptions of Multi-Item Dependent Variables

Claim Types	No. of Observations	Attitude		Confidence		Benefit	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Control	38	4.28	1.11	3.26	1.16	3.16	1.18
Level D	38	4.08	1.09	3.05	1.53	3.16	1.49
Level C	35	4.59	1.08	3.45	1.54	3.43	1.39
Level B	37	4.90	0.95	3.81	1.35	3.56	1.45
Level A	38	4.56	1.26	3.96	1.39	3.71	1.30

Table 3.3: Cell Means and Standard Deviation for Dependent Variables – Study 1

	MANOVA			ANOVA					
				Attitude		Confidence		Benefit	
	Wilk's	F	Pr > F	F	Pr > F	F	Pr > F	F	Pr > F
Claim Type	0.89	1.75	0.06	2.93	0.02	2.74	0.03	1.19	0.32

Table 3.4: MANOVA and ANOVA Results – Study 1

Claim Type	Presence of Report Card	No. of Observations	Attitude		Confidence		Benefit	
			Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Level D	No	29	4.64	1.04	3.34	1.30	3.25	1.25
Level D	Yes	29	4.14	1.38	2.91	1.35	2.89	1.44
Level A	No	25	4.71	0.99	4.11	1.42	3.75	1.72
Level A	Yes	26	5.11	0.87	5.02	1.20	4.67	0.94

Table 3.5: Cell Means and Standard Deviation for Dependent Variables – Study 2

	MANOVA			ANOVA					
				Attitude		Confidence		Benefit	
	Wilk's	F	Pr > F	F	Pr > F	F	Pr > F	F	Pr > F
Claim Type	0.77	10.56	0.00	6.09	0.02	32.16	0.00	19.10	0.00
Report Card	0.98	0.56	0.64	0.07	0.80	0.92	0.34	1.15	0.29
Claim x Card	0.92	2.88	0.04	4.55	0.04	6.88	0.01	6.04	0.02

Table 3.6: MANOVA and ANOVA Results – Study 2

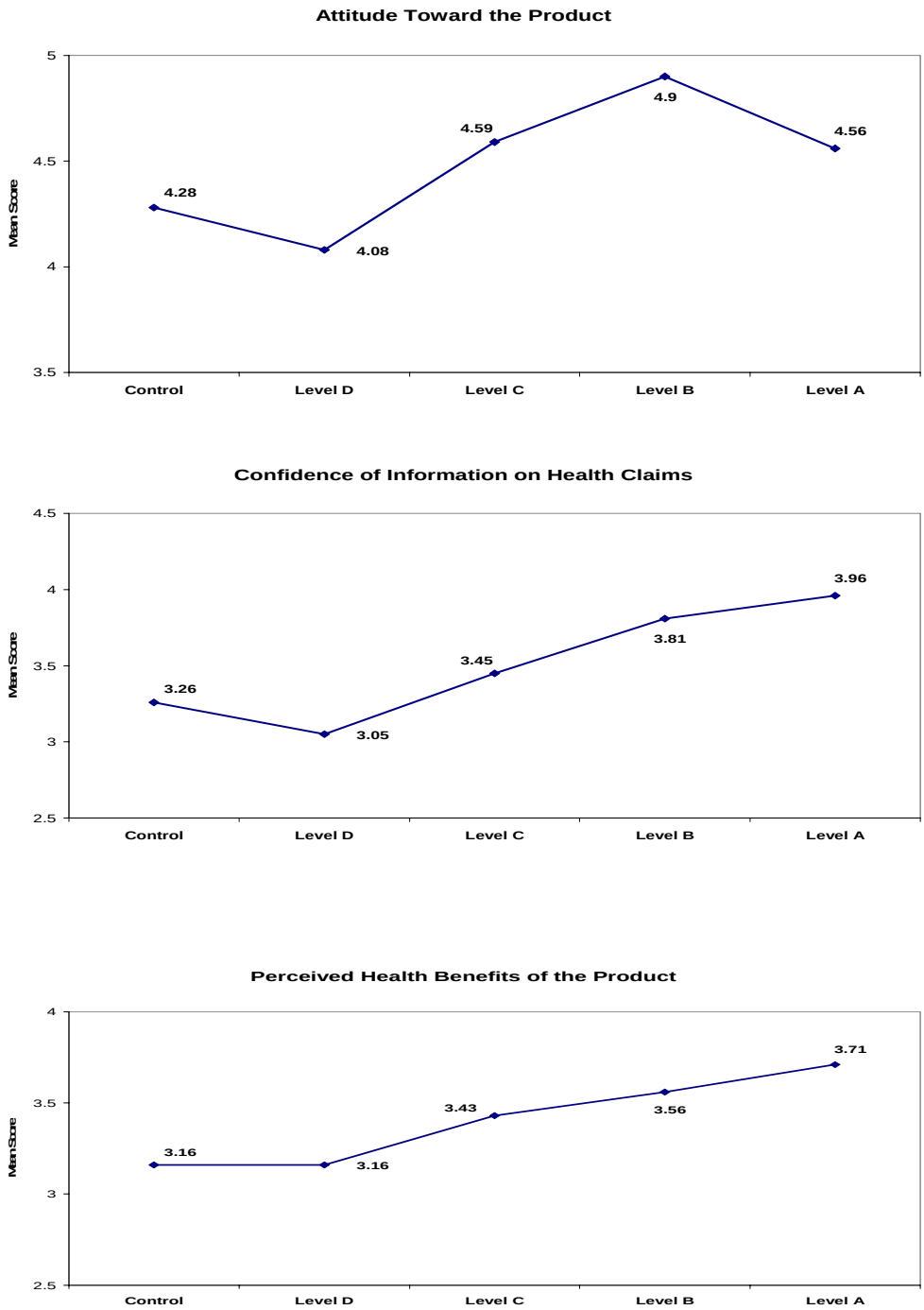

Figure 3.1 Mean Score Plots for Dependent Variables – Study 1

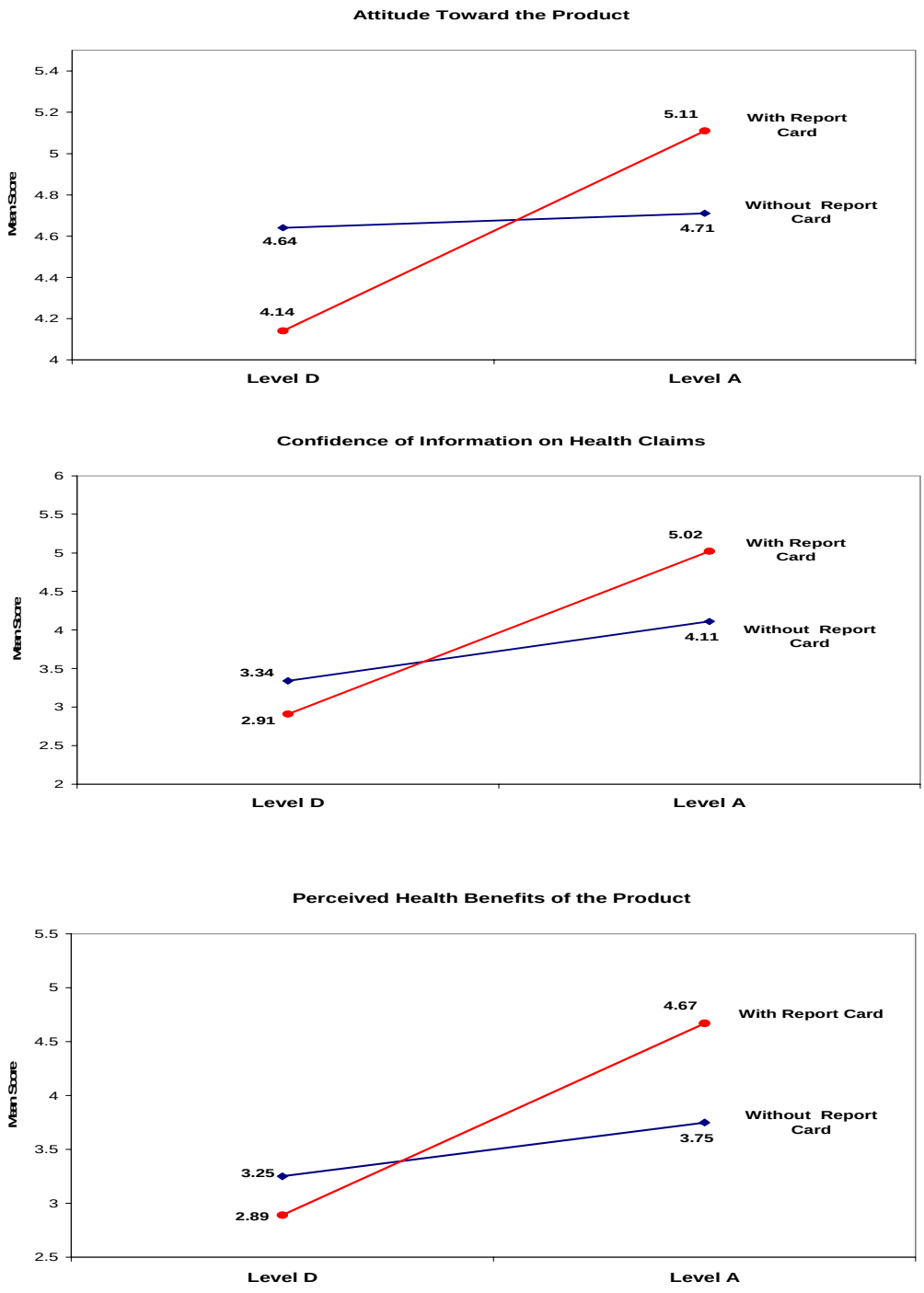

Figure 3.2 Mean Score Plots for Dependent Variables – Study 2

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APPENDICES

APPENDIX A: FOOD CHOICE DECISION INSERTED IN OHIO SURVEY

The following questions relate to how you make food purchasing decisions. More and more food products are designed to offer health benefits beyond basic nutrients, such as calcium fortified orange juice or high fiber cereal. Currently, researchers at The Ohio State University are studying a new product that contains tomato and soy. Scientific studies show that nutrients in tomato and soy may reduce the risk of prostate cancer and heart disease.

Imagine you are at your local supermarket shopping for tomato juice and find several different tomato juice products are available. Some of the juices are made from **organic** ingredients. Most nutrients are **naturally** found in the products (tomato and soy) but for some products additional nutrients require **fortification**.

Please choose between the three products in each of the four scenarios below. All products are the same size (6 packs of 8oz. cans) but the price varies depending on the ingredients used. Please look at the characteristic of each product and check only the box above the product you most prefer in each scenario.

Scenario 1: Check the box above the product you most prefer

□	□	□	□
Conventional Tomato Juice Organic ingredients Natural $4.00	**Tomato Juice Plus** Rich in nutrients that may reduce the risk of prostate cancer Organic ingredients Fortified nutrients $4.50	**Tomato Juice Plus With Soy** Rich in nutrients that may reduce the risk of prostate cancer and heart disease Conventional ingredients Natural $3.00	I prefer none of these products

Scenario 2: Check the box above the product you most prefer

□	□	□	□
Conventional Tomato Juice Conventional ingredients Fortified nutrients $4.00	**Tomato Juice Plus** Rich in nutrients that may reduce the risk of prostate cancer Conventional ingredients Natural $3.00	**Tomato Juice Plus With Soy** Rich in nutrients that may reduce the risk of prostate cancer and heart disease Organic ingredients Natural $3.50	I prefer none of these products

Scenario 3: Check the box above the product you most prefer

□	□	□	□
Conventional Tomato Juice Conventional ingredients Natural $4.50	**Tomato Juice Plus** Rich in nutrients that may reduce the risk of prostate cancer Conventional ingredients Fortified nutrients $3.50	**Tomato Juice Plus With Soy** Rich in nutrients that may reduce the risk of prostate cancer and heart disease Organic ingredients Fortified nutrients $3.00	I prefer none of these products

Scenario 4: Check the box above the product you most prefer

□	□	□	□
Conventional Tomato Juice Organic ingredients Fortified nutrients $3.00	**Tomato Juice Plus** Rich in nutrients that may reduce the risk of prostate cancer Organic ingredients Natural $4.00	**Tomato Juice Plus With Soy** Rich in nutrients that may reduce the risk of prostate cancer and heart disease Conventional ingredients Fortified nutrients $4.50	I prefer none of these products

APPENDIX B: OHIO SURVEY OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL ISSUES

Ohio Survey of Food, Agriculture, and Environmental Issues

The Ohio State University
Columbus, Ohio

June 2004-A

Ohio Survey of Food, Agriculture, and Environmental Issues

I. Residence and "Rural" Experiences

A. Please describe the kind of place in which you currently live. ***(Circle your answer)***

1. City
2. Suburb
3. Small Town
4. Countryside (but not on a farm)
5. Farm

B. In what kind of place did you spend most of your childhood? ***(Circle your answer)***

1. City
2. Suburb
3. Small Town
4. Countryside (but not on a farm)
5. Farm

C. Please indicate whether the following items describe you or your household. ***(Circle your answer)***

	Yes	No
a. Did your parents ever own or operate a farm?	1	2
b. Does anyone in your household maintain a vegetable garden?	1	2
c. Have you ever heard or read the slogan, "Ohio farmers are naturally resourceful?"	1	2
d. Have you ever heard or read the slogan, "Every day is Earth Day to a farmer?"	1	2

D. How often do you engage in the following activities associated with rural places? ***(Circle your answer)***

How often do you…	Never	Seldom	Occasionally	Frequently
a. Visit a small town for recreational shopping or sightseeing?	1	2	3	4
b. Take a recreational drive through the countryside?	1	2	3	4
c. Hunt or fish?	1	2	3	4
d. Travel to a rural area to experience or view the natural environment?	1	2	3	4
e. Purchase farm produce or other food items at a farmer's market or roadside stand?	1	2	3	4

E. About how many days each month, on average, do you have a conversation with a farmer or member of a farm family? *(Please write in "0" if you never interact with a farmer or member of a farm family*)

_____ Days per month

II. Attitudes about Food, Agriculture and the Environment

A. Please indicate your level of agreement with the following statements related to food, agriculture or the environment by circling the appropriate numbered responses.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
a. Ohio's economy will suffer if the state continues to lose farmers	1	2	3	4	5
b. I trust Ohio farmers to protect the environment	1	2	3	4	5
c. Environmental protection laws regulating farming practices are too strict	1	2	3	4	5
d. Overall, farming positively contributes to the quality of life in Ohio	1	2	3	4	5
e. Ohio's most productive farmland should be preserved for agriculture	1	2	3	4	5
f. When houses are built on good farmland, the developer should pay for protecting other farmland in the area	1	2	3	4	5
g. Food is not as safe as it was 10 years ago	1	2	3	4	5
h. Concerns about food safety are exaggerated	1	2	3	4	5
i. Biotechnology is having a negative impact on the food supply	1	2	3	4	5
j. Organic foods are healthier than conventionally produced foods	1	2	3	4	5
k. Organically grown foods are too expensive	1	2	3	4	5

B. Several food, agricultural, and environmental issues have been in the news in the past year. We would like to know how concerned you are about the following issues.

	Not Concerned		Somewhat Concerned				Very Concerned
a. Global warming or the "greenhouse effect"	1	2	3	4	5	6	7
b. Pollution of Ohio's rivers, streams or groundwater	1	2	3	4	5	6	7
c. Loss of farmland as a result of urban growth	1	2	3	4	5	6	7
d. Mad cow disease	1	2	3	4	5	6	7
e. Development of large-scale poultry and livestock production facilities in Ohio	1	2	3	4	5	6	7
f. The loss of family farmers	1	2	3	4	5	6	7
g. Genetic modification of plants	1	2	3	4	5	6	7
h. Genetic modification of animals	1	2	3	4	5	6	7
i. Rising obesity among Americans	1	2	3	4	5	6	7

III. Attitudes about Pets and Livestock Animals

A. There has been growing interest in the treatment of pets and livestock animals recently. Please indicate your level of agreement with the following statements related to pets and livestock animals.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
a. If people were nicer to animals, they would also be nicer to other people	1	2	3	4	5
b. In general, increased regulation of the treatment of animals in farming is needed	1	2	3	4	5
c. I am interested in learning more about farm animals	1	2	3	4	5
d. The well-being of farm animals is just as important as the well-being of pets	1	2	3	4	5
e. It is acceptable to use animals to grow organs for humans	1	2	3	4	5
f. It is okay to discipline a pet by smacking or hitting	1	2	3	4	5
g. It is of no concern to me whether farm animals feel emotional pain	1	2	3	4	5
h. As long as animals do not suffer pain, humans should be able to use them for any purpose	1	2	3	4	5
i. It is important to me that animals on farms are well-cared for	1	2	3	4	5
j. Euthanizing (putting to sleep) a pet is an acceptable solution to behavioral problems	1	2	3	4	5
k. Farm animals should be protected from feeling physical pain	1	2	3	4	5
l. I often discuss the treatment of farm animals with other people	1	2	3	4	5
m. Even though some farm animals are used for meat, the quality of their lives is important	1	2	3	4	5

IV. Food and Health

A. Please indicate whether the following health and food matters describe you. ***(Circle your answer))***

	Yes	No
a. Does anyone in your household have a food allergy?	1	2
b. Have you ever stopped buying a product because of a food safety concern?	1	2
c. Have you or any members of your family been diagnosed with cancer?	1	2
d. Have you or any members of your family ever been diagnosed with heart disease?	1	2
e. Are you more than 15 pounds above your ideal weight?	1	2
f. Have you reduced your consumption of carbohydrates in the last year?	1	2

B. Ohioans must consider a number of factors when making food purchases. Please rate on a scale of 1 to 7 (1=not important, 7=very important) the importance of the following factors you may consider when purchasing food.

	Not Important					Somewhat Important	Very Important
a. Taste	1	2	3	4	5	6	7
b. Nutritional value	1	2	3	4	5	6	7
c. Added health benefits beyond basic nutrition	1	2	3	4	5	6	7
d. Price	1	2	3	4	5	6	7
e. Food product is available where you normally shop	1	2	3	4	5	6	7
f. Labeled organic	1	2	3	4	5	6	7
g. Grown locally	1	2	3	4	5	6	7
h. Grown locally and labeled organic	1	2	3	4	5	6	7
i. Meat, poultry or dairy products from humanely treated animals	1	2	3	4	5	6	7
j. Grown in the State of Ohio	1	2	3	4	5	6	7
k. Food purchase will keep a local farmer in business	1	2	3	4	5	6	7

C. Please indicate how often you engage in the following food related activities. ***(Circle your answer)***

How often do you…	Never	Seldom	Occasionally	Frequently
a. Buy foods that are locally grown or produced?	1	2	3	4
b. Buy foods that are organically grown or produced?	1	2	3	4
c. Buy locally grown or produced foods that are also grown organically?	1	2	3	4
d. Buy foods that provide health-promoting or disease-fighting benefits beyond basic nutrition?	1	2	3	4
e. Eat at a fast food restaurant?	1	2	3	4
f. Purchase food from a natural food grocery store or co-op?	1	2	3	4

D. On average, how many times weekly do you eat the following foods?

	Average times per week					
a. Red meat (such as beef, lamb, or pork)	0	1	2	3	4	5 or more
b. Poultry (such as chicken, turkey, or duck)	0	1	2	3	4	5 or more
c. Fish or other seafood	0	1	2	3	4	5 or more
d. Dairy products (such as milk, yogurt, or cheese)	0	1	2	3	4	5 or more
e. Eggs	0	1	2	3	4	5 or more

E. Please indicate your level of agreement with the following statements related to the food you eat and your health. ***(Circle your answer)***

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
a. Food safety is a major concern of mine	1	2	3	4	5
b. Knowing how my food is grown is important to me	1	2	3	4	5
c. My eating habits are more healthy than others I know	1	2	3	4	5
d. I consider myself health conscious	1	2	3	4	5
e. I am interested in using food to maintain good health	1	2	3	4	5
f. I am interested in using food to prevent disease	1	2	3	4	5
g. I am knowledgeable of the health benefits of foods I eat	1	2	3	4	5
h. I usually look for health information when I buy food products	1	2	3	4	5
i. I am concerned that someone in my household, including myself, might be diagnosed with heart disease	1	2	3	4	5
j. As a percent of my income, food costs me less than it did for my grandparents	1	2	3	4	5

F. Please indicate how much you would be willing to pay for the following types of food items.

How much extra would you be willing to pay for:	Not willing to pay more	10% more	25% more	50% more
a. Locally grown or produced foods?	1	2	3	4
b. Organically grown or produced foods?	1	2	3	4
c. Locally grown or produced food that has also been grown organically?	1	2	3	4
d. Foods that provide health-promoting or disease-fighting benefits beyond basic nutrition?	1	2	3	4
e. Meat, poultry or dairy products labeled as coming from humanely treated animals?	1	2	3	4

G. Please indicate whether the following food related matters describe you.

	Yes	No
a. Do you subscribe to any cooking magazines?	1	2
b. Are you currently or have you ever been a member of a food co-op?	1	2
c. Do you consider yourself a vegetarian?	1	2
d. Are locally grown foods available at the places you normally shop?	1	2
e. Are organically grown foods available at the places you normally shop?	1	2

V. Food Choice Decisions

The following questions relate to how you make food purchasing decisions. More and more food products are designed to offer health benefits beyond basic nutrients, such as calcium fortified orange juice or high fiber cereal. Currently, researchers at The Ohio State University are studying a new product that contains tomato and soy. Scientific studies show that nutrients in tomato and soy may reduce the risk of prostate cancer and heart disease.

Imagine you are at your local supermarket shopping for tomato juice and find several different tomato juice products are available. Some of the juices are made from **organic** ingredients. Most nutrients are **naturally** found in the products (tomato and soy) but for some products additional nutrients require **fortification**.

Please choose between the three products in each of the four scenarios below. All products are the same size (6 packs of 8oz. cans) but the price varies depending on the ingredients used. Please look at the characteristic of each product and <u>check only the box above the product you most prefer in each scenario</u>.

Scenario 1: Check the box above the product you most prefer

Conventional Tomato Juice	**Tomato Juice Plus**	**Tomato Juice Plus With Soy**	
Conventional ingredients Fortified nutrients $4.50	Rich in nutrients that may reduce the risk of prostate cancer Conventional ingredients Natural $3.50	Rich in nutrients that may reduce the risk of prostate cancer and heart disease Organic ingredients Fortified nutrients $4.00	I prefer none of these products

Scenario 2: Check the box above the product you most prefer

Conventional Tomato Juice	**Tomato Juice Plus**	**Tomato Juice Plus With Soy**	
Conventional ingredients Natural $3.00	Rich in nutrients that may reduce the risk of prostate cancer Organic ingredients Natural $4.50	Rich in nutrients that may reduce the risk of prostate cancer and heart disease Conventional ingredients Fortified nutrients $3.50	I prefer none of these products

Scenario 3: Check the box above the product you most prefer

Conventional Tomato Juice	**Tomato Juice Plus**	**Tomato Juice Plus With Soy**	
Organic ingredients Natural $3.50	Rich in nutrients that may reduce the risk of prostate cancer Conventional ingredients Fortified nutrients $4.00	Rich in nutrients that may reduce the risk of prostate cancer and heart disease Organic ingredients Natural $4.50	I prefer none of these products

Scenario 4: Check the box above the product you most prefer

Conventional Tomato Juice	**Tomato Juice Plus**	**Tomato Juice Plus With Soy**	
Organic ingredients Fortified nutrients $3.50	Rich in nutrients that may reduce the risk of prostate cancer Organic ingredients Fortified nutrients $3.00	Rich in nutrients that may reduce the risk of prostate cancer and heart disease Conventional ingredients Natural $4.00	I prefer none of these products

VI. Awareness of and Experience with Ohio State University Extension and OARDC

A. The following questions pertain to Ohio State University Extension (also known as OSU Extension). How familiar are you with OSU Extension?

1. Very familiar
2. Somewhat familiar
3. Not at all familiar

B. Please answer the following questions about your level of contact with OSU Extension.

	Yes	No	Not Sure
a. Is there an OSU Extension office in the county where you live?	1	2	3
b. Have you ever been to an OSU Extension office?	1	2	3
c. Have you ever used an OSU Extension bulletin or publication?	1	2	3
d. Have you called or e-mailed OSU Extension for information?	1	2	3
e. Have you ever obtained information from an OSU Extension website?	1	2	3
f. Have you ever participated in a program sponsored by OSU Extension?	1	2	3
g. Have you or any members of your household participated in 4-H?	1	2	3

C. How would you rate your overall experience with Ohio State University Extension?

1. Excellent
2. Good
3. Fair
4. Poor
5. I have had no experiences with Ohio State University Extension

D. Ohio State University Extension is an organization that delivers research-based information and educational programs to Ohio residents. How important is it to maintain this type of service in Ohio?

1. Very important
2. Somewhat important
3. Not at all important

E. How familiar are you with the Ohio Agricultural Research and Development Center (OARDC)?

1. Very familiar
2. Somewhat familiar
3. Not at all familiar

F. The Ohio Agricultural Research and Development Center (OARDC) conducts research and disseminates information on food, agriculture, family, and natural resources. How important is it to maintain this type of service in the state of Ohio?

1. Very important
2. Somewhat important
3. Not at all important

VII. Topics of Interest and Preferred Methods for Receiving Information

A. Please rate your level of interest in educational information on the following topics.

		Not Interested			Somewhat Interested			Very Interested
a.	Lawn, gardening, or home landscaping	1	2	3	4	5	6	7
b.	Personal health, disease prevention or fitness	1	2	3	4	5	6	7
c.	Food topics, such as nutrition or safe food handling	1	2	3	4	5	6	7
d.	Parenting, child or youth development	1	2	3	4	5	6	7
e.	Farming or agribusiness management	1	2	3	4	5	6	7
f.	Environmental topics, such as developing wildlife habitat or protecting water, soil and air quality	1	2	3	4	5	6	7
g.	Community economic development or leadership	1	2	3	4	5	6	7
h.	Household budgeting or finances	1	2	3	4	5	6	7
i.	Aging, retirement, or elder care	1	2	3	4	5	6	7
j.	Small business management	1	2	3	4	5	6	7
k.	Commercial horticulture topics, such as nursery, landscape, greenhouse or turf management	1	2	3	4	5	6	7

B. Please rate your personal preference for the following sources or methods of receiving educational information on topics that interest you. ***(Circle your answer)***

		Least Preferred				Most Preferred
a.	Newspapers	1	2	3	4	5
b.	Radio	1	2	3	4	5
c.	Television	1	2	3	4	5
d.	Electronic newsletters or periodic e-mail updates	1	2	3	4	5
e.	World Wide Web or Internet	1	2	3	4	5
f.	Videotapes, CD-ROMs, or DVDs for free checkout at your library, county Extension office or other locations	1	2	3	4	5
g.	Fact sheets or printed publications	1	2	3	4	5
h.	Presentations or seminars in your community or place of work	1	2	3	4	5
i.	Information specialists accessible by telephone or e-mail	1	2	3	4	5
j.	Free information available in public places, such as schools, banks, businesses, and libraries	1	2	3	4	5
k.	Handheld computer or PDA	1	2	3	4	5

VIII. Household Management and Environmental Activities

A. The following questions pertain to how you manage your household and environmental or animal related activities you might engage in. ***(Circle your answer)***

	Yes	No
In the last year, have you…		
a. Used savings to pay for household living expenses?	1	2
b. Changed transportation patterns to save money?	1	2
c. Eaten at home more or changed the types of food eaten to save money?	1	2
d. Postponed obtaining prescription drugs in order to save money?	1	2
Environmental and animal activities		
e. Have you ever stopped buying a product because it was associated with an environmental problem?	1	2
f. Do you recycle paper, cans, plastic, or glass in your home?	1	2
g. Have you ever contributed money to or volunteered for an environmental group?	1	2
h. Does anyone in your household own a pet (dog, cat, etc.)?	1	2
i. Have you ever contributed money to or volunteered for an animal protection group?	1	2

B. In your household, who is generally responsible for the following activities? ***(Circle your answer)***

a. Who is usually responsible for cooking in your household?	You	Your spouse or partner	Shared between you and spouse	Other
b. Who is usually responsible for shopping for food in your household?	You	Your spouse or partner	Shared between you and spouse	Other

IX. Background Questions

A. What is your age (as of your last birthday)? _____ years

B. Your sex?

1. Male
2. Female

C. Which best describes you?

1. African American
2. Asian
3. Hispanic/Latino
4. Native American/American Indian
5. White
6. Other: (please specify)

D. How many years of education have you completed? _____ years
(for example, high school diploma or GED is equivalent to 12 years)

E. What is your current marital status?

1. Now married
2. Living together
3. Never married
4. Divorced/Separated
5. Widowed/Widower

F. How many persons living in your household are under 5 years of age _____

G. How many persons living in your household are between 5 and 18 years of age _____

H. Do you own or rent your current residence?

1. Own
2. Rent
3. Have some other arrangement

I. What is your present employment status (and occupation)?

1. Employed or self-employed on a **full-time** basis; occupation:_____
2. Employed or self-employed on a **part-time** basis; occupation:_____
3. Retired
4. Full-time homemaker
5. Student
6. Unemployed

J. How would you generally describe your political views on a scale of 1 to 7 (1=extremely liberal, 7=extremely conservative)? ***(Circle your answer)***

1	2	3	4	5	6	7
Extremely Liberal			Middle of the Road			Extremely Conservative

K. What was your approximate gross household income from all sources, before taxes, for 2003?

1. Less than $9,999
2. $10,000 to 19,999
3. $20,000 to 34,999
4. $35,000 to 49,999
5. $50,000 to 74,999
6. $75,000 to 99,999
7. $100,000 or more

Thank you for your cooperation!!!
If you have additional comments, please provide them on the back cover.

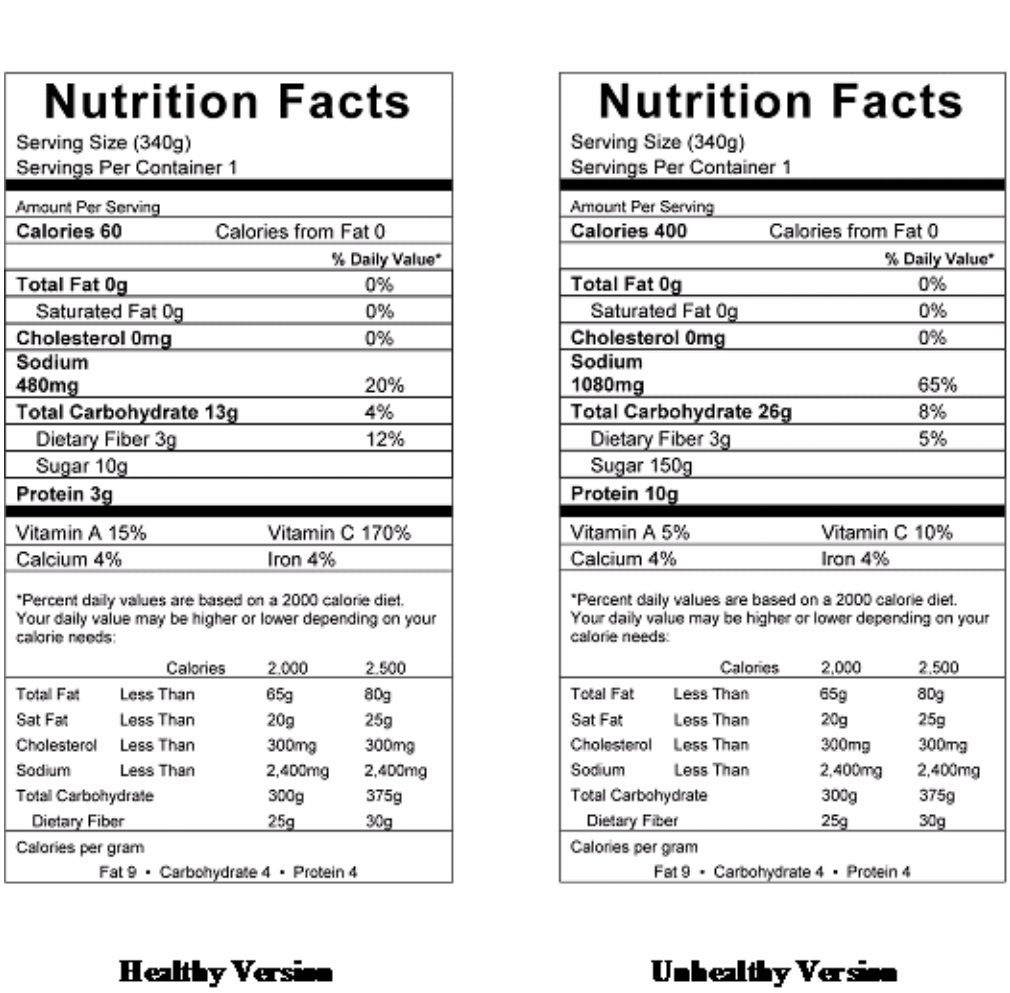
APPENDIX C: EXAMPLES OF FRONT LABELS OF THE FUNCTIONAL FOOD (ESSAY 2)

Control Version

Nutrient Content Claim Version

Health Claim Version

APPENDIX D: EXAMPLES OF NUTRITION FACTS PANEL OF THE FUNCTIONAL FOOD (ESSAY 2)



Nutrition Facts

Serving Size (340g)
Servings Per Container 1

Amount Per Serving	
Calories 60	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 480mg	20%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugar 10g	
Protein 3g	

Vitamin A 15%	Vitamin C 170%
Calcium 4%	Iron 4%

*Percent daily values are based on a 2000 calorie diet. Your daily value may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Sat Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram
Fat 9 • Carbohydrate 4 • Protein 4

Healthy Version

Nutrition Facts

Serving Size (340g)
Servings Per Container 1

Amount Per Serving	
Calories 400	Calories from Fat 0
	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 1080mg	65%
Total Carbohydrate 26g	8%
Dietary Fiber 3g	5%
Sugar 150g	
Protein 10g	

Vitamin A 5%	Vitamin C 10%
Calcium 4%	Iron 4%

*Percent daily values are based on a 2000 calorie diet. Your daily value may be higher or lower depending on your calorie needs:

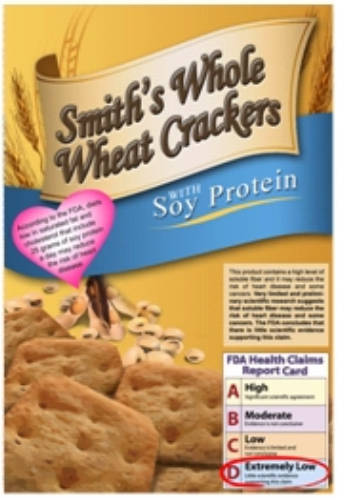
	Calories	2,000	2,500
Total Fat	Less Than	65g	80g
Sat Fat	Less Than	20g	25g
Cholesterol	Less Than	300mg	300mg
Sodium	Less Than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram
Fat 9 • Carbohydrate 4 • Protein 4

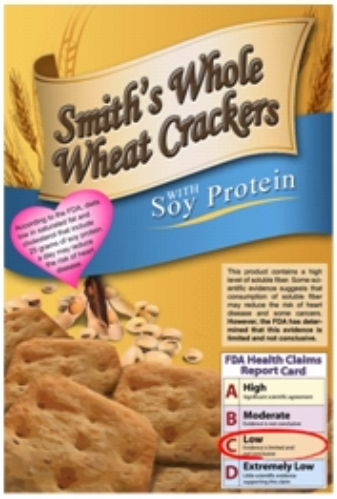
Unhealthy Version

APPENDIX E: FIVE VERSIONS OF FRONT LABELS – STUDY 1 (ESSAY 3)

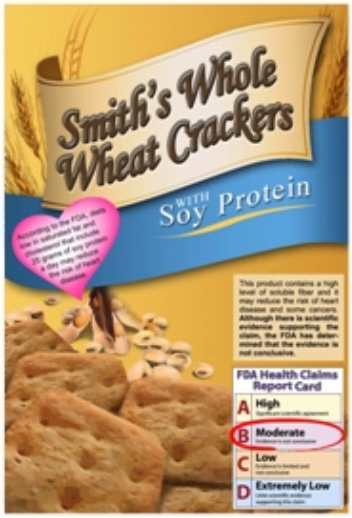
Control (No Claim)



Level D



Level C



Level B

Level A

APPENDIX F: NUTRITION FACTS PANEL (ESSAY 3)

Nutrition Facts

Serving Size 13 crackers (31g)
Servings Per Container About 7

Amount Per Serving	
Calories 77	Calories from Fat 9
	% Daily Value*
Total Fat 1g	6%
Saturated Fat 0.5g	3%
Polyunsaturated Fat 0g	0%
Monounsaturated Fat 0.5g	3%
Cholesterol 0mg	0%
Sodium 100mg	4%
Potassium 135mg	4%
Total Carbohydrate 14g	5%
Dietary Fiber 10g	40%
Sugar 4g	
Protein 3g	

Vitamin A 0%	Vitamin C 0%
Calcium 2%	Iron 6%

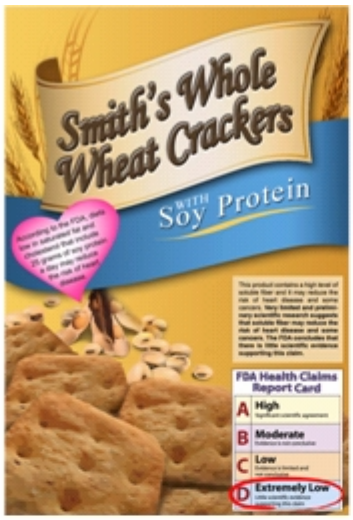
*Percent daily values are based on a 2000 calorie diet. Your daily value may be higher or lower depending on your calorie needs:

		Calories	2,000	2,500
Total Fat	Less Than		65g	80g
Sat Fat	Less Than		20g	25g
Cholesterol	Less Than		300mg	300mg
Sodium	Less Than		2,400mg	2,400mg
Total Carbohydrate			300g	375g
Dietary Fiber			25g	30g

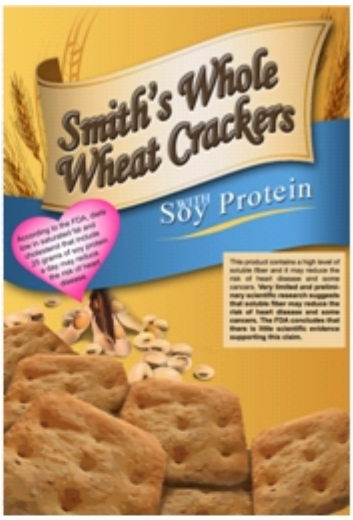
Calories per gram
Fat 9 • Carbohydrate 4 • Protein 4

APPENDIX G: EXAMPLES OF VISUAL AID – REPORT CARD (ESSAY 3)

APPENDIX H: FOUR VERSIONS OF FRONT LABELS – STUDY 2 (ESSAY 3)

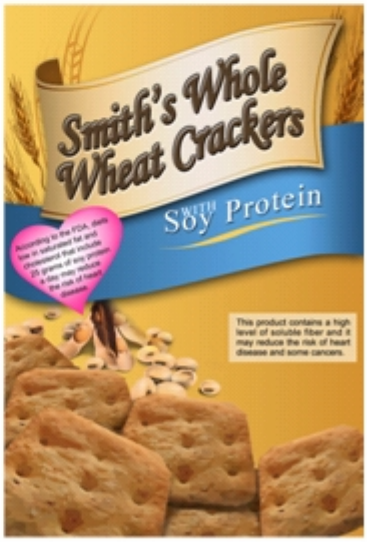


Level D with Report Card



Level D without Report Card

Level A with Report Card



Level A without Report Card