

2006

Analysis of consumer attitudes and their willingness to pay for functional foods

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ANALYSIS OF CONSUMER ATTITUDES AND THEIR WILLINGNESS
TO PAY FOR FUNCTIONAL FOODS

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The Department of Agricultural Economics
and Agribusiness

by

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May, 2006

DEDICATION

To my Lord Jesus Christ who has been my shield, my strength, my portion, my deliverer, my strong tower, my miracle and my very present help in time of need. Thank you my Lord for giving me a hope beyond hopes, for seeing me through this thesis, for placing your angels along the way that my way may be easier, and most of all for drawing me to yourself.

ACKNOWLEDGEMENTS

My sincere and deepest appreciation goes to my major professor Dr. R. Wes Harrison. I want to thank him for providing the resources for the survey and for his guidance throughout this project. I especially thank him for taking time to read my work even during the weekend when he could be spending time with his family or relaxing somewhere. I am grateful for all that I have learned from him. I would like to thank Dr. Kennedy for his guidance and especially for encouraging me to pursue this degree even on top of a Ph. D degree. I thank Dr. Hinson, my committee member, for his guidance, encouragement and concern. I especially thank Dr. Hinson for the exceptionally quick response to my e-mails; he made this program so much easier. I am grateful to the whole Agricultural Economics department, starting with the administration, for example Miss Debbie, who with a smile says, “go pick up your packet” when I ask her for paper to print the many articles I have had to read for this thesis.

I am grateful for all the people that God has put in my way while here at LSU. I am very grateful to Brian Boever who always had me in mind when searching for his own references. He would pick out references and would say to me “I thought this would be of interest to you” and surely he was right. I must admit he saved me many hours of literature search. I am also indebted to Pramod, Sachin, Pawan, Heidi, Augustus, Jae-Hwan who sat with me for long hours to stuff eight thousand questionnaires and for all the other help they have accorded me during my tenure in the department.

My life at LSU has been an adventure and I want to thank God Almighty who has directed my life this far and provided for my every need. While working on this degree I have had to commute between Temple, Texas and Baton Rouge, Louisiana. While at LSU

God has always sent me angels and this time round He sent them in form of Eva and her family. Eva and her lovely husband Dr. Muhumuza graciously opened their house to me and took care of all my needs while in Baton Rouge. May God return a hundred-fold for all they have done for me, and for Maria, am grateful for the wonderful meals I have had while in Baton Rouge. I am especially grateful to Mrs. Nuruh Sempasa (Mama Nuruh) who drove all the way from Slidell to Baton Rouge so that she could read to me, on the phone, the responses to the additional surveys that came in while I was in Temple. Other people sacrificed their time to help me through the data processing stage and I am especially grateful to Ben Omonuk. I am also grateful to the students in the department who in one way or another made my tenure in the department a pleasant one. I am especially grateful to Lilian. International Christian Fellowship (ICF) and Istrouma Baptist Church Sunday school brothers and sisters in Christ have been such a support for me. They have prayed for me, encouraged me and have been there any time I have needed them. These have been angels sent by God to help me stand through this period.

Many people have made sacrifices for me to get this far, but my family has borne a great deal. I want to thank most sincerely my wonderful, very wonderful husband who has supported me with everything he has through this endeavor. He has driven long hours to and from Baton Rouge. He has stayed up at night, gone without sleep to offer his help any way he can. He has created spreadsheets to make my data entry easier, the list goes on and on, I just cannot thank him enough. He has especially taken care of our son in Temple, while I pursue further education in Baton Rouge, without complaining, he has stood with me through it all. He has supported me emotionally, financially, prayed with me, prayed for me, like I said the list goes on. Absolutely no words can express my gratitude to him. And probably the person

who has sacrificed most is my cute one-year old son, Michael. Michael has had to be without Mama on many occasions while I am in Baton Rouge. He has also been on the road for long hours to and from Baton Rouge, all for the sake of allowing Mama to finish school. I am indebted to Michael for spending time in the office to work on something that Mama needed to get done overnight, for missing all the play time with his parents just because Mama and Daddy have to meet another of Mama's deadlines. I am indebted to him for allowing me to complete this degree.

I am very grateful to my grandmother who raised me and instilled values in me. It is sad she did not see this come to the end but am sure she is still proud of me. I am grateful for my Dad and Mum, for that soft side of Mummy that is always so encouraging and makes life so much easier. For Daddy, I thank God for your life, for encouraging me to keep going even when things get tough and thank you for the prayers. Your dedication to work has inspired me greatly and has indeed propelled me forward. Being there whenever I have need you has made such a difference and I count myself blessed to have a father like you. My sisters and brothers and cousins and nephews, you guys have contributed so much to this journey, reading from Jackie in the middle of a frustration was so refreshing. Kizito has forced me to mature because he has looked up to me sought my advise and I strive to be a good example and model for my brother.

All in all I have been blessed of God. God has been so good to me and has brought me from far and has provided all that I have needed to walk this journey. I praise my God, the father of my Lord Jesus Christ for showing me favor and I will live to glorify Him and sing of His mercy and faithfulness for He has been a good God.

TABLE OF CONTENTS

DEDICATION.....	ii
ACKNOWLEDGEMENTS.....	iii
LIST OF TABLES.....	viii
LIST OF FIGURES.....	viii
ABSTRACT.....	viii
CHAPTER I: INTRODUCTION.....	1
1.1 Problem Statement.....	5
1.2 Statement of Research Objectives and Questions.....	6
1.2.1 Specific Objectives.....	7
1.3 Organization of the Study.....	8
CHAPTER II: LITERATURE REVIEW.....	9
2.1 Definition of Functional Foods.....	9
2.2 Status of Functional Foods.....	10
2.3 Stakeholders in Functional Foods.....	11
2.4 Consumer Acceptance of Functional Foods.....	12
2.5 Willingness to Pay for Functional Foods.....	18
CHAPTER III: METHODS.....	26
3.1 Review of Willingness to Pay Theory.....	26
3.2. Measurement of Willingness to Pay.....	27
3.3 Theoretical Framework.....	29
3.3.1 Factors Influencing Customers' Attitude and WTP for Functional Foods.....	30
3.4 Survey Design and Measurement of Variables.....	33
3.4.1 Contingent Valuation.....	34
3.5 Data Collection.....	41
3.6 Empirical Models and Analysis Procedures.....	42
3.7 Ordered Probit Analysis.....	47
CHAPTER IV: RESULTS AND DISCUSSION.....	50
4.1 Introduction.....	50
4.2 Consumer Characteristics and Demographics.....	50
4.3 Consumer Knowledge of Functional Foods, Nutrition and Health.....	52
4.4 Consumer Beliefs about Nutrition and Health.....	55
4.5 Consumer Health and Exercise History.....	56
4.6 Consumers' Current Consumption Habits and Purchasing Patterns.....	58
4.7 Consumer Beliefs about Functional Foods.....	61
4.8 Consumer Attitude toward Functional Foods.....	62
4.9 Willingness to Pay for Functional Foods.....	64

4.10 Ordered Probit Results.....	67
4.11 Probabilities of Paying a Premium for Spread A, Spread B and Bread A.....	87
CHAPTER V: SUMMARY AND CONCLUSIONS.....	90
5.1 Introduction.....	90
5.2 Results.....	91
5.3 Implications.....	97
5.4 Limitations and Future Research.....	98
REFERENCES.....	100
APPENDIX A: A SURVEY OF CONSUMER ATTITUDES CONCERNING FUNCTIONAL FOODS.....	107
APPENDIX B: SOME OF THE FUNCTIONAL FOODS ON THE SHELVES OF WALMART GROCERY STORE – BATON ROUGE, LA.....	116
APPENDIX C: COVER LETTER FOR THE FIRST MAIL-OUT.....	119
APPENDIX D: FOLLOW-UP COVER LETTER.....	120
APPENDIX E: COMPARISON OF EFFECT OF CHANGING VALUE OF BELIEF IN NUTRITION AND HEALTH AND EFFECT OF CHANGE IN CONCERN ON PROBABILITY OF WTP A PREMIUM FOR SPREAD A.....	121
APPENDIX F: COMPARISON OF EFFECT OF CHANGING VALUE OF BELIEF IN NUTRITION AND HEALTH AND EFFECT OF CHANGE IN CONCERN ON THE PROBABILITY OF WTP A PREMIUM FOR SPREAD B.....	122
APPENDIX G: EFFECT OF CURRENT CONSUMPTION PATTERN ON THE PROBABILITY OF PAYING A PREMIUM FOR SPREAD A & SPREAD B.....	123
APPENDIX H: EFFECT OF CURRENT CONSUMPTION PATTERN ON THE PROBABILITY OF PAYING A PREMIUM FOR BREAD A.....	124
APPENDIX I: EFFECT OF ATTITUDE ON THE PROBABILITY OF PAYING A PREMIUM FOR BREAD A AND SPREAD B.....	125
APPENDIX J: SUMMARY STATISTICS OF ALL THE VARIABLES INCLUDED IN THE SURVEY INSTRUMENT.....	126
VITA.....	147

LIST OF TABLES

Table 4.1. Frequency distribution of the demographic characteristics of survey respondents	51
Table 4.2. Foods consumers identified as having a health benefit	54
Table 4.3. Respondents' response to the dietary change question	56
Table 4.4. Cross tabulation of "doctor advised you to change your diet" and "have you changed your diet"	58
Table 4.5. Respondents' level of exercise	58
Table 4.6. Respondents' ranking of the importance of nutrition in purchasing	59
Table 4.7. Respondents' beliefs about the attributes of functional foods	63
Table 4.8. Respondents' attitude toward functional foods	63
Table 4.9. Variable definitions	69
Table 4.10. Results of Ordered Probit Analysis of Consumers' WTP for SPREAD A (Spread that helps maintain a healthy heart)	71
Table 4.11. Results of Ordered Probit Analysis of Consumers' WTP for SPREAD B (Spread that reduces cholesterol)	73
Table 4.12. Results of Ordered Probit Analysis of Consumers' WTP for "Functional" BREAD A	75
Table 4.13. Probability of paying a premium for spread A, spread B and bread A	89

LIST OF FIGURES

Figure 3.1. Conceptual model showing the factors affecting consumers' willingness to pay for functional foods.....	30
Figure 3.2. Causal relationships between the factors proposed to determine the attitudes and ultimate willingness to pay for functional foods. The upper case words in parenthesis represent composite variables.....	42
Figure 4.1. Importance of different factors in influencing purchasing decisions	60
Figure 4.2. Participants' response to the statement, "I eat five or more servings of fruits and vegetables a day.	61
Figure 4.3. Distribution of WTP premiums for spread A, spread B and bread A.	66
Figure 4.4. Probability curve showing the effect of attitude on WTP for the spread that helps maintain a healthy heart (spread A).....	77
Figure 4.5. Probability curve showing the effect of belief in nutrition and health on WTP for bread A.....	78
Figure 4.6. Probability curve showing the effect of concern about different chronic diseases on WTP for bread A.....	80

ABSTRACT

Survey data collected from randomly selected participants within the four geographical regions of the U.S. were used to evaluate consumer attitudes towards functional foods and determine their willingness to pay for these foods. Contingent valuation using the payment card method was used to elicit premiums that consumers are willing to pay for a spread that maintains a healthy heart (spread A), a spread that is proven to significantly reduce cholesterol (spread B) and a loaf of bread that may reduce the risk of heart disease and certain cancers (bread A). Ordered probit regression analysis was used to evaluate the effect of different explanatory variables on the willingness to pay a premium for the three different functional food products.

Overall, the following four factors significantly affected the respondents' willingness to pay a premium for all the three products evaluated: beliefs about the link between nutrition and health, concern about different chronic diseases, current purchasing and consumption patterns, and attitude towards functional foods. These factors also seem to affect the decision of whether to pay a premium for functional foods more than the decision of how much to pay. The significance of demographic variables depended on the product being valued.

Regarding the premiums, on average respondents are willing to pay the current grocery store premium for spread A. On average, respondents are not willing to pay even half of the current grocery store 500% premium for spread B, although the stated WTP results indicated that 9%, are willing to pay at least 400% premium. For bread A, respondents are on average willing to pay a 33% premium instead of the current grocery store 40% premium. Stated WTP indicated that about 42% of the respondents are willing to pay at least a 50% premium for the functional bread.

CHAPTER I: INTRODUCTION

Chronic diseases including diabetes, heart disease and cancers are among the most common and most costly health problems in the United States. Diabetes costs the nation about \$100 billion annually and it is the fifth leading cause of death in the state of Louisiana (Agyeman *et al.*, 2002). Cardiovascular disease, which includes heart disease and stroke, causes 40% of all deaths in the United States and costs the nation almost \$260 billion annually (CDC-OC, 1997). Heart disease is the leading cause of death in Louisiana, accounting for approximately 27% of the state's deaths in 2001 while stroke is the third leading cause of death, accounting for approximately 6% of the state's deaths in 2001 (CVH, 2005). The major risk factors of heart disease are high blood pressure, high blood cholesterol, diabetes, smoking, overweight or obesity, lack of exercise, most of which could be controlled, and therefore reduce the chances of cardiovascular disease.

Cancer is the second leading cause of death in Louisiana and Louisiana's cancer mortality rates rank among the highest in the nation (Louisiana Cancer Control Partnership, 2004). According to the Louisiana Cancer and Lung Trust Fund Board (2004), approximately three people will be diagnosed with cancer in Louisiana every hour. This high cancer rate in Louisiana is an issue of great concern and one of the state's top priorities (Louisiana Cancer Control Partnership, 2004).

In the U.S. cancer causes one of every four deaths, yet only 5% to 10% of all cancers are clearly hereditary, the rest result from mutations that occur through one's lifetime, either due to external factors like tobacco, chemicals, and sunlight or internal factors like hormones or the digestion of nutrients within cells (American Cancer Society, 2005).

About one-third of the 570,280 cancer deaths expected to occur in 2005 will be related to nutrition, physical inactivity, and overweight or obesity, and thus could be prevented (American Cancer Society, 2005). Colorectal cancer, which is the second leading cause of cancer mortalities, could be reduced 50-75% if Americans would adopt a series of risk-lowering behaviors (Emenaker, 2003). According to Watson (2003), nutrition and foods are related to 30% of cancers and the focus is now turning to the use of dietary vegetables, medicinal herbs and their extracts or components to prevent or treat cancer.

Some components of vegetables that are known to be beneficial in reducing cancer are antioxidants such as vitamins A, C, and E (Fisher, 2003). These vitamins are found in most fruits, vegetables, and whole grains. Some food components, such as phytochemicals, are not classified as nutrients but they can positively affect human function and reduce the risk of disease. Phytochemicals, which are found in a variety of herbs, have many ways to offset cancer (Fisher, 2003). They can offset cancer by stimulating the vital process of detoxification in the body, which results in the elimination of carcinogenic factors. They can also stimulate and strengthen the body's immune system, which helps to inactivate, fight and destroy cancer cells.

The *Allium* genus of vegetables including garlic, onions, leeks, scallions, chives, and shallots is characterized by a composition that is high in organosulfur compounds (Waladkhani and Clemens, 2003), whose anticarcinogenic effects have been demonstrated in animals. Other anticarcinogenic chemical families including flavonoids, polyphenols and terpenes are found in various fruits, vegetables and herbs (Waladkhani and Clemens, 2003). Various essential oils, particularly oils of lemon, orange, mandarin, caraway and parsley,

contain monoterpenes whose anticancer activity has been shown in invitro studies (Pietta, 2003).

Dietary fiber, its metabolic by-products, and associated biologically active compounds may contribute to the reduction of colon cancer incidence rates by mediating biological and genetic factors influencing carcinogenesis (Emenaker, 2003). Whole grains are an important source of dietary fiber and of many vitamins and minerals such as folate, vitamin E and selenium that have been associated with lower risk of colon cancer (Emenaker, 2003).

As much as individual compounds are known to be effective against certain diseases, scientists are considering the properties of whole foods rather than single compounds. The American Dietetic Association recommends that the best nutritional strategy for promoting health and reducing the risk of chronic disease is to obtain adequate nutrients from a variety of foods (Davis and Finley, 2003).

A number of epidemiological studies have shown a reduced risk of cancer as a result of a high intake of fresh fruits and vegetables, rather than a high intake of any specific antioxidant (Riso et al., 2003). The protective value of high-fiber diets may also depend on other compounds such as antioxidants, micronutrients and phytonutrients with anticarcinogenic properties co-consumed in the diet (Emenaker, 2003). Therefore, it is best to obtain fiber from whole grains, vegetables and fruits rather than from fiber supplements. Supplements lack the additional macronutrients, micronutrients and biologically active compounds that are found in whole foods (Emenaker, 2003). Furthermore, consuming foods enriched in selenium is a much better way to obtain selenium than supplements. This is because food often contains multiple chemical forms of selenium, and selenium is supplied in

a matrix with other health-promoting chemicals. There is also little chance of consuming a toxic dose of selenium from food (Davis and Finley, 2003).

The above considerations have generated considerable public interest in functional foods. Functional foods are foods promoted for health benefits beyond meeting nutritional needs of growth and maintenance (Litov, 1998). The presence of health promoting substances like anti-angiogenic factors, antioxidants, anti-inflammatory and anti-tumor or anti-cancer compounds forms the basis for functional foods. These foods aim to maintain health, improve well-being, and create the conditions for reducing risk of disease (Haesman and Mellentin, 2001). They may decrease the risk of chronic diseases or delay the onset of deadly chronic diseases like cancer, diabetes and heart disease and may therefore prolong survival. Functional foods may be specific natural foods with a high or low content of a certain component or they may be designed foods where ingredients have been added or removed (Kalbe et al., 2003).

As a consequence of increasing interest in improving or maintaining health in a proactive and convenient approach (Jong et al., 2003), consumers have become more concerned about the nutrition, health, and quality of food they eat (Gil et al., 2000). Accordingly, the field of diet and health is rapidly growing and the food industry is focused on developing products with positive nutritional benefits (Litov, 1998). Food manufacturing companies and the pharmaceutical industry are developing products that would help control weight, improve general health, prevent aging and lower the risk of degenerative diseases including coronary heart disease and cancer. The agricultural industry is also keeping an eye on the increasing opportunities in value-added production especially focusing on functional foods as a vehicle for improving farm incomes (Maynard and Franklin, 2003).

Examples of functional foods already on the market are beverages, snack foods, breads, grains and dairy products. Health-promoting compounds like lycopene and lutein have been used in a range of food products including yoghurts, cheese, bread, sausages and cereal bars. Functional foods have also been designed to regulate fat metabolism, for example, margarines that are intended to reduce the risk of excessive consumption of cholesterol and saturated fatty acids (Kalbe et al., 2003).

1.1 Problem Statement

Louisiana has the fourth highest cardiovascular death rate in the nation (Office of Public Health) and Louisiana's cancer mortality rates rank among the highest in the nation (Louisiana Cancer Control Partnership, 2004). The state indeed feels the burden of deadly chronic diseases. Conversely, scientific evidence shows a relationship between nutrition and incidences of chronic diseases. And current dietary recommendations advocate a diet low in dietary fat and high in dietary fiber, grains, vegetables and fruits, as these overall patterns appear to be associated with reducing the risk of various chronic diseases (Vinson, 1999). Vegetables and fruits contain health-promoting substances, which forms the basis for functional foods. "It is the position of the American Dietetic Association that functional foods, including whole foods and fortified, enriched or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis" (ADA Reports, 2004).

The food industry increasingly realizes that functional foods have the potential to add value to their business (Kleef et al., 2002). Food companies are enthusiastic about developing new functional foods (McConnon et al., 2002) and most of these companies are reviewing the nutritional profile of their portfolios (Market Analysis, 2004). Louisiana's agricultural

industry, as many other agricultural industries, is also interested in nutri-ceuticals and functional foods as one of the ways to expand in value-added products (Agriculture and Louisiana's Economic Development). Functional foods, however, present both challenges and opportunities. They offer the opportunity for developing a healthier Louisiana (and the population at large), which is one of Louisiana's top priorities (Louisiana Cancer Control Partnership, 2004), and the opportunity for the state's economic development.

On the other hand, functional food innovation and production are risky, involving high costs (Kleef et al., 2002; Maynard and Franklin, 2003), and they pose the challenge of positioning. Hollingsworth (2001) reported that marketing functional foods is not always as easy as expected. Whereas some companies have done very well with functional food lines, others have failed. One cited reason is that consumers are slow to embrace the new concepts as a result of food health claims many of which have little quantifiable effect. Furthermore, in the 2004 Market Analysis, Childs stated that too many fast and novel moves have backfired in the past. To achieve the two-pronged goal of a healthier Louisiana, and successful value-added industries based on functional foods, it is important that research be done to determine if consumers are willing to pay for functional foods and if not, determine the reasons. This would provide useful information for developing marketing strategies for functional food products and assist in the formulation of policies and education programs to ensure that consumers make informed choices, leading to healthier lifestyles.

1.2 Statement of Research Objectives and Questions

“For the food industry, the driving force behind the functional food concept is to create a market niche to commercialize innovative products claiming beneficial physiological effects beyond those ordinarily associated with typical nutrients” (Jong et al., 2003). “Public

perception however may determine whether this new food concept is to become the next successful breakthrough in nutritional science or just another marketing gimmick devised by food manufacturers” (McConnon et al. 2002). According to the American Dietetic Association Trends 2002 Survey, while 85% of Americans say that diet and nutrition are important to them personally, only 38% say that they have made significant changes to achieve a healthful diet (Toner and Pitman, 2004). Therefore, to promote public health and to realize the impact of functional foods on health, understanding consumer behavior will be important (Frewer et al., 2003). In addition, assessment of consumers’ attitudes, norms and knowledge regarding functional foods in relation to actual dietary patterns and health risk profiles is necessary (Jong et al., 2003). Furthermore, knowing consumers’ attitudes about functional foods is important for nutrition experts so that they will be best positioned to meet consumers where they are (Toner and Pitman, 2004). The overall goal of this study is to assess the factors that affect willingness to pay (WTP) for functional foods. The primary research question is to determine which factors affect the consumers’ decision to pay for foods that could enhance their health. The study sought to encompass two specific objectives:

1.2.1 Specific Objectives

1. To evaluate consumer behavior and attitudes regarding the consumption of functional foods. It is hypothesized that consumer attitude toward functional foods, which will be affected by different factors including knowledge, will determine consumers’ willingness to pay for functional foods.
2. To measure willingness to pay for selected functional foods and to evaluate price premiums that consumers are willing to pay for different functional foods containing different health claims.

1.3 Organization of the Study

The remaining chapters focus on literature review, methods, results and conclusions. In chapter two previous research and relevant literature is reviewed and summarized. Chapter three describes the methods used in this study, including the theoretical and empirical models, survey design and measurement of variables, as well as the analysis procedures. Chapter four focuses on interpretation and discussion of empirical results. The final chapter (V) summarizes the study and presents conclusions as well as limitations and suggestions for future research.

CHAPTER II: LITERATURE REVIEW

2.1 Definition of Functional Foods

Functional foods have been given a range of definitions including, “foods that may provide health benefits beyond basic nutrition; foods that encompass potentially helpful products, including any modified food or food ingredient that may provide a health benefit beyond that of the traditional nutrient it contains; food similar in appearance to conventional food that is intended to be consumed as part of a normal diet, but has been modified to subserve physiologic roles beyond the provision of simple nutrient requirements” (Frewer et al., 2003). The Institute of Medicine of the National Academy of Sciences limits functional foods to those in which the concentrations of one or more ingredients have been manipulated or modified to enhance their contribution to a healthful diet (ADA Reports, 2004). There is no universally accepted definition of functional foods (ADA Reports, 2004) but even so the term functional foods is used to describe a range of novel foods under development, which are designed to deliver some benefit beyond nutrition to the person consuming them (Frewer et al., 2003). These include products aimed at people already suffering from medically recognized health-related conditions, and products aimed at preventing the development of such diseases within the general population. According to the American Dietetic Association, un-modified whole foods such as fruits and vegetables represent the simplest form of functional foods and, the term functional foods should not be used to imply that there are good foods and bad foods. All foods can be incorporated into a healthful eating plan – the key being moderation and variety (ADA Reports, 2004).

2.2 Status of Functional Foods

Research on functional foods began in the early 1980s in Japan, where a shift in public focus drew attention towards concern about preventing chronic disease in an ageing population (McConnon et al., 2002). Functional foods are designed to supplement the human diet by increasing the intake of bioactive agents that are thought to enhance health and fitness (Zeisel, 1999). Scientists are identifying functional components of foods that could reduce risks of chronic diseases including the two leading causes of death in the U.S.: cancer and cardiovascular disease (Unnevehr et al., 1999). A growing industry exists to commercialize these discoveries, and food products are now being marketed for their ability to promote wellness, or as a preventative measure against illness and chronic disease. Multibillion-dollar companies like Monsanto, Bristol-Myers Squibb, Lipton, Johnson & Johnson, Dupont, Procter & Gamble and Novartis commit substantial resources to discover health-enhancing activities within the foods we eat and to change traditional foods so they contain more of these active ingredients (Zeisel, 1999). The functional food world market was estimated to be worth at least 32 billion U.S. dollars in 1999 and it is steadily growing with new functional food products frequently being launched (Urala and Larhteenmaki, 2003). By 2003, the market for functional foods in Europe and the USA had experienced 15% and 20% growth respectively over the preceding four years (Frewer et al., 2003). The 2004 Market Analysis also reported that functional foods are still growing at a healthy pace, expanding 8.8 per cent in 2003 and functional foods are four percent of the \$555 billion U.S. food industry. The lesser-evil category, which includes products with ingredients removed predominantly for health purposes, is at 11% while natural and organic category is at three percent (Market Analysis, 2004). Federal and state grants supporting value-added agricultural activities are

also increasingly available (Maynard and Franklin, 2003). Examples of functional foods already on the market include cholesterol-reducing spreads such as Benecol and Take Control (Maynard and Franklin, 2003). Cranberry juice, which reduces the incidence of urinary tract infections, is another functional food already present on the market. “In 2003, the largest major categories were beverages at 11.9 billion, followed by breads and grains (5.2 billion) and snacks and bars (\$2.3 billion) (Market Analysis, 2004).

2.3 Stakeholders in Functional Foods

The major stakeholders in functional foods include the food industry, consumers, the health sector, and governments, each with different but strongly interdependent interests (McConnon et al., 2002). The food industry is enthusiastic about developing new functional foods as these products have added ingredients thus increasing their value, allowing higher prices to be paid for them and returning greater profit. Health professionals who tend to be trusted by consumers, and nutritionists who play a role in educating consumers, will play an important role for the success of functional foods. The government’s role of legislation will also greatly affect functional food industry growth. Currently, the growth of the functional food market is encouraged by the Dietary Supplement Health and Education Act (DSHEA) that was passed by the U.S. Congress in 1994. The act was based on the recognition that dietary supplements offer significant health benefits and it gave manufacturers of dietary supplements freedom to sell these supplements and to provide information about product benefits on labels, with significantly reduced requirements for pre-market review by the FDA (Zeisel, 1999). This act opens a lot of opportunities to improve existing foods and develop new foods and supplements for the diet but it also creates a potential risk to the public if companies market products whose associated risks are not sufficiently evaluated.

The consumer is more aware of the link between diet and health, is more concerned about self-care and personal health (Toner and Pitman, 2004), and is seemingly demanding more information on how to achieve better health through diet. But consumers perceive risk along with the benefits. According to McConnon et al. (2002), 78% of respondents agreed to the statement that “a lot of health claims made by food manufacturers about their food products are misleading.” This shows the importance of the stakeholders working together and especially educating consumers thereby allowing them to make informed decisions about dietary choices. Toner and Pitman (2004) reported that the IFIC (International Food Information Council) that has been tracking consumer attitudes about functional foods, found positive attitudes and strong interest in the concept of functional foods. However, the authors also reported that numerous factors weigh heavily on the success of effective communication with patients, and therefore understanding the communications environment, ranging from the food label, to the evening news, to consumer preferences, will help food and nutrition professionals provide appropriate and effective education for consumers. The 2004 ADA report, on the position of the American Dietetic Association on Functional foods, gives a detailed presentation of the strength of evidence for functional foods currently on the U.S. market. It is also an informative resource about disease-diet relationships and some approved health claims, as well as, the role and responsibilities of the dietetics professional, which will be very crucial in the long term success of functional foods.

2.4 Consumer Acceptance of Functional Foods

The consumer’s level of understanding and awareness of the importance of diet in providing good health and preventing disease has grown as a result of the numerous government, public health, and education campaigns (Childs, 1997). An example of these

campaigns is the U.S. government's program to increase our consumption of fruits and vegetables to five servings a day (Vinson, 1999). The IFIC 2002 survey results showed that consumers believe that nutrition plays an important role in their health, and that some foods have health benefits that go beyond basic nutrition. The IFIC survey indicated that 85% of the respondents are interested in learning more about such foods.

Childs (1997) reported results of Childs and Poryzees' research on consumer belief in functional foods. This study focused on the evaluation of belief in the concept that "food or food products can help reduce the risk of cancer and other diseases." They reported that women, higher income groups, and the more educated were more likely to believe in the health benefits of foods. Among the age groups, belief was significantly higher among the respondents aged 35-64, than among younger or older age groups. Childs also reported findings of the HealthFocus work which identified a "Food as Medicine" segment. This segment is reportedly characterized by its concern for long-term health, and it includes somewhat older and better educated consumers who exhibit concern for their long-term health. Another study reported by Childs (1997) is Wrick's research published in 1994 which suggested a growing acceptance of functional foods in the population. According to Childs (1997), the functional food consumer represents an identifiable market segment with characteristic beliefs, concerns and goals. Furthermore, the typical well-informed functional food customer has many noncommercial sources of information about nutrition and diet-disease relationship and can afford to buy healthy foods as "insurance" for future health, as long as the products are presented as credible, high quality, readily available, tasty, varied and convenient. Toner and Pitman (2004) reported that the demand for foods that help reduce the risk of or treat a condition is at an all-time high. Additionally, shoppers continue to

purchase foods that help prevent, manage or treat a condition and a majority agrees that eating healthfully is a better way to manage illness than medications.

Marketing healthy foods, however, has come with some challenges. While some companies have done very well, others have not (Hollingsworth, 2001). According to Lusk and Hudson (2004), a considerable number of new food products introduced annually have success rates often as low as 10%. The apparent interest of consumers in food and health and the potential ease of new product introductions because of the DSHEA act have not always resulted into functional food success. For instance Campbell Soup's Intelligent Quisine™ and Kellogg's Ensemble, both of which were heart-healthy lines, never achieved sustainable sales volume (Hollingsworth, 2001). Among the reasons given by marketing experts, was consumer reluctance to build a diet around these new brands (Hollingsworth, 2001) probably due to skepticism about health claims. Another reason functional food products may not do that well is the inevitably high price due to the extra resources required to include functional ingredients in food. For instance, existing stanol and sterol ester-based products cost up to three times more than their conventional counterparts, and may therefore prevent many consumers from trying the functional products.

Consumers accept novel products to various degrees and most new products are discontinued within a year of their often costly market entry (Mark-Herbert, 2003). Worsley and Skrzypiec (1998) conducted surveys in Australia to examine factors that may influence consumers' concerns about food and health. They administered a 28-item food and health concerns survey along with selected personality traits, personal values and shopping style scales. Their results showed that psychological variables accounted for more variance in the food and health concern scores than the demographic variables.

Bech-Larsen and Grunert (2003) carried out a conjoint study of Danish, Finnish and American consumers' perception of functional foods. The factors included in their conjoint design were: base-products, health claims, functional enrichments, processing methods, price; and two interactions between enrichments, base products and processing methods. According to the authors, consumer acceptance of functional foods is influenced by their perceptions of the healthiness of the processing methods, enrichment components, food-types, and health claims used in the production and marketing of functional foods. And because consumers may perceive enrichment as interfering with nature, cultural values pertaining to man's manipulation of nature may also influence consumer acceptance of functional foods. Their results indicated that "values relating to man's manipulation of nature" was only modestly related to acceptance of functional foods. On the other hand, use of different health claims, processing methods, product types and especially the interaction between the enrichments and product types, were important determinants of consumers' perceptions of the healthiness of functional foods. Important to note is the result that consumers' perception of the healthiness of functional foods is more dependent on their perception of the nutritional qualities of the base product than on any type of health claim. Chan et al. (2005) also reported that the use of food additives and the safety of processed foods are among the most important consumer concerns about the food supply. Bech-Larsen and Grunert (2003) noted that food producers considering marketing a functionally enriched alternative should be very particular in their research of consumer attitudes to the particular base-product and enrichment involved.

The study of Urala and Lahteenmaki (2003) evaluated reasons behind consumers' functional food choices. Using a laddering interview technique, they determined five central

means-end chains describing the product attributes, consequences and values behind respondents' food choices, which referred to healthiness, taste and pleasure, security and familiarity, convenience and price. Data were collected from 50 Finnish-speaking consumers who volunteered to be interviewed on a day ferry between Turku (in Finland) and Stockholm (in Sweden). Their results indicated that respondents perceive functional food products as a member of the general product category such as yoghurt or spread and only secondarily as a functional food. Their study also indicated that gender, age, state of health or body mass index (BMI) had no effect on the use frequencies, or the perceived healthiness of the functional products.

The study of Jong et al. (2003) explored opinions from Dutch consumers regarding different functional foods and dietary supplements as well as the association between demographic variables, several lifestyle characteristics and actual functional food and/or dietary supplement consumption. Data were obtained from self-administered questionnaires filled in by a consumer panel aged 19-91 years and logistic regression was used. This study concluded that determinants of functional food use depended on the type of product and therefore generalization of consumer characteristics over different foods is not valid. Their study also reported that a larger number of respondents are in favor of the "functional food concept" yet a lower number reported actual consumption of functional foods. In other words, some consumers think that the idea of functional foods is good but they have not made any effort to consume functional foods.

Frewer et al. (2003) presented a very informative review of various cross-cultural and demographic factors that would affect acceptance of functional foods, as well as barriers to dietary change. Some of the factors found to be important to acceptance of functional foods

were, cross-cultural and intra-individual factors which may be related to nutritional knowledge; consumer perception of the technology used to produce functional foods (for example genetic modification); the degree to which sensory properties meet customer expectations; and, the price of the food. The authors noted that the alternative to the currently accepted market segmentation approach is to understand why consumers are not selecting functional foods. The authors suggest that this could be done through understanding risk perception and barriers to healthy eating. Consequently, understanding consumers' risk perceptions and concerns associated with processing technologies and emerging scientific innovations will be key. This will enable development of information strategies that are relevant to wider groups of individuals in the population and deliver real health benefits to people at risk of or suffering from major degenerative illnesses. Furthermore Jong et al. (2003) suggested that in addition to research on lifestyle factors, surveys about consumers' attitudes, norms and knowledge regarding functional foods in relation to actual dietary patterns and health risk profiles are necessary.

The assumption that functional foods with specific health advantages are likely to deliver population-wide benefits is not generally accepted (Frewer et al., 2003). Additionally the past assumption that consumers would accept novel foods if there is a concrete and tangible consumer benefit associated with them does not imply that functional foods would be quickly accepted. Consumers may have a strong belief in the relationship between nutrition and health and this is necessary, but not a sufficient condition for functional foods to be successful in achieving their commercial and public health objectives. Survey results published by Deloitte & Touche found that, despite stated interests, people eat what is most convenient rather than what is most healthy (Market Analysis, 2004).

Many companies also struggle with how to translate the plethora of scientific opportunities into successful new products (Kleef et al., 2002). Kleef et al. (2002) further noted that despite considerable promotional expenditure and the effort being put into explaining the health benefits to consumers, many products face problems with market acceptance and some are withdrawn. In order to address the problem of reducing risks in strategic decision-making, Kleef et al. (2002) provided a framework which would allow the potential functional food-developing company to obtain relevant consumer and expert input in the early stages of functional food development. The authors reported that by systematically generating and rigorously screening a large set of functional food concepts both inside (functional food experts) and outside (consumers) the company, the framework prevents the possibility of overlooking high potential opportunities. This in turn provides a platform for product developers to discuss and decide upon which opportunities to pursue. On the whole, for successful functional food development, both consumer needs and the opportunities originating from scientific research need to be taken into account from the earliest phase.

Furthermore, the value of differentiated goods and services needs to be established and therefore, market research into the viability of new products and services is critical (Lusk and Hudson, 2004). Estimating the demand for novel products can be done using the willingness-to-pay methodology (Lusk and Hudson, 2004).

2.5 Willingness to Pay for Functional Foods

Willingness to pay (WTP) is the price or dollar amount that someone is willing to give up or pay to acquire a good or service. It could also be defined as the maximum amount of money that may be contributed by an individual to equalize a utility change. The WTP

function identifies the price an individual is willing to pay for a given level of quality, q , given specific levels of price p and utility U (Lusk and Hudson, 2004).

Willingness to pay is based on the principle that the maximum amount of money an individual is willing to pay for a commodity is an indicator of the value to him or her of that commodity. It is a crucial determinant of the incentives for product innovation using emerging health information (Unnevehr et al., 1999) and an important concept for benefit-cost analysis. According to Maynard and Franklin (2003) the identification of consumer characteristics that influence the likelihood of willingness to pay for functional foods will be valuable as the market continues its growth.

Three basic methods have been used to elicit consumers' economic value or willingness to pay for preferences; these include personal interviews, mail surveys and experimental auctions (Umberger et al., 2002). The most widely used techniques to obtain WTP estimates are, contingent valuation, conjoint analysis, and experimental auctions. Conjoint analysis and contingent valuation are hypothetical valuation methods, which use survey responses to elicit consumer's willingness-to-pay. Experimental auctions also determine how much consumers will pay for a good or service but in a more or less real situation.

Contingent valuation was originally used to value environmental and public goods but has been extended to the determination of WTP for private goods especially those goods in which a market does not yet exist, i.e., non-market goods. Contingent valuation, which measures willingness to pay for a non market good by creating a hypothetical market for that good, also readily lends itself to estimation of WTP for food attributes (Maynard and Franklin, 2003).

The method usually requires the use of surveys or questionnaires to elicit the WTP bids. The questionnaires could employ either open-ended or close-ended questions. Single-bounded and double-bounded dichotomous choice questions which have been frequently used to estimate the value of non-market goods can be extended to the valuation of novel food products (Lusk and Hudson, 2004).

Campiche et al. (2004) used the Dichotomous Choice Contingent Valuation Method (DC-CVM) to examine the impacts of consumer characteristics on willingness to pay for natural beef in the Southern Plains. Survey respondents were given a hypothetical supermarket scenario and asked to make a choice, to either purchase regular beef sirloin steaks at \$4/pound or natural beef sirloin steaks at \$5.60/pound. If respondents chose to purchase the natural beef, they were given a second scenario in which the regular beef price remained the same but the natural beef price jumped to \$6.50/pound. Those who chose regular beef in the first scenario were also provided an additional scenario in which the natural beef price dropped to \$5/pound while regular beef price stayed at \$4/pound. They used a multinomial logit model to assess the effect of consumers' demographic characteristics on willingness to pay. They also determined the effects of consumers' meat purchasing behavior and perceptions of natural beef on willingness to pay. Their results showed that consumers' meat purchasing behavior and perceptions of natural beef were much better indicators of their willingness to pay for natural beef than demographic and socioeconomic factors. Their results also indicated that consumer responses differed significantly by geographic location.

Gil et al. (2002) used contingent valuation to measure consumers' willingness to pay for organic food products. Their procedure referred to as close-ended with follow up

consisted of a dichotomous choice question and a maximum willingness to pay question. Boccaletti and Nardella (2000) used contingent valuation to determine consumer willingness to pay for pesticide-free fresh fruits and vegetables in Italy. Their results indicated that WTP was significantly and positively related to income and risk concern. Maynard and Franklin (2003) used contingent valuation to elicit consumers' willingness to pay for high-CLA dairy products. They used the payment card method to determine the maximum amount that the respondents were willing to pay for the cancer-fighting products. Their results showed that households with children and health-conscious consumers are more willing to pay premiums for cancer-fighting dairy products. Halbrendt et al. (1995) also used contingent valuation to estimate willingness to pay for pork with lower saturated fat.

One of the problems usually associated with contingent valuation is hypothetical bias. However, the method can be made incentive-compatible in agribusiness situations since the product being valued is deliverable (Lusk and Hudson, 2004).

Conjoint Analysis (CA) is a multivariate technique that is used specifically to understand how respondents develop preferences for certain products or services and it has been commonly used in new product development (Hair et al., 1998). This method is based on the principle that consumers evaluate the value of a product by combining the separate amounts of value provided by each attribute. In a choice-based conjoint framework, consumers are typically confronted with a choice between alternative products, defined by several attributes such as price and quality (Lusk and Hudson, 2004). The consumers are then asked to choose which product they would purchase, given several product descriptions. Baker and Burnham (2001) used conjoint analysis to elicit consumer preferences for attributes of genetically modified foods. The authors used a logit analysis to analyze

consumer characteristics associated with the acceptance of GMO foods. Their results showed that those consumers who were most risk averse were most unlikely to believe that GMOs improved the quality or safety of food and most knowledgeable about biotechnology were the most likely to be accepting of GMO foods. Bech-Larsen and Grunert (2003) used conjoint analysis to study the extent to which Danish, Finnish and American consumer perceive the healthiness of functional foods. The factors included in the conjoint design were: base-products, health claims, functional enrichments, processing methods, price and two interactions between enrichments, base products and processing methods. Their results indicated that the use of different health claims, processing methods, enrichments, product types, and especially the interactions between enrichments and product types are important determinants of the healthiness of functional foods.

Experimental auction methods have been cited as having the potential to provide more reliable measures of willingness to pay than a hypothetical survey method (Umberger et al., 2002). Experimental auctions may be conducted in one of two ways: consumers can be provided with a pre-existing good and then asked to bid to exchange their endowed good for a novel good or consumers can bid directly on several competing goods and a random drawing can be used to determine which good is binding so that the demand for a single unit can be elicited (Lusk and Hudson, 2004). A commonly used experimental auction design is the Vickrey sealed-bid, second price auction where each participant submits a written bid on a particular product (Umberger et al., 2002). In a sealed-bid, second-price auction, bids are ranked from highest to lowest. The highest bidder is determined to be the winner of the auction and must purchase the product at the second highest bid (Lusk and Hudson, 2004). The primary advantage of this type of auction is that participants have the incentive to reveal

their true valuation for the product; underbidding induces the risk of foregoing a potentially profitable purchase, and overbidding increases the risk of the participant having to purchase a product at a price more than the true willingness to pay.

Second-price auctions have been used to determine the price premium consumers were willing to pay for vacuum-packaged steaks versus over-wrapped steaks (Menkhaus et al., 1992), to determine the value of genetically modified pork (Buhr et al., 1993), to elicit consumer willingness to pay for food safety (Hays et al., 1995), and to place value on consumer preferences for various quality attributes of fresh pork chops (Melton et al., 1996). Based on the second-price Vickrey auction methodology, Umberger et al. (2002) developed an experimental valuation process using a fourth-price Vickrey auction to elicit consumers' true willingness to pay for their preferred steaks. The fourth highest bid determined the market price and the top three bidders were required to purchase steaks at the fourth-highest price.

Umberger et al (2002) used experimental auction procedures to measure Chicago and San Francisco consumers' willingness to pay for beef flavor from domestic, corn-fed beef versus Argentine, grass-fed beef. Their results showed that on average, consumers were willing to pay a 30.6% premium for corn-fed beef.

Unnevehr et al. (1999) used experimental auctions to test for the effect of health information on consumer willingness to pay for a new food product with health promoting characteristics. They developed a model of consumer decisions to pursue activities that promote health and derived three hypotheses regarding the resulting demand for functional foods and value of enhanced market information. The three hypotheses that were tested using experimental auctions were a) consumers should be willing to demand, and hence pay more

for the health promoting market input when they learn that it has substantial health benefits, b) consumers with low health endowments should be willing to pay more for health promoting input and c) consumers with high health endowments should not be willing to pay more for the health promoting input. In controlled laboratory experiments, the researchers elicited consumer valuations of conventional and soy baked goods both before and after presenting information regarding product content and health benefits. Subjects were drawn from students and senior citizens. These participants were assumed to have different health conditions.

The experiments were conducted to find out what senior citizens and students would pay for a soy cookie with specific health benefits. Their results indicated that students were not willing to forego the value of other goods to consume more soy, presumably because they have a large initial endowment of health. Because they are likely to have a lower endowment of health, senior citizens bid more for soy cookies after learning of their health benefits. Their results confirmed that senior citizens were more likely than students to bid more for soy cookies after information about health benefits, implying that information increases functional food demand.

While some insight has been gained regarding consumers' willingness to pay for functional foods, much remains to be learned. Little information exists regarding the impact of current food purchasing patterns, consumer beliefs and attitudes, as well as consumer characteristics and socioeconomic variables on willingness to pay for functional foods. Available information on consumption is less precise and it is still necessary to further understand the consumer regarding functional foods and how consumers make comparisons of conventional and functional food alternatives. This study will expand on the empirical

evidence regarding the factors influencing consumer willingness to pay for functional foods. And it will ultimately enhance the understanding of US consumers in relation to functional foods.

The importance of this research lies in the implications the results will carry for improving the health of the general public and the marketing strategies to lead to successful products. The results of this study are expected to provide important information for the marketers and food developers and help them to understand the main factors affecting consumers' decisions regarding functional foods and thereby improve or develop better marketing strategies. Results are also expected to provide information useful for formulation of policies and education programs to ensure that consumers make informed choices in product selection.

CHAPTER III: METHODS

3.1 Review of Willingness to Pay Theory

The welfare of consumers changes due to changes in prices of goods and services, and consumer incomes. “The conventional welfare measures for price changes are compensating and equivalent variations, which correspond to the maximum amount an individual would be willing to pay (WTP) to secure the change or the minimum amount she would be willing to accept to forgo it” (Hanemann, 1991). Willingness to pay is a Hicksian surplus measure and can be expressed in a number of equivalent ways (Lusk and Hudson, 2004). One way of the ways to express WTP is to consider a consumer’s utility maximization problem subject to a budget constraint and another way which is dual to utility maximization is an expenditure minimization (Hanemann, 1991). In the first case, an individual has preferences for various market commodities whose consumption is denoted by the vector x as well as another commodity whose consumption is denoted by q . According to Lusk and Hudson (2004), for agribusiness applications, q is most applicable as an index of a good’s quality. The individual’s consumption of q is fixed exogenously, although she can freely vary her consumption of x (Hanemann, 1991). The consumer takes the level of q as given and chooses the level of the market good x_m that maximizes utility, yielding an ordinary demand function (Marshallian) $x_m(p, y, q)$ and an indirect utility function $v(p, y, q)$, where p is the market price of the good and y is income (Hanemann, 1991; Lusk and Hudson, 2004). Assuming that an agribusiness considers an improvement in the quality of an existing product from q^0 to q^1 with prices and income remaining constant (p, y) , the individual’s utility changes from $u^0 \equiv v(p, y, q^0)$ to $u^1 \equiv v(p, y, q^1) \geq u^0$ (Hanemann, 1991). The compensating variation (C) measure of this change, which aims to make the individual as

well off as she was before the change in quality (u^0), is defined by $v(p, y - C, q^1) = v(p, y, q^0)$. Otherwise stated, this represents a measurement of the value the consumer places on the improvement in quality, and can be derived by determining the magnitude of WTP such that the following equality holds (Lusk and Hudson, 2004): $v(p, y - WTP, q^1) = v(p, y, q^0)$. The consumer should be willing to pay C (compensating variation) in order to secure the quality change.

Considering the dual expenditure minimization problem, the consumer seeks to minimize expenditure $\sum p_i x_i$ with respect to x and subject to a given level of utility $u = (x, q)$. “In this case, the consumer chooses the level of consumption of the market good (x_h) that minimizes expenditures, yielding a Hicksian demand curve $x_h(p, U, q)$ and an indirect expenditure function $m(p, U, q)$, where U is the level of utility (Lusk and Hudson, 2004). In terms of this function, the WTP (compensating variation) which represents the value the consumer places on the change in the good’s quality from q^0 to q^1 is,

$$WTP = m(p, U^0, q^0) - m(p, U^0, q^1).$$

3.2. Measurement of Willingness to Pay

Among the WTP elicitation techniques, contingent valuation was selected for this study. Conjoint analysis, which is a hypothetical valuation method like contingent valuation, was deemed inappropriate for this study. Conjoint analysis (CA) is consistent with Lancaster’s theory of utility maximization, where consumers demand attributes embodied in a good, and it closely mimics a consumer’s typical shopping experience (Lusk and Hudson, 2004). Conjoint analysis also portrays consumers’ decisions realistically as trade-offs among multiattribute products (Hair et al., 1998).

There are several factors that make up the total utility of a functional food. In addition to health promoting functional ingredients, other factors include convenience, accessibility, taste (Davis and Reinhardt, 2005), price, and trust of a health claim (Hollingsworth, 2001). Some of these factors do not vary substantially between objects and are not key determinants in making product choices. For instance, convenience may not be a significant determinant in choosing a functional food product over a similar conventional alternative that the respondent is already familiar with or is currently purchasing. For example, an individual who has been buying bread, convenience would not be a relevant factor to consider when deciding to choose a functional multigrain loaf instead of a white one. Other factors that may be important in selecting functional foods are sensory characteristics such as taste, smell, touch, etc. Sensory characteristics, however, are not easily communicated in a hypothetical setting for a realistic evaluation, since written descriptions do not capture sensory effects (Hair et al., 1998). For instance, it would be impossible to describe the taste or flavor of a functional food and how it compares with the conventional alternative. In such a case, an experimental auction coupled with sensory evaluation would be the most viable alternative. However, an experimental auction was not selected for this study because of the high costs in addition to the geographical limitations associated with experimental auctions. Moreover, it is also not farfetched to assume that the flavor and/or taste of functional foods is at an acceptable level because sensory evaluation is an integral part of product development, and any new product must have acceptable sensory characteristics.

With just two attributes, the health claim and the price associated with it, conjoint analysis was found unsuitable for estimating WTP, in favor of contingent valuation. Contingent valuation does not easily lend itself to investigating tradeoffs between several

competing product attributes, but does allow the researcher to focus on specific product attributes (for instance health claim), moreover, it is not limited by geographical considerations.

3.3 Theoretical Framework

The person's attitude towards an item is important in determining a person's intentions to or not to purchase the item (Ajzen and Fishbein, 1980). In terms of a functional food, attitudes can be defined as a learned predisposition to respond in a consistently favorable or unfavorable manner regarding functional foods. Frewer et al. (2003) reported results of Childs and Poryzees' survey of North American consumer beliefs about disease and nutrition. In this study nearly one in three consumers preferred nutritional supplements to be delivered in pill form rather than through novel foods. And only about 7% of the population preferred different novel foods with specific health benefits. Bech-Larsen and Grunert (2003) study showed that the Finnish were more positive about the healthiness of functional foods than the Danish respondents. Consequently, functional foods in Finland have enjoyed considerable success, whereas acceptance rates in Denmark have only been moderate. This underscores the importance of consumer attitudes or perceptions regarding functional foods, and this study proposes that the consumers' attitude toward functional foods will affect the consumers' willingness to pay for functional foods.

The tendency to respond to an object in a particular way is learned, implying that attitudes are affected by different factors that cause the learning to take place prior to the formation of attitudes. People learn to like objects and acquire unfavorable attitudes toward objects (Ajzen and Fishbein, 1980). Figure 3.1 depicts the causal paths leading to formation of overall attitude toward functional foods and the influence that it may have on willingness

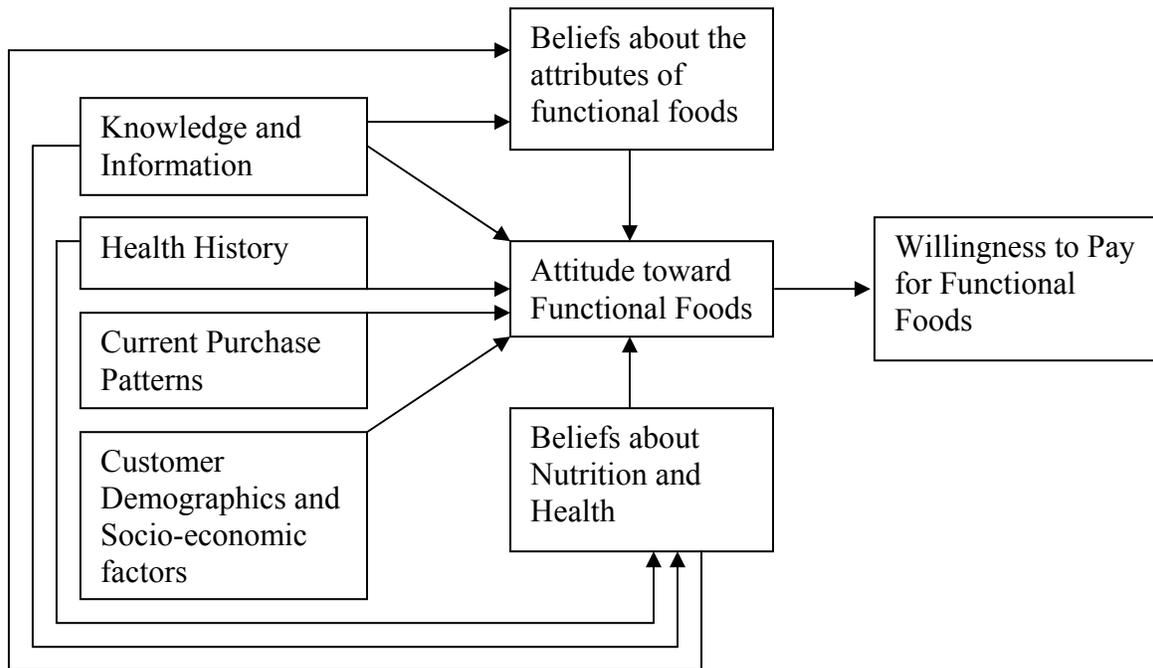


Figure 3.1. Conceptual model showing the factors affecting consumers' willingness to pay for functional foods

to pay for functional foods. The factors expected to determine the attitudes towards functional foods and willingness to pay for these foods include: knowledge and information that the customer has, the health history of the customer, customer demographics, current purchase patterns, beliefs about nutrition and health, and finally the customer's beliefs about the attributes of functional foods. This model is an extension of the multiattribute and mediation models of Moon and Balasubramanian (2004) and Ajzen and Fishbein (1980).

3.3.1 Factors Influencing Customers' Attitude and WTP for Functional Foods

Attitudes toward any object are determined by beliefs about that object, and beliefs about the object are formed by associating that object with various characteristics, qualities, and attributes (Ajzen and Fishbein, 1980). The attitude toward functional foods will be directly affected by customer beliefs about the attributes or characteristics associated with

functional foods. According to Louviere et al. (2000), customers are first of all equipped with a set of beliefs about attributes possessed by different products. The customers then develop a preference ranking for the products. Finally, depending on the budget or other constraints, customers make decisions about whether to purchase. In terms of functional foods, beliefs can be defined as a consumer's perception of the association between a particular attribute (e.g price) and the functional food. Customers may associate functional foods with high price, and they may also associate them with medicine. According to Hollingsworth (2001) consumers who consider themselves "normal" people don't want to consume "treating" foods. In other words some consumers see some functional foods as medicine (for treating) and this is considered one of the reasons some healthy food lines have not done well. The study of Unnevehr et al. (1999) also showed that information increased the functional food demand among the elderly and not the students, the cited reason being that students presumably have a large initial endowment of health. This implies that students believe they do not need these foods, after all, they are not sick. The concept of functional foods, however, is not only about correcting a condition but prevention as well (Donaldson, 2004; Losso and Bansode, 2004).

Another factor that may be negatively or positively associated with functional foods is the consumers' trust of the health claims as well as trust in regulatory bodies which protect the public (Frewer et al., 2003). Hollingsworth (2001) reported that consumers are slow to embrace the new concepts as a result of food health claims, many of which have little quantifiable effect. In a study done in the UK by the Institute of Grocery distribution, just under one fifth of the sample thought that functional foods would improve people's health (Frewer et al., 2003). Beliefs may be formed through a person's lifetime as a result of direct

observation or indirectly by accepting information from outside sources (Ajzen and Fishbein, 1980). Therefore, the effect of knowledge and information on the individual's attitude and willingness to pay for functional foods may be mediated by the individual's beliefs about the attributes of functional foods (Figure 3.1). This study hypothesizes that the knowledge and information that a customer has acquired regarding functional foods can directly influence the consumer's attitude toward functional foods, it can influence the consumer's belief about the attributes of functional foods and it can strengthen the consumer's belief in the relationship between nutrition and health. If people are educated about the relationship between health and food, they are more likely to consider buying health-promoting foods (functional foods).

Customer demographics may also affect the customer attitude toward functional foods and ultimately the willingness to pay for functional foods. The study of Gil et al. (2000) showed that some socio-economic factors including age, gender, education level, family size and income level were important in determining willingness to pay for organic food, which consumers perceive as healthier than conventional alternatives. The study of Maynard and Franklin (2003) also showed that households with children were among those most willing to pay premiums for "cancer-fighting" dairy products.

Consumers' attitude toward functional foods and ultimate willingness to pay for functional foods may also be affected by the consumers' health history. The influence of health history on attitude may be direct or it may be mediated by the customer's beliefs about nutrition and health. This study hypothesizes that someone who has a strong belief in the effect of nutrition on health will have a positive attitude toward functional foods and would be willing to pay for functional foods. Furthermore, the strength of one's belief in the

nutrition/health relationship may be determined by one's health history. People who have been affected or have a close associate who has been affected by a chronic disease may not only be more receptive of functional food but may also be more appreciative of the relationship between health and nutrition. For example, close associates of a diabetic who has to nutritionally manage the disease on a daily basis may have a better appreciation the link between nutrition and health.

Finally, current consumption behavior and purchase patterns is expected to have an effect on willingness to pay for functional foods, either directly or mediated through attitude toward functional foods. For instance, a customer who purchases organic products may have a negative attitude towards foods that have been manipulated by addition of artificial ingredients, and may therefore not be willing to pay a premium for novel functional foods.

3.4 Survey Design and Measurement of Variables

A survey was constructed to collect data on consumers' willingness to pay for functional foods and on selected explanatory variables (Appendix A). Questions were grouped in eight short sections. The first section, knowledge and information, was grouped into three subsections. Section Ia sought to determine consumer knowledge of nutrition and health, the second to determine consumers' knowledge of functional foods and the third subsection was concerned with consumers' source of nutrition information. Five questions using the true-false measures were used to measure objective knowledge of the diet and disease link (House et al., 2004). The measure of consumer knowledge of functional foods was designed as series of five statements requiring responses to a five-point Likert scale ranging from strongly agree to strongly disagree. A neutral statement was included to allow for the possibility of lack of an opinion. To evaluate beliefs about nutrition and health, the

second section employed five items using a five-point scale ranging from strongly agree to strongly disagree. The third section evaluated the health and exercise history of the respondent and the fourth evaluated the current consumption habits and purchasing patterns. Section five and six were used to evaluate beliefs about functional foods, and consumer attitude toward functional foods, respectively. Both sections used a five-point Likert scale, ranging from strongly agree to strongly disagree with a “not sure” option. Section eight addressed the consumer characteristics and demographics. This section was designed to closely represent the U.S. population especially in terms of age categories, education, occupation and income (U.S. Census, 2000).

The dependent variable, willingness to pay for functional foods, was determined using contingent valuation, which was the seventh section of the survey.

3.4.1 Contingent Valuation

A number of studies have used contingent valuation to estimate WTP for food attributes; Maynard and Franklin, 2003; Campiche et al., 2004; Gil et al., 2002, Boccaletti and Nardella, 2000, Halbrendt et al., 1995. The main weakness of this method however is hypothetical bias (Lusk and Hudson, 2004), since consumers don't necessarily do what they say. The present study included a “Cheap talk” section in order to make the method more incentive compatible. Lusk (2003) found that cheap talk, which is the process of explaining hypothetical bias to individuals prior to asking a valuation question, was effective at reducing stated WTP for the less informed respondents.

Different CV methods have been used to elicit willingness to pay for novel food products. According to Lusk and Hudson (2004), dichotomous and double-bounded dichotomous choice questions techniques are easily extendable to valuation of novel food

products. In this case, consumers are typically confronted with the price of a new product and are asked whether they would buy the new product (YES or NO) at the stated price. In a double-bounded dichotomous choice question, if an individual responds with NO to the first question, another question is posed with a lower price. On the other hand, if an individual responds YES to the first question, a subsequent dichotomous choice question is posed with a higher price. The double-bounded dichotomous choice framework is more statistically efficient than the single bounded, since it incorporates more information about the individual's willingness to pay, although it may suffer from starting point biases and may be less incentive-compatible than the single-bounded (Lusk and Hudson, 2003).

The double-bounded dichotomous choice technique was deemed inappropriate for this study, based on pretest interviews. This study intended to assess consumers' willingness to pay for a number of products. Three products were used in the pretest session and the participants were asked if they were willing to pay a particular amount for the first product. If the individual responded NO, a second bid that was smaller than the first amount was presented. Subsequently, there seemed to be a learning effect where the respondents seemed to gain experience in the first episode in answering questions (Ready et al., 2001). Respondents knew that if they answered NO to the initial question, a lower bid would be presented. One respondent commented, "well if answering NO to the first bid means I can get the product at a cheaper price, then why not!" This study therefore opted for the payment card method. This method asks respondents to select the amount they are willing to pay from a checklist of possible payments, either in absolute terms or as a percentage of price (Boccaletti and Nardella, 2000). Maynard and Franklin (2003) successfully used the payment card method to elicit WTP for three different cancer-fighting products. The payment card

method is simple and it gives uninformed individuals a detailed choice among a range of pre-defined price premiums (Boccaletti and Nardella, 2000). We chose to use a payment card with seven classes of price premiums. Our study however modified the payment card method according to Ready et al. (2001) and Howe et al. (1994). “A frequently used CV survey design asks a pair of questions: (1) Would you be willing to pay for the proposed change?; and (2) If yes, what is your maximum WTP?; the reason for posing the two questions is that some respondents may be unable or un-willing to state a monetary WTP (Howe et al., 1994). Ready et al. (2001) used certainty follow-up questions in a CV study that valued health impacts from air pollution. The authors also reported that previous studies have used the follow up question, “how certain are you of your answer to the previous question?; with a response scale from 0% certain to 100% certain”. In the specified-certainty payment card survey version of Ready et al. (2001) study, the respondents were asked to select the largest value on the payment card that they would pay; this question was followed by a certainty follow up question. If the respondent gave a response to the certainty question other than 95% sure yes, she was asked to select another value on the payment card that was the largest amount she was 95% sure she would.

In the present study, we combined and modified the methods of Ready et al. (2001) and Howe et al. (1994) as follows:

Respondents were asked to read a brief introduction before answering the willingness to pay questions. The introduction provided information about the seriousness of chronic diseases and the benefits of consuming health-enhancing foods (functional foods). Next was the cheap talk script which read as follows; *“In the section that follows, we present several “hypothetical” foods. It has been our experience that usually people tend to overestimate what they would actually pay for functional foods. In the*

following questions, we ask that you please respond exactly as you would if you were in the grocery store and had to spend your own money. Your honest opinion is the key that will make this survey useful.” The hypothetical scenario was presented after the cheap talk script and it read as follows; *“You walk into the grocery store to purchase spread/margarine and bread. There are different types of these products on the shelves, some are regular and some contain health-enhancing properties as shown on the labels. Please indicate your purchase decision below.”*

The participants were presented with three different hypothetical products which included a health claim very similar to one that they would find in a grocery store. The typical price of the regular product was also presented. The participants were then asked a series of nested questions:

- (1) Would you be willing to pay extra for the product bearing the respective health claim?
- (2) If YES, please mark the most you would pay for this product in addition to the regular price. The respondents were to select from seven values indicated on the payment card. Current actual prices of the products in the grocery stores were used as the basis for the price premiums presented. The premium amounts on the payment card were chosen to include a markup/premium that represents the actual price of the product in question. The highest value on the card was set with an assumption that it will exceed the WTP of almost all the respondents. Maynard and Franklin (2003), set the highest value on the payment card method to exceed the WTP of at least 95% of the participants. Ready et al. (2001) reported that payment card responses are not sensitive to range effects as long as the

card includes values that are high relative to the respondent's value. All these considerations would require a payment card that spans a wide range of values. In order to make the choice easier and more feasible for the respondents, we decided to limit the values even at the cost of not having a payment card with equal increments from one value to the next. The study of Maynard and Franklin (2003) did not use equal increments among the 15 values included on their payment card. The present study considered the use of interval sets as choices on the payment card but this would not allow us to determine how many respondents are willing to pay the actual price of the products.

- (3) How sure are you about your purchase decision? This follow-up question asked participants to indicate how sure they were about their decision on a 7-point scale from less than 50% sure to 100% sure. This question complements and emphasizes the "cheap talk" section. According to Ready et al. (2001), the similarity between telling people to be 95% sure that they would pay the money, and asking them if they really want to spend the money, is clear.
- (4) If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the heart healthy spread in addition to the regular price. If the respondents were not at least 80% sure of their initial WTP decision, they were asked to write the most they would be willing to pay. The issue of exactly how sure we want the respondents to be can be addressed by considering how the perceived certainty level matches the

actual probability of purchase (Ready et al., 2001). And the best approach according to Ready et al. (2001) is through criterion validity studies that compare the proportion who actually purchase a commodity to the stated probabilities of purchase.

3.4.1.1 Selection of Foods to Value

The foods to be evaluated in this study were selected based on functional foods that are already available on the grocery store shelves. Appendix B shows some of the functional foods that appear on the shelves of WalMart, Baton Rouge, LA. The appendix shows the functional food with the health claim that appears on the label, the conventional alternative and the prices associated with the products. For example the V8 vegetable juice that contains antioxidant vitamins A and C for healthy eyes and skin and costs \$0.18 more than the conventional V8 vegetable juice.

For this study however, common and/or popular conventional foods with a functional alternative were selected. The selection of these products is very important in communicating the message of functional foods to the consumer and it should make the valuation process easier. For instance, almost everyone eats bread and therefore visualizing choosing to pay a premium for a loaf that would enhance one's health over one that would not, should be easier than deciding whether one should be willing to pay a premium for meatless meat balls containing soy. Two spreads, one that maintains a healthy heart and one that is cholesterol-lowering were also selected to be valued in this study. Different studies for instance that of Jong et al. (2003) have shown that determinants of functional food or supplement use depended on the type of product. Since a major focus of this study was to relate consumer

attitudes towards functional foods (figure 3.1) to price premiums, we decided to use familiar foods.

Another issue that could arise is, “why use a hypothetical method such as contingent valuation when the products are already present on the market?” In contingent valuation, responses are sought from individuals as to their actions contingent on the occurrence of a particular hypothetical situation. As much as the products being valued in this study are already on the market, a hypothetical valuation technique like CV is appropriate since the concept of functional foods is relatively new to consumers. Those consumers who are not well informed may not pay attention to new functional foods, or they may not be able to distinguish functional foods from conventional counterparts. This line of reasoning is echoed in other studies. For instance, Bech-Larsen and Grunert (2003) chose to implement their study by a conjoint task giving the reason that functionally enriched foods and health claims are new concepts to many consumers. Urala and Lahteenmaki (2003) also reported that functional food products are quite new and the respondents may have limited experiences with these kinds of products. In addition, secondary data from actual purchases are not easily obtained from the grocery stores and cannot be easily related to consumer attitudes, behavior, demographics, or health risks. This information is important for both marketers and policy makers, since uncertainty still exists regarding the success of various health-food lines. Moreover, additional information regarding factors that affect the consumers’ decision to buy or not to buy foods with health promoting substances is still needed. Secondary data can also be used to compare stated willingness to pay obtained through the survey with the revealed willingness to pay based on actual consumer purchases of functional foods already present on

the market. Wier et al. (2002), compared stated WTP with revealed WTP for organic foods based on purchases of a panel of more than 2,300 households in Denmark.

3.5 Data Collection

The survey was administered by mail in July 2005 to a stratified (by geographic regions) random sample of 4000 U.S. household individuals. Addresses were purchased from *InfoUSA*. A sample closely representing the US population according to the 2000 U.S. Census was randomly taken in each geographical region. Twenty percent of the sample represented the Northeast, 22% the West, 23% the Midwest and 35% the South.

A modified version of Dillman's Mail and Telephone Surveys: The Tailored Design Method (Dillman, 2000), was used to guide the survey and data collection procedures. During the first week of July 2005, each individual was mailed a survey accompanied with a cover letter. The cover letter (Appendix C) provided information about the study including a short background to functional foods, the reason the survey was being conducted and the importance of the individual's response as well as contact information, should the individual need it. Due to cost considerations, the post card reminder supposed to be mailed about two weeks after the survey has been mailed, was omitted. Instead, a reminder letter (Appendix D) together with a follow-up questionnaire, were sent three weeks after the initial mailings to the individuals whose response had not yet been received. A total of 708 responses (17.7%) were received after the follow-up mailing. Of these, 80 surveys were immediately deemed unusable either because they were not filled at all or major sections of the survey were not completed. For example all those that did not complete the WTP section were eliminated. These considerations left 632 surveys for a 15.8% useable response rate.

3.6 Empirical Models and Analysis Procedures

This study proposes that consumers' attitude toward functional foods will affect the consumers' willingness to pay for functional foods. Different situations and experiences cause people to acquire favorable or unfavorable attitudes towards objects (Figure 3.2).

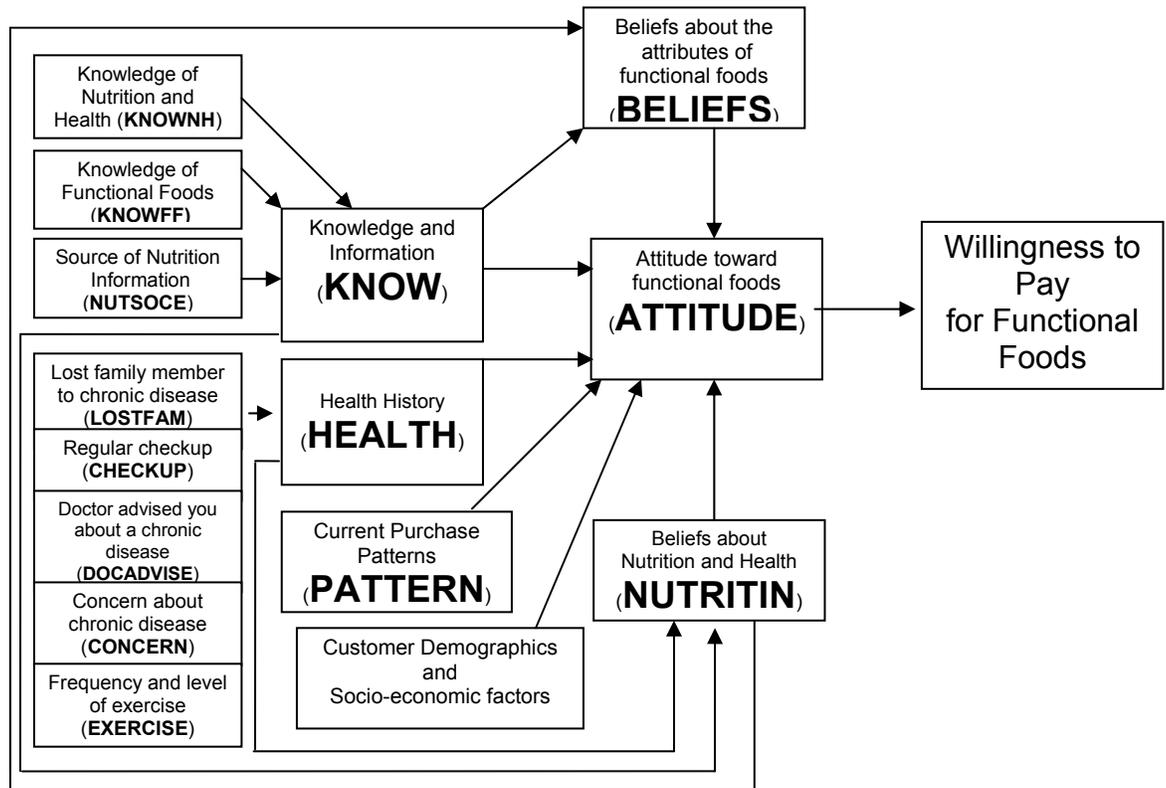


Figure 3.2. Causal relationships between the factors proposed to determine the attitudes and ultimate willingness to pay for functional foods. The upper case words in parenthesis represent composite variables

In order to examine the effect of the different variables on WTP, data was collected on each of the boxes represented in figure 3.2. Each of the variables shown in the figure was measured using at least five items. These items will be used to develop composite indices each of which will represent a concept for example ATTITUDE to represent attitude towards functional foods. The objective was to avoid the use of only a single variable to represent each of the concepts, but instead to use several variables (indicators), all representing

different facets of the concept to obtain a more “well-rounded” perspective (Hair et al., 1998).

In order to evaluate the effect of the different factors on consumers’ willingness to pay for these foods, the following regression model was developed:

$$\mathbf{WTP} = f(\mathbf{DEMOGRAPHICS, KNOWNH, KNOWFF, NUTRITIN, LOSTFAM, CHECKUP, DOCADVISE, CONCERN, EXERCISE, PATTERN, BELIEFS, ATTITUDE})$$

The composite indices, KNOWNH, KNOWFF, NUTRITIN, PATTERN, BELIEFS and ATTITUDE will be derived by averaging the responses to each of the corresponding items (Moon and Balasubramanian, 2004; House et al., 2004). This will yield summated scores that could be any value between two limits. For example the summated score for ATTITUDE could range between 1 (least positive attitude) and 5 (most positive attitude). The variable HEALTH was meant to capture people’s health condition as well as their concern for various chronic diseases. Five different variables (LOSTFAM, CHECKUP, DOCADVISE, CONCERN and EXERCISE) were used to measure and represent the effect of one’s state of health on WTP for functional foods.

The behavioral and attitudinal variables included in the model are hypothesized to have positive or negative effects on willingness to pay for functional foods. Knowledge of nutrition and health (KNOWNH) and knowledge of functional foods (KNOWFF) are hypothesized to have positive signs since it is expected that the more knowledge one has regarding the link between nutrition and health, and the food that could enhance their health, the more willing they would be to pay a premium for functional foods. The variable NUTRITIN representing consumer beliefs about nutrition and health is hypothesized to have

a positive sign since it is expected that the stronger one's conviction regarding the nutrition-health link, the more willing they will be to pay for foods that could enhance their health.

Regarding one's health history, three variables (LOSTFAM, CHECKUP, DOCADVISE) with hypothesized positive signs are also included in the model. It is expected that one who has lost a family member or close associate to a chronic disease (LOSTFAM) is more aware of the seriousness of chronic diseases and would be more willing to pay for foods that could reduce his/her risk of chronic diseases. It is also expected that those who make it a point to have regular checkups (CHECKUP) are more health-conscious and are more likely to heed the message of functional foods. For those that the doctor has advised to change their diet in response to a health concern (DOCADVISE), functional foods should not only be something that they seek out but they should be more willing to pay a premium for these foods that could help them deal with the health condition. Concern for different chronic diseases (CONCERN) is also hypothesized to have a positive sign.

Functional foods are marketed for their ability to somehow reduce one's risk or at least delay the onset of a chronic disease and in some cases to treat an already existing condition. We therefore expect that the consumer with the greatest concern about chronic diseases should be more willing to pay for functional foods. A physical activity variable (EXERCISE) is hypothesized to have either a positive or negative sign. This is due to the fact that those who have made exercise a regular part of their schedule, are not only health conscious, but they also have the knowledge and conviction to remain healthy. We hypothesize that these individuals would therefore not be willing to spend more on cholesterol-lowering spread, or heart healthy spread, since they know that to maintain a healthy heart one needs to exercise and eat a balanced diet, and in this case the sign on

EXERCISE would be negative. This is supported by Jong et al. (2003) who reported that individuals might actually use functional foods as a means to compensate for an unhealthy lifestyle. The individual knows that since he/she does not keep active enough, buying a spread that maintains a healthy heart is an alternative. These individuals who do not exercise may view consumption of functional foods, e.g. a cholesterol-reducing spread, as a way to remain healthy without exercising.

On the other hand, one may be exercising and is definitely health-conscious and therefore he is not willing to eat anything that will minimize his goal of trying to remain healthy. This individual would substitute any butter or margarine in his diet for a functional spread that helps maintain a healthy heart, in this case the sign on the EXERCISE coefficient will be positive. This is also argued by Jong et al. (2003) who reported that individuals who already have a healthy lifestyle are more likely to buy dietary supplements.

Current consumption patterns (PATTERN) is also hypothesized to have either positive or negative sign. In the case of individuals who buy only natural or organic foods, the sign is expected to be negative since these people may not want unnatural additives and would not be willing to pay a premium for processed novel functional foods, or foods with artificial ingredients. On the other hand, individuals whose shopping consumption patterns reveal health-consciousness, but are not organic food purchasers, may be the first to seek out health-enhancing foods and would be willing to pay a premium for them. In this case the sign on the coefficient would be positive. Regarding the variables beliefs (BELIEFS) and attitudes (ATTITUDE) towards functional foods, positive signs were hypothesized. Individuals with better beliefs or convictions about the attributes of functional foods would be more willing to

pay a premium for functional foods. And the better the attitude towards functional foods, the more willing one would be to pay a premium for functional foods.

For the dependent variable willingness to pay (WTP), a nested set of 4 questions as shown below were asked:

-
1. Would you be willing to pay extra? Yes No **Dependent variable is dichotomous**
(categorical with two levels)
 2. If YES please mark the most you would pay for this product **in addition to** the regular price
Dependent variable is discrete with five possible options and its ordered = an ordinal variable
 3. How sure are you about your purchase decision? **Dependent variable is discrete with six possible options and its ordered = an ordinal variable**
 4. If you are less than 80% sure please indicate in the space below the most you would be willing to pay **Dependent variable is continuous as the response can take on an infinite number of values**
-

The analysis can be approached by considering that most payment card methods include a value of zero dollars or percent in order to represent the respondents who are not willing to pay anything, for instance the studies of Maynard and Franklin (2003), Boccaletti and Nardella (2000) and Ready et al. (2001). In the present study therefore, the “NO” response to the first question can be taken as the “\$0.00” that the respondent is willing to pay in addition to the regular price and the method will be more or less transformed into an ordinary payment card method. This will yield a set of eight ordinal values (ordinary PC WTP) instead of the original seven. For the issue of the certainty follow-up question, Ready et al. (2001) obtained a specified-certainty payment card WTP estimate by asking the respondents to select the largest value on the payment card that they would be willing to pay, followed by a certainty-follow up question. If the respondent gave a response to the certainty question other than “95% sure yes,” she/he was asked to select another value on the payment card that was the largest amount she was 95% sure she would pay. Likewise in the present study, the respondents were asked to indicate how sure they were about their purchase

decision on a response scale from less than 50% to 100%. And if they were not at least 80% sure they were asked to write in a figure. Following the method of Ready et al. (2001), we can obtain a specified-certainty payment card (SC-PC) WTP by taking only the values for which the respondents are at least 80% sure that they are willing to pay.

Therefore for each of the products valued, there is an ordinary PC WTP and a second estimate of WTP (SC-PC WTP). The resulting WTP variable is discrete and implies the adoption of maximum likelihood techniques such as probit/or logit (Boccaletti and Nardella, 2000; Borooah, 2002). In addition, the WTP variable has an ordinal ranking and the multinomial probit/logit model would fail to account for the ordinal nature of the dependent variable and therefore ordered logit or ordered probit models would be more appropriate (Borooah, 2002). “The difference between ordered logit and ordered probit models lies in the (assumed) distribution of the error term; an ordered logit model is the result of assuming that the error term is logistically distributed while the ordered probit model is the result of assuming that the error term is normally distributed and, it is difficult to justify the choice of one distribution over the other on theoretical grounds” (Borooah, 2002). This study chose to apply the ordered probit model to the data.

3.7 Ordered Probit Analysis

The ordinal regression model is commonly presented as a latent variable model with a structural equation specified as, $y_i^* = x_i\beta + \varepsilon_i$ where y_i^* is a latent variable ranging from $-\infty$ to ∞ . This model is derived from a measurement model in which y_i^* is mapped to an observed variable y which is thought of as providing incomplete information about an underlying y^* according to the following measurement equation (Long, 1997):

$y_i = m$ if $\tau_{m-1} \leq y_i^* < \tau_m$ for $m = 1$ to J where the τ 's are thresholds or cut-points.

The measurement model divides y_i^* into J ordinal categories, with the extreme categories 1 and J defined by $\tau_0 = -\infty$ and $\tau_J = \infty$.

In this study respondents were asked to select a value that they are willing to pay for the functional food in question. Each respondent's willingness to pay can be represented by the value of variable y_i such that higher values of y_i represent higher WTP for the functional food. Each person's WTP score depends upon a variety of factors including the consumer's attitude towards functional foods as well as socio-demographic characteristics. The variable y_i is a linear function of k factors ("explanatory variables") whose values for individual i , are x_{ik} , $k = 1, \dots, k$ (Borooah, 2002). The WTP can therefore be represented as:

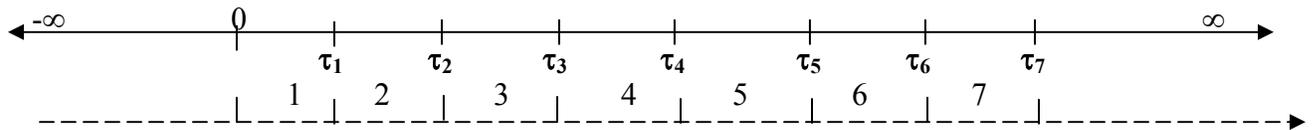
$$\text{WTP} = y_i = \sum \beta_k x_{ik} + \varepsilon_i \quad (1)$$

where β_k is the coefficient associated with the k^{th} variable ($k = 1, \dots, k$). An increase in the value of the k^{th} factor for a particular respondent will cause his or her WTP score to rise if $\beta_k > 0$ and fall if $\beta_k < 0$. The error term ε_i is included to account for the fact that the relationship between the WTP score and the WTP-inducing factors is not an exact one, since there may be factors left out of the equation or factors may be measured inaccurately.

There were eight possible WTP response scores ranging from \$0.00 to a maximum of \$4.00. The variable y_i can therefore be associated with eight levels such that $y_i = 0$ if a person is not willing to pay for the food and $y_i = 7$ if the individual is willing to pay the highest value on the payment card. The continuous latent variable y^* can be thought of as the propensity to pay a certain amount for the functional food, and the observed response categories are related to the censored latent variable by the following measurement model according to Harrison and McLennon (2004):

$$y_i = \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ 1 & \text{if } 0 < y_i^* \leq \tau_1 \\ 2 & \text{if } \tau_1 < y_i^* \leq \tau_2 \\ 3 & \text{if } \tau_2 < y_i^* \leq \tau_3 \\ 4 & \text{if } \tau_3 < y_i^* \leq \tau_4 \\ 5 & \text{if } \tau_4 < y_i^* \leq \tau_5 \\ 6 & \text{if } \tau_5 < y_i^* \leq \tau_6 \\ 7 & \text{if } \tau_6 < y_i^* \leq \tau_7 \end{cases} \text{ where } y_i \text{ is the } i^{\text{th}} \text{ respondent's WTP value.}$$

The mapping from the latent y^* to the observed categories can be illustrated as follows:



The solid line represents the latent variable y^* with the cut-points τ_1 to τ_7 , and the dotted line shows the observed values of y over the range y^* . When y^* crosses a cut-point, the observed category changes. The cut points or threshold values are unknown parameters to be estimated along with the β_k of equation (1).

The probability of observing $y_i = m$, of WTP taking a value 0 to 7, for given values of x_k corresponds to the region of the distribution where y^* falls between the cut-points τ_{m-1} and τ_m and it is given by: $\Pr(y = m | x) = F(\tau_m - x\beta) - F(\tau_{m-1} - x\beta)$, where F is cdf (cumulative distribution function) for ε_i (long, 1997). “The ordered probit model assumes that ε_i is normally distributed with zero mean and variance equal to one (Harrison and McInnion, 2004). After estimating the regression model, the estimated values of the coefficients β_k allows an estimated value $\sum \beta_k x_{ik}$ to be computed for each individual in the sample. Using this estimated value, in conjunction with the estimated values of the cutoff parameters, allows the probabilities of selecting a particular WTP bid to be estimated for each individual in the sample. Calculation of these predicted probabilities and other statistical analyses were performed using Stata, version 9 (StataCorp, College Station, TX).

CHAPTER IV: RESULTS AND DISCUSSION

4.1 Introduction

This chapter discusses the results of the survey that was used to collect information about the U.S. consumer attitudes towards functional foods and their willingness to pay for the foods that could enhance their health. Questionnaires were mailed to a random sample of 4000 consumers stratified by US geographical regions according to the 2000 US Census. A total of 632 surveys for a 15.8% useable response rate were returned. The summary statistics of all the questions included in the survey can be found in Appendix J.

4.2 Consumer Characteristics and Demographics

The demographic summary statistics of the study participants are presented in Table 4.1 in parallel with the 2000 US Census population profile. The greatest number of responses came from the Midwest and the South geographical regions. Approximately 51% of the respondents were female, very closely representing the US Census profile, and about 71% were the primary household shoppers. Compared to the US population, more married and less single were represented in our sample. The age categories from 45 and over were over represented in our sample and the white race which represents about 75% of the US population, accounted for the majority of the respondents (86%) in our study. At least 41% of the respondents had a bachelor degree (compared to 24% of the US population), and only 4.9% of the respondents had less than high school, which percentage is less than that of the same category (19.6%) in the US population. In most cases, however, the household income of the respondents was comparable to the US population. The medium annual income of the respondents was between \$50,000 and \$74,999. About 5% had an annual income of less than \$10,000 while about 3% had an annual income in the excess of \$200,000.

Table 4.1. Frequency distribution of the demographic characteristics of survey respondents

Characteristic (n=632)		Number of Respondents	% Respondents	% US Census 2000
Geographical Region	West	131	20.7	22.0
	Midwest	179	28.3	23.0
	Northeast	108	17.1	20.0
	South	213	33.7	35.0
	Unknown	1	0.2	
Residency	Urban	386	61.1	
	Rural	230	36.4	
	Unknown	16	2.5	
Gender	Male	304	48.1	49.1
	Female	326	51.6	50.9
	Unknown	2	0.3	0.0
Marital Status	Married	408	64.6	54.4
	Single	220	34.8	45.6
	Unknown	4	0.6	
Age	15-19			7.2
	20-24			6.7
	18-24	21	3.3	
	25-34	65	10.3	14.2
	35-44	104	16.5	16.0
	45-54	128	20.3	13.4
	55-59	68	10.8	4.8
	60-64	72	11.4	3.8
	65-74	88	13.9	6.5
	75 or older	83	13.1	5.9
Race	White	546	86.4	75.1
	Non-white	65	10.3	22.5
	Two or more races	16	2.5	2.4
	Unknown	5	0.8	
Education	Less than high school	31	4.9	19.6
	High school graduate	121	19.1	28.6
	Some college, no degree	154	24.4	21.0
	Associate degree	60	9.5	6.3
	Bachelor degree	130	20.6	15.5
	Graduate or professional degree	133	21.0	8.9
	Unknown	3	0.5	0.0
Household Income	Less than \$10,000	32	5.1	9.5
	\$10,000 - \$14,999	24	3.8	6.3
	\$15,000 - \$24,999	56	8.9	12.8
	\$25,000 - \$34,999	67	10.6	12.8
	\$35,000 - \$49,999	107	16.9	16.5
	\$50,000 - \$74,999	125	19.8	19.5
	\$75,000 - \$99,999	77	12.2	10.2
	\$100,000 - \$149,999	66	10.4	7.7
	\$150,000 - \$199,999	16	2.5	2.2
	\$200,000 or more	18	2.8	2.4
	Unknown	44	7.0	
Employment Status	Retired	179	28.3	
	Not Retired	449	71.1	
	Unknown	4	0.6	
Primary Household Shopper	Yes	451	71.3	
	No	173	27.4	
	Unknown	8	1.3	

4.3 Consumer Knowledge of Functional Foods, Nutrition and Health

Two of three categories of consumer product class knowledge used in consumer behavior research are subjective knowledge and objective knowledge (House et al., 2004). In our study we measured objective knowledge of nutrition and health using five items found in section Ia of Appendix A. Measuring objective knowledge implies measuring what an individual actually knows and this “textbook” knowledge can be measured as a set of true/false items. The descriptive statistics of the five items is found in Appendix J. Fifty one percent of the respondents answered all true/false questions correctly and only 0.16% answered all the questions wrong. Eighty nine percent of the respondents were aware that cancer and cardiovascular disease are leading causes of death in the US; 71% knew that their diets affect their risk of developing heart disease and cancer; 94% knew that the risk of developing a deadly chronic disease increases with obesity. The average score of the answers to the true/false questions (0 = Incorrect and 1= Correct) was used as the summated scale (used in further analysis) for the objective knowledge of nutrition and health (variable name KNOWNH). According to Hair et al. (1998), summated scales may be formed by summing up the separate variables and then their total or average score is used in the analysis.

Subjective knowledge of functional foods was measured using six items (found in section Ib of Appendix A) that required respondents to select from a response scale ranging from strongly agree to strongly disagree. A score of 5 was used to represent the highest subjective knowledge regarding a particular item while a score of 1 was used to represent the least subjective knowledge. The available choices also included a “not sure” option (coded 3) to allow for the possibility of lack of an opinion. Subjective knowledge is the individual’s perception of how much she or he knows (House et al., 2004). The frequency distribution and

descriptive statistics of the five items in section Ib are found in Appendix J. The results indicated that 96% of the respondents agree that some foods have specific health benefits that reduce one's risk of developing chronic diseases, which is comparable to the 2002 IFIC survey finding of 94%.

Based on the position of the American Dietetic Association (ADA Reports, 2004), functional foods include whole foods and fortified, enriched, or enhanced foods that have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis at effective levels. Our study results showed that 63% of the respondents agree that functional foods include whole, enriched, or enhanced foods that have ingredients incorporated into them to provide a specific health benefit, while 30% indicate that they are not sure what functional foods include. A "key" item that was used in our study to test the respondents' level of knowledge of functional foods used the following statement "the only foods that can be categorized as functional foods are foods with a health claim on the nutritional label", to which the respondents were asked to show their degree of agreement using a Likert scale ranging from strongly agree to strongly disagree. Approximately 18% of the respondents agree with the statement that "the only foods that can be categorized as functional foods are foods with a health claim on the nutritional label." Forty six percent of the respondents disagree with this statement and 35% indicate that they are not sure. Based on the ADA report (ADA Reports, 2004) that unmodified whole foods such as fruits and vegetables represent the simplest form of a functional food, our results indicate a relatively low level (46%) of knowledge of functional foods among the respondents. This result is not surprising considering the result of a 2000 nationwide public opinion survey conducted by the ADA, reported by Killackey-Jones et al. (2004), that found that only 21% of Americans

had heard of “functional foods.” The results from the last two items included in the evaluation of consumer information and knowledge of functional foods reveal that 80% of the respondents agree that eating is a better way to obtain health-enhancing substances than taking supplements while 82% agree that functional foods should not replace a healthy diet but should be consumed as part of a varied diet. A composite index of knowledge of functional foods (KNOWFF) was formed by averaging the responses to the first five items used in this section (section Ib, Appendix A). The items were coded in such a way that the highest value (5) indicated the highest level of subjective knowledge and the lowest value (1) indicated the lowest level of subjective knowledge of functional foods.

Approximately 78% of the respondents were able to mention a food they associate with a health benefit. This is comparable to the 2002 IFIC survey findings that more than 80% of Americans could associate at least one functional food with a disease or health condition. Our results (Table 4.2) also agreed with the IFIC findings regarding the foods consumers identify as having a health benefit.

Table 4.2 Foods consumers identified as having a health benefit

Food	%	Food	%
Broccoli	16.67	Fish	5.49
Fruits and vegetables	13.01	Milk Products	4.27
Vegetables	10.77	Carrots	4.27
Whole grains	10.37	Bananas	3.05
Blueberries	8.13	Garlic	2.24
Oats/oat bran/oatmeal	6.50	Soy products	1.83
Tomatoes	6.10	Fruit juices	1.83

Regarding consumers’ source of information, only about 15% of the respondents reported always reading nutrition labels before purchasing food products. Fifty one percent use food advertisements as their source of information when making purchasing decisions, 39% use health care professionals, 10% use internet, 14% use health food store, 30% use

media and 55% use friends and family. The 2002 IFIC survey found that 47% of the consumers trust health professionals for information about health benefits of food while 23% trust the media.

4.4 Consumer Beliefs about Nutrition and Health

Worsley (2002) defined a belief as a perception of a link between two concepts. One may see a strong or weak relation between the two concepts and one may hold the belief with a particular degree of strength. Respondents' perception of a link between nutrition and health was measured using six items (found in section II of Appendix A) that required respondents to select from a response scale ranging from strongly agree (5) to strongly disagree (1). The available choices also included a "not sure" option (coded 3) to allow for the possibility of lack of an opinion. The frequency distribution and descriptive statistics of the five items in section II are found in Appendix J. Our results indicate that consumers have a strong belief in the link between nutrition and health. At least 91% of the respondents agree that some foods increase the risk of developing some diseases while other foods reduce this risk. The majority (97%) of respondents agree that foods that reduce the risks of disease should be eaten regularly throughout one's lifetime. Almost 96% agree that diet and nutrition play a role in their health, which is more than the 71% result of the 2002 IFIC survey. Approximately 95% agree that adopting better dietary habits is essential to reduce deaths from a variety of chronic diseases. Furthermore, 97% believe that they have some control over their health which is in agreement with the 98% result of the IFIC survey. A composite index of beliefs about nutrition and health (NUTRITIN) was formed by averaging the responses to the first five items used in this section (section II, Appendix A).

When asked whether they have switched to a more healthy diet, about 30% of the respondents indicated that they switched to a more healthy diet in the last five years (Table 4.3) while 18% said that they have not yet switched to a more healthy diet. Toner and Pitman (2004) reported results of a 2002 ADA survey whereby 38% of Americans indicated that they have made significant changes to achieve a healthful diet. This figure was an increase from the 28% that reported (in 2000) making changes to achieve an optimal diet. The authors reported the improvement as an increase in effort by consumers to improve their health through diet. This is further reflected in our results, considering that 25% switched to a more healthy diet more than five years ago and an additional 30% switched to a healthy diet in the last five years.

Table 4.3 Respondents' response to the dietary change question

Response to whether participant has switched to a more healthy diet	Frequency	Percent
Have always been on a healthy diet	146	23.43
Switched to a healthy diet more than 5 years ago	157	25.20
Switched to a healthy diet in the last 5 years	184	29.53
Not yet switched to a healthy diet.	113	18.14
I don't plan to	23	3.69
Total	623	100.00

4.5 Consumer Health and Exercise History

Our survey also included six questions to evaluate consumer health and exercise history (section IIIa, Appendix A). The first set of three questions (yes/no responses) addressed the health history, question four addressed the respondents' concern about different health conditions (cancer, heart disease, diabetes and high cholesterol), which required the respondents to select from a response scale ranging from 1 (very unconcerned) to 7 (very concerned). The summated scale (CONCERN) was computed by averaging the responses to the four health conditions evaluated. Questions 5 and 6 addressed the exercise

history and were used to form the variable EXERCISE. This summated scale was calculated using the total score for the two questions (5 and 6). The frequency distribution and descriptive statistics of all the items in this section are found in Appendix J. Approximately 86% of respondents indicated that they have ever lost a family member or close associate to a chronic disease such as cancer, heart disease, or diabetes. Seventy seven percent reported that they have regular checkups. About 44% of the respondents have been advised by the doctor to change their diet in response to a health concern and 86% of them follow the doctor's recommendations when shopping for food.

Results of cross-tabulations between “have you switched to a more healthy diet” and “whether your doctor advised you to change your diet” (Table 4.4), showed that about 55% of those who have switched their diet to a more healthy diet were advised by their doctor and 45% of those who have not yet switched to a more healthy diet have already been advised by the doctor to change their diet. These types of respondents could be compared with the two types of consumers that were reported by Frewer et al. (2003), one segment which was referred to as the unmotivated, were aware of the links between diet and health but had not made significant changes to their diet. The second group of motivated consumers had actively made dietary changes in order to promote better health.

Regarding the respondents' concern about different health conditions, 39%, 38%, 28% and 32% of the respondents are very concerned about cancer, heart disease, diabetes and cholesterol respectively. Although the respondents concern about different health conditions was low, it does not necessarily mean that these conditions are not a threat to a higher number of people in the population. The study of Urala and Lahteenmaki (2003), showed that 60% of the respondents claimed that their state of health was good or excellent yet 54% were

Table 4.4 Cross tabulation of “doctor advised you to change your diet” and “have you changed your diet”

Have you switched to a more healthy diet?	Doctor advised you to change your diet		Total
	No	Yes	
I don't plan to	19	4	23
Not yet switched to a healthy diet	62	51	113
Switched to a healthy diet in the last 5 years	88	98	186
Switched to a healthy diet more than 5 years ago	69	88	157
Have always been on a healthy diet	113	34	147
Total	351	275	626

found overweight implying that 14% were overweight and yet they did not think of it as a health concern. Regarding the level of exercise, only 19% of respondents in our study reported not exercising at all and 52% reported exercising 30 to 60 minutes per day (Table 4.5).

Table 4.5 Respondents’ level of exercise

	# of respondents	%
Don't exercise at all	121	19.2
Exercise less than 3 days per week	223	35.4
Exercise 3 to 5 days per week	226	35.9
Exercise more than 5 days per week	60	9.5
Total	630	100
Level of exercise		
Less than 30 minutes per day	154	30.4
30 to 60 minutes per day	266	52.6
More than 60 minutes per day	86	17.0
Total	506	100

As discussed above, two composite variables were generated from this section, one representing the respondents’ exercise history (EXERCISE) and one representing the respondents’ level of concern about chronic diseases (CONCERN).

4.6 Consumers’ Current Consumption Habits and Purchasing Patterns

This study also sought to evaluate consumers’ current consumption habits and purchasing patterns using nine questions (section IV, Appendix A). The frequency

distribution and descriptive statistics of all the items in this section are found in Appendix J. Question one asked the respondents to rank nutritional content of the food, price of the food, taste or flavor of the food, perceived safety of the food as well as brand name and convenience according to the importance of each factor in influencing purchasing decisions. Thirty seven percent ranked nutrition as the most important factor influencing their purchasing decisions (Table 4.6) while only four percent ranked it as the least important. Taste or flavor of the food is the factor that most respondents (45%) consider most important in influencing their purchasing decisions (Figure 4.1), 21% ranked price as the most important and only 4.5% of the respondents indicated convenience as the most important factor in influencing their purchasing decisions. Regarding the respondents' choice of taste as the most important factor influencing their purchasing decision, our results agree with the findings of Gilbert (2000). The author reported that almost one in two shoppers (46%) won't give up good taste for health benefits.

Table 4.6 Respondents' ranking of the importance of nutrition in purchasing

		# of Respondents	%
Most important	1	212	37.59
	2	140	24.82
	3	97	17.2
	4	59	10.46
	5	35	6.21
Least important	6	21	3.72
Total		564	100

Considering the notion that consumers seem to lean toward purchasing more of the food products they already eat, question two of section IV (Appendix A) included a number of food categories that contain health claims on the food labels. Consumers were asked to mark the product categories that they buy. The results showed that 45% buy green tea, 87% buy margarine, butter or spread and about 26% buy soy products. A set of seven items was

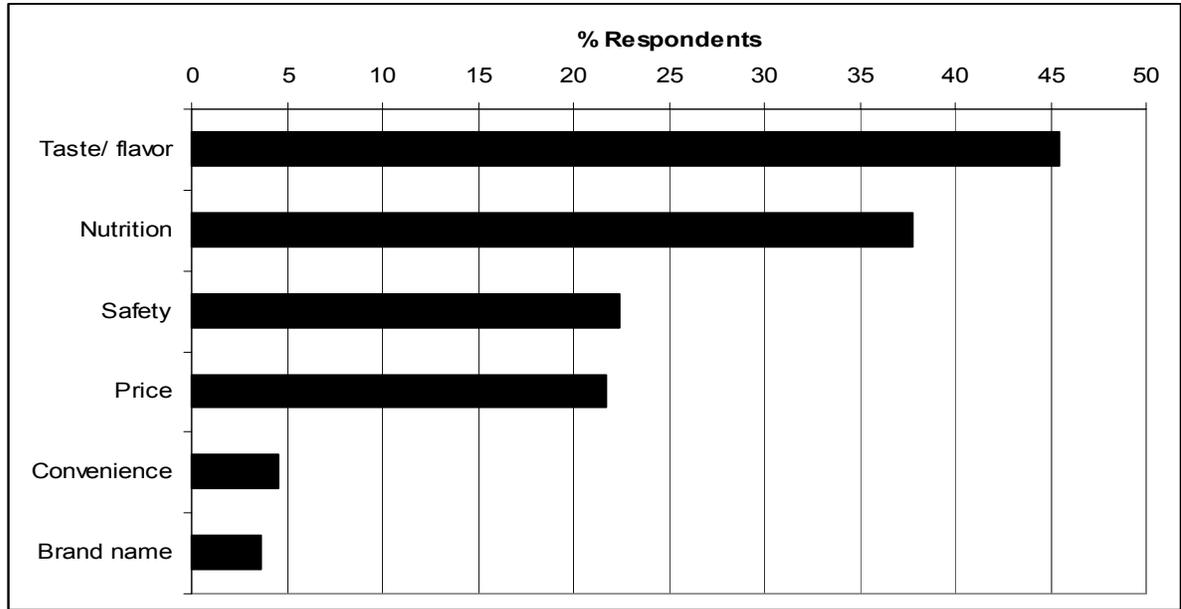


Figure 4.1 Importance of different factors in influencing purchasing decisions

used to measure and construct an index of current consumption patterns (PATTERN). The index was formed by averaging the responses to the last seven questions in section IV (Appendix A) of the survey instrument. The items were coded in such a way that the highest value (4) represents “always health conscious” regarding shopping practices while the least value (0, zero) represents “never health conscious” when shopping for food.

Approximately 68% of the respondents indicated that most of the time they try to eat healthy foods. Only about 8% of the respondents indicated that they always eat the recommended five or more servings of fruits and vegetables a day (Figure 4.2). On the other hand 17% of the respondents always buy dietary supplements, 15% buy these supplements most of the time and 21% buy them sometimes. About 30% of respondents buy herbal, natural or organic foods sometimes, 9% buy these foods most times and only three percent of the respondents indicated always buying herbal, natural or organic foods.

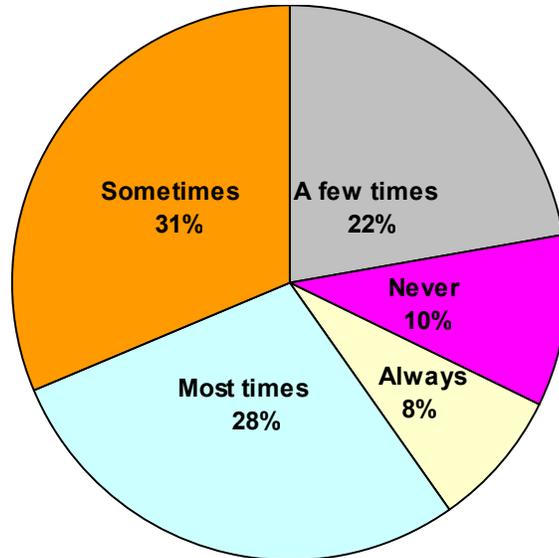


Figure 4.2 Participants' response to the statement, "I eat five or more servings of fruits and vegetables a day"

4.7 Consumer Beliefs about Functional Foods

Beliefs about an object are formed by associating that object with various characteristics, qualities and attributes (Ajzen and Fishbein, 1980). The 5 items in Table 4.7 were used to measure consumer beliefs about the attributes of functional foods. About 55% of the respondents believe in the efficacy of functional foods as indicated by their agreement with the statement, "I trust foods that promise to improve my health". A majority of the respondents (83%) also believe that foods that enhance health are not meant only for the sick and the elderly. In response to the statement of whether healthy foods taste as good as conventional foods, at least 57% of the respondents agreed with the statement. Fifty nine percent of the respondents indicated that they are not sure whether some functional foods may have harmful effects. Regarding the cost of functional foods, about 45% of the respondents disagreed with the statement that health-enhancing foods are affordable while 35% agreed and about 30% selected the "not sure" option. Price is a factor that has been

reported in literature (Hollingsworth, 2001; Frewer et al. 2003) that may contribute to hindrance of consumer acceptance of functional foods. The composite index (BELIEFS) was formed by averaging the responses to the five items in section V (Appendix A) of the survey instrument. The items were coded in such a way that the highest value (5) indicated the highest level of positive beliefs about functional and the lowest value (1) indicated the least level of positive beliefs about functional foods.

4.8 Consumer Attitude toward Functional Foods

Table 4.8 shows the respondents' responses to the five statements used to measure consumer attitudes towards functional foods. The statements were coded in such a way that the highest value (5) represented positive/good attitude towards functional foods and the lowest value (1) represented negative/bad attitude towards functional foods. On average (means of 4.23 and 4.17 in Table 4.8), respondents agree that eating health-enhancing food is beneficial for them and that all grocery stores should carry health-enhancing foods. At least 52% of the respondents agree that foods enriched with health-enhancing ingredients are worth the extra cost. Forty four percent of the respondents disagreed with the statement that functional foods are only a temporary fad, while 20% agreed and 35% selected the "not sure" option.

Respondents seemed equally divided on the issue of whether there is a need to develop new products fortified with health-enhancing ingredients. About 38% and 35% agreed and disagreed respectively with the statement, "we can obtain health-enhancing substances from existing foods. So there is no need to develop new products fortified with health-enhancing substances." The composite index (ATTITUDE) was formed by averaging the responses to the five items in section VI (Appendix A) of the survey instrument.

Table 4.7 Respondents' beliefs about the attributes of functional foods

Question	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean	Std. Dev.
1. I trust foods that promise to improve my health.	12.44	44.34	21.05	15.95	6.22	627	3.41	1.09
2. Health-enhancing foods are affordable.	5.74	29.35	20.73	30.94	13.24	627	2.83	1.16
3. Health-enhancing foods are meant only for sick people and the elderly.	3.82	3.66	9.24	21.82	61.46	628	4.33	1.04
4. Healthy foods taste as good as conventional foods.	15.68	41.44	12.96	23.84	6.08	625	3.37	1.18
5. Some functional foods may have harmful effects.	5.6	20.96	59.04	8.96	5.44	625	2.88	0.85

Table 4.8 Respondents' attitude toward functional foods

Question	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean*	Std. Dev.
1. Eating health-enhancing foods is beneficial for me.	41.49	42.29	13.99	1.91	0.32	629	4.23	0.78
2. All grocery stores should carry health-enhancing food products.	43.74	36.29	14.74	4.12	1.11	631	4.17	0.91
3. Foods enriched with health-enhancing ingredients are worth the extra costs.	14.9	37.08	29	14.9	4.12	631	3.44	1.04
4. We can obtain health-enhancing substances from existing foods. So there is no need to develop new products fortified with health-enhancing substances.	9.70	28.14	27.34	27.34	7.47	629	2.95	1.11
5. Functional foods are only a temporary fad, they are here today and will be gone tomorrow.	3.83	16.45	35.3	26.36	18.05	626	3.38	1.07

* 1 represents negative attitude and 5 represents positive attitude.

4.9 Willingness to Pay for Functional Foods

This study elicited consumers' willingness to pay for three products (section VII, Appendix A): spread A, a spread with a health claim that reads "helps maintain a healthy heart when substituted for butter or margarine as part of a diet low in saturated fat and cholesterol; spread B, a spread with a health claim that reads, "proven to significantly lower cholesterol; bread A, with a health claim that reads, "in a low fat diet, whole grain foods, multi grains, 100% whole wheat breads may reduce the risk of heart disease and certain cancers. Diets rich in whole grain foods and other plant foods low in fat, saturated fat and cholesterol may help reduce the risk of heart disease and certain cancers." The frequency distribution and descriptive statistics of the variables used in this section are presented in Appendix J. Approximately 72%, 71% and 78% of the respondents expressed willingness to pay for spread A, spread B, and bread A respectively. On average, respondents indicated willingness to pay a premium of \$0.61 (57% premium) for spread A, \$1.00 (200% premium) for spread B, and \$0.74 (49% premium) for bread A. As discussed in the methodology section (Chapter 3) of this thesis, the actual prices of products with these health claims in WalMart Grocery Store (Baton Rouge, LA) were used as a basis for the price categories indicated on the payment card of the WTP section.

Figure 4.3 shows the distribution of WTP responses for each of the three products. The willingness to pay for spread A and bread A was spread across the WTP values, as opposed to the WTP for spread B which was skewed toward the low premiums. Approximately 27% of the respondents expressed willingness to pay at least a 70% premium for spread A. The current grocery store price for this spread is about 45% more than the regular spread. About 52% of the respondents indicated a willingness to pay at least 48%

premium for the heart healthy spread which implies that at least half of the respondents are willing to pay the current grocery store price of spread A. Spread B costs 5 to 8 times more than the alternatives without the cholesterol-reducing health claim. Figure 4.3 shows that most of the WTP bids for this spread were skewed to the left, implying that the majority of the respondents are not willing to pay the current grocery store premium for this spread. Only 9% of the respondents expressed a WTP of at least a 400% premium (4 times the price of regular spread) for the cholesterol-lowering spread and about 38% expressed willingness to pay at least 200% more than the regular spread. Willingness to pay bids for bread A were more evenly distributed as seen in Figure 4.3. A loaf of bread with a health claim like the one used in this study currently costs about 40% more than the regular bread. Approximately 42% of the respondents expressed willingness to pay at least a 50% premium for the health-enhancing bread while 61% are willing to pay at least a 33% premium. A follow up question that required respondents to indicate how sure they were about their stated WTP bid was included in this study. Eighty five percent, 87% and 95% were at least 80% sure that they would pay their stated WTP bid in a real setting for spread A, spread B and bread A respectively. For the respondents that were less than 80% sure of their hypothetical purchase decision, some commented that their willingness to pay would depend on the taste of the product.

Some of the reasons given by respondents that expressed lack of willingness to pay for particular products were: product is too expensive, it is possible to obtain a cheaper version of the product, product should not cost more than regular, we don't eat any form of spread, we only eat natural butter since its healthier and, there is no spread that is good for anyone.

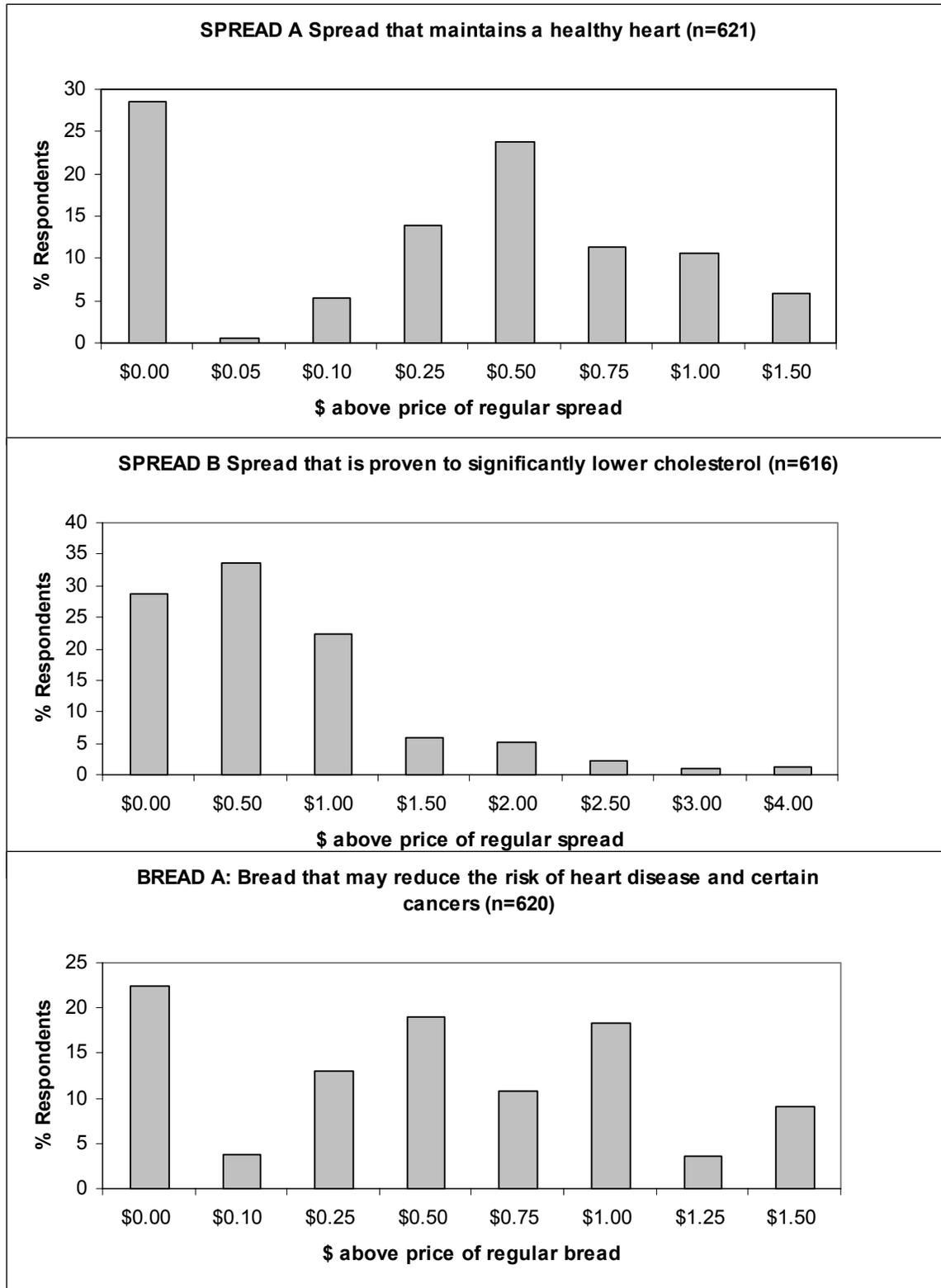


Figure 4.3 Distribution of WTP premiums for spread A, spread B and bread A

These comments seem to be in agreement with what other authors have reported (Hollingsworth, 2001 and Frewer et al., 2003). Frewer et al. (2003) reported that even a functional food with desirable and proven health benefits may not be attractive to consumers if its sensory properties do not meet consumer expectations or if it is simply too expensive to warrant purchase. In addition, people's risk perception associated with foods extends beyond their own personal health, and encompasses wider beliefs about the merits or disadvantages of technological processes used to produce them (Frewer et al., 2003) which may explain why some of the respondents said that there is no spread that is good for anyone, implying that they would not buy spread no matter what health benefits are associated with it.

4.10 Ordered Probit Results

This section presents the results from the ordered probit model used to evaluate the effect of different explanatory variables (Table 4.9) on willingness to pay for selected functional foods. Ordered probit is a method that is used to estimate models with more than two outcomes, when the dependent variable associated with the outcomes is both discrete and ordinal (Borooah, 2002). Three ordered probit models were estimated to determine the relationship between WTP for functional products, spread A (helps maintain a healthy heart), spread B (proven to significantly lower cholesterol) and bread A (may reduce the risk of heart disease and certain cancers). Several alternative specifications of the model were estimated, relating WTP to different combinations of individual explanatory variables. The final model, selected to analyze the dependence of WTP on demographic and other variables was specified as:

$$\begin{aligned}
WTP_i = & \beta_0 + \beta_1 FEMALE + \beta_2 MARRIED + \beta_3 AGE_2 + \beta_4 AGE_3 + \beta_5 AGE_4 + \beta_6 AGE_5 + \\
& \beta_7 AGE_6 + \beta_8 AGE_7 + \beta_9 RACE + \beta_{10} CHILDREN + \beta_{11} ADULTS + \beta_{12} EDUC_2 + \beta_{13} EDUC_3 + \\
& \beta_{14} EDUC_4 + \beta_{15} EDUC_5 + \beta_{16} EDUC_6 + \beta_{17} INCOME_1 + \beta_{18} INCOME_2 + \beta_{19} INCOME_3 + \\
& \beta_{20} INCOME_4 + \beta_{21} INCOME_5 + \beta_{22} INCOME_6 + \beta_{23} INCOME_7 + \beta_{24} INCOME_8 + \\
& \beta_{25} INCOME_9 + \beta_{26} KNOWNH + \beta_{27} KNOWFF + \beta_{28} NUTRITIN + \beta_{29} LOSTFAM + \\
& \beta_{30} CHECKUP + \beta_{31} DOCADVISE + \beta_{32} CONCERN + \beta_{33} EXERCISE + \beta_{34} PATTERN + \\
& \beta_{35} BELIEFS + \beta_{36} ATTITUDE
\end{aligned}$$

where WTP_i is willingness to pay for product i , i represents, spread A, spread B and bread A, β_1 through β_{36} are estimated coefficients representing the expected change in WTP given a unit increase in the associated explanatory variable, holding all other variables constant. The statistical model was also used to compute predicted probabilities associated with observing a particular willingness to pay value. The variables used in the analysis are described in Table 4.9. The hypothesized signs associated with the variables are also shown in Table 4.9. Our hypotheses regarding the different behavioral and attitudinal variables included in the model were discussed in the methodology chapter 3 (section 3.6).

Tables 4.10, 4.11 and 4.12 contain the estimates of the ordered probit analysis of consumers' willingness to pay for spread A, spread B and bread A, respectively. The chi-square test was used to test the null hypothesis that the model did not have greater explanatory power than an "intercept only" model. This hypothesis was rejected in the case of each of the three models estimated, implying that the overall model was significant at the 1% level. A z-test was used to test the null hypothesis that the associated coefficients are zero. In all the three models, the coefficients associated with beliefs about nutrition and health (NUTRITIN), current purchasing and consumption patterns (PATTERN) and attitude towards functional foods (ATTITUDE) are significant at the 1% level of confidence and have the hypothesized signs. The coefficients associated with the concern for chronic diseases (CONCERN) are also significant (with the positive signs) for all the three products at the 5% level of confidence.

Table 4.9 Variable definitions

Variable definition	Variable name	Max	Min	Expected signs*
Gender of respondent 1 if female 0 otherwise	FEMALE	1	0	
Marital Status of respondent 1 if married 0 otherwise	MARRIED	1	0	
Age of respondent 1 if 18-24 years of age 0 otherwise	AGE1	1	0	
1 if 25-34 years of age 0 otherwise	AGE2	1	0	
1 if 35-44 years of age 0 otherwise	AGE3	1	0	
1 if 45-54 years of age 0 otherwise	AGE4	1	0	
1 if 55-59 years of age 0 otherwise	AGE5	1	0	
1 if 60-64 years of age 0 otherwise	AGE6	1	0	
1 if 65-74 years of age 0 otherwise	AGE7	1	0	
1 if 75 or more years of age 0 otherwise	AGE8	1	0	
Race of respondent 1 if white 0 otherwise	RACE	1	0	
Number of children in the home	CHILDREN		0	
Number of adults in the home	ADULTS		1	
Education of respondent 1 if less than high school 0 otherwise	EDUC1	1	0	
1 if High school graduate 0 otherwise	EDUC2	1	0	
1 if Some college, no degree 0 otherwise	EDUC3	1	0	
1 if Associate degree 0 otherwise	EDUC4	1	0	
1 if Bachelor degree 0 otherwise	EDUC5	1	0	
1 if Graduate or professional degree 0 otherwise	EDUC6	1	0	
Household income of respondent 1 if Less than \$10,000 0 otherwise	INCOME1	1	0	
1 if \$10,000 - \$14,999 0 otherwise	INCOME2	1	0	
1 if \$15,000 - \$24,999 0 otherwise	INCOME3	1	0	
1 if \$25,000 - \$34,999 0 otherwise	INCOME4	1	0	
1 if \$35,000 - \$49,999 0 otherwise	INCOME5	1	0	
1 if \$50,000 - \$74,999 0 otherwise	INCOME6	1	0	
1 if \$75,000 - \$99,999 0 otherwise	INCOME7	1	0	
1 if \$100,000 - \$149,999 0 otherwise	INCOME8	1	0	
1 if \$150,000 - \$199,999 0 otherwise	INCOME9	1	0	
1 if \$200,000 or more 0 otherwise	INCOME10	1	0	
Knowledge of nutrition and health composite index comprising the following 5 items	KNOWNH	1	0	(+)
1. The two leading causes of death in the United States are cancer and cardiovascular disease				
2. Two of the major risk factors of heart disease are high blood pressure and smoking				
3. My diet affects my risk of developing heart disease, but not my risk of developing cancer				
4. The food pyramid is a set of dietary guidelines that describes a healthy diet as one that is low in saturated fats, trans fats, cholesterol, salt, and high in dietary fiber, whole grains, vegetables and fruits.				
5. The risk of developing a deadly chronic disease does not increase with overweight and obesity.				
Subjective knowledge of functional foods index comprising the following 5 items	KNOWFF	5	1	(+)
1. Some foods have specific health benefits that reduce your risk of developing chronic diseases.				
2. Functional foods include whole, enriched, or enhanced foods that have ingredients incorporated into them to provide a specific health benefit				
3. The only foods that can be categorized as a functional food are foods with a health claim on the nutritional label.				
4. Eating is a better way to obtain health-enhancing substances than taking dietary supplements like vitamins				
5. Functional foods should not replace a healthy diet, but should be consumed as part of a varied diet.				

Table 4.9 (Continued)

Beliefs about nutrition and health index comprising the following 5 items	NUTRITIN	5	1	(+)
1. Some foods increase the risk of developing some diseases while other foods reduce this risk.				
2. Foods that reduce the risks of disease should be eaten regularly throughout one's lifetime.				
3. Diet and nutrition play a major role in my health.				
4. Adopting better dietary habits is essential to reduce deaths from a variety of chronic diseases.				
5. I believe I have some control over my health				
Health history				
1. Have you ever lost a family member or close associate to a chronic disease such as cancer, heart disease, or diabetes?	LOSTFAM	1	0	(+)
2. Do you have regular check-ups?	CHECKUP	1	0	(+)
3. Has your doctor ever advised you to change your diet in response to a health concern?	DOCADVISE	1	0	(+)
Level of concern for various chronic diseases index comprising the following 4 items	CONCERN	7	1	(+)
On a scale of 1 to 7, 1 being very unconcerned and 7 being very concerned, please check your level of concern about the following health conditions:				
Cancer				
Heart disease				
Diabetes				
Cholesterol				
Frequency and level of exercise index comprising the following 2 items	EXERCISE	6	0	(±)
1. How many days during the week do you exercise outside your normal daily activities? 0 = Don't exercise at all 1 = Less than 3 days per week 2 = 3 to 5 days per week 3 = more than 5 days per week				
2. Please rate the level of your exercise (e.g., walking, jogging, biking, aerobics, gardening, etc.). 1 = Less than 30 minutes per day 2 = 30 to 60 minutes per day 3 = More than 60 minutes per day				
Current consumption and purchasing patterns index comprising the following 7 items	PATTERN	4	0	(±)
1. I try to eat healthy foods				
2. I eat five or more servings of fruits and vegetables a day.				
3. I buy herbal, natural, or organic foods.				
4. I buy dietary supplements				
5. I avoid high-salt foods.				
6. I avoid high-cholesterol foods.				
7. I avoid high-sugar foods				
Beliefs about functional foods index comprising the following 5 items	BELIEFS	5	1	(+)
1. I trust foods that promise to improve my health				
2. Health-enhancing foods are affordable				
3. Health-enhancing foods are meant only for sick people and the elderly.				
4. Healthy foods taste as good as conventional foods.				
5. Some functional foods may have harmful effects.				
Attitude towards functional foods index comprising the following 5 items	ATTITUDE	5	1	(+)
1. Eating health-enhancing foods is beneficial for me				
2. All grocery stores should carry health-enhancing food products.				
3. Foods enriched with health-enhancing ingredients are worth the extra costs.				
4. We can obtain health-enhancing substances from existing foods. So there is no need to develop new products fortified with health-enhancing substances.				
5. Functional foods are only a temporary fad, they are here today and will be gone tomorrow.				
Dependent Variable (WTP_i)				
Willingness to pay for spread A	WTP _{SA}	8	1	
1 = \$0.00 (none) 2 = \$0.05 3 = \$0.10 4 = \$0.25 5 = \$0.50 6 = \$0.75 7 = \$1.00 8 = \$1.50				
Willingness to pay for spread B	WTP _{SB}	8	1	
1 = \$0.00 (none) 2 = \$0.50 3 = \$1.00 4 = \$1.50 5 = \$2.00 6 = \$2.50 7 = \$3.00 8 = \$4.00				
Willingness to pay for bread A	WTP _{BA}	8	1	
1 = \$0.00 (none) 2 = \$0.10 3 = \$0.25 4 = \$0.50 5 = \$0.75 6 = \$1.00 7 = \$1.25 8 = \$1.50				

*The hypothesized signs are discussed in chapter 3 (section 3.6)

Table 4.10 Results of Ordered Probit Analysis of Consumers' WTP for SPREAD A (Spread that helps maintain a healthy heart)

Variable	Variable name	Coefficient	Standard Error	z	P> z
Gender ^a					
Female	FEMALE	0.067	0.112	0.60	0.546
Marital Status ^b					
Married	MARRIED	0.012	0.128	0.09	0.927
Age ^c					
25-34	AGE2	-0.335	0.309	-1.09	0.278
35-44	AGE3	-0.393	0.305	-1.29	0.197
45-54	AGE4	-0.532*	0.300	-1.77	0.077
55-59	AGE5	-0.664**	0.328	-2.02	0.043
60-64	AGE6	-0.653*	0.334	-1.96	0.051
65-74	AGE7	-0.530	0.325	-1.63	0.103
75 or older	AGE8	-0.616*	0.334	-1.85	0.065
race ^d	RACE	0.143	0.151	0.95	0.344
Number of children in the home	CHILDREN	-0.126**	0.060	-2.10	0.036
Number of adults in the home	ADULTS	0.036	0.033	1.10	0.271
Education ^e					
High school graduate	EDUC2	-0.320	0.290	-1.10	0.270
Some college, no degree	EDUC3	-0.551*	0.287	-1.92	0.055
Associate degree	EDUC4	-0.515	0.314	-1.64	0.101
Bachelor degree	EDUC5	-0.363	0.296	-1.23	0.219
Graduate or professional degree	EDUC6	-0.537*	0.299	-1.79	0.073
Income ^f					
Less than \$10,000	INCOME1	-0.314	0.374	-0.84	0.401
\$10,000 - \$14,999	INCOME2	-0.875**	0.405	-2.16	0.031
\$15,000 - \$24,999	INCOME3	-0.456	0.341	-1.34	0.182
\$25,000 - \$34,999	INCOME4	-0.290	0.317	-0.92	0.360
\$35,000 - \$49,999	INCOME5	-0.240	0.294	-0.82	0.414
\$50,000 - \$74,999	INCOME6	-0.522*	0.284	-1.84	0.066
\$75,000 - \$99,999	INCOME7	-0.366	0.293	-1.25	0.212
\$100,000 - \$149,999	INCOME8	-0.470	0.298	-1.58	0.115
\$150,000 - \$199,999	INCOME9	-0.244	0.389	-0.63	0.530
Knowledge of nutrition and health	KNOWNH	0.250	0.327	0.76	0.445
Knowledge of functional foods	KNOWFF	-0.229*	0.121	-1.89	0.059
Beliefs about nutrition and health	NUTRITIN	0.393***	0.133	2.95	0.003
Lost family member/close associate to a chronic disease	LOSTFAM	0.174	0.144	1.21	0.226
Have regular check-ups	CHECKUP	0.114	0.131	0.87	0.385
Doctor advised you to change your diet	DOCADVISE	-0.111	0.110	-1.01	0.311
Level of concern for various chronic diseases	CONCERN	0.065**	0.030	2.20	0.028
Frequency and level of exercise	EXERCISE	-0.065	0.060	-1.08	0.280
Current consumption and purchasing patterns	PATTERN	0.268***	0.082	3.26	0.001
Beliefs about functional foods	BELIEFS	0.132	0.101	1.30	0.192
Attitude towards functional foods	ATTITUDE	0.316***	0.092	3.45	0.001
Ordered Probit Thresholds	Coefficient (β)	Standard Error (SE)	(β/SE)		
τ_1	1.825**	0.802	2.275		
τ_2	1.845**	0.802	2.300		
τ_3	2.015**	0.803	2.510		

Table 4.10 (Continued)

τ_4	2.423***	0.804	3.013
τ_5	3.132***	0.807	3.881
τ_6	3.599***	0.809	4.449
τ_7	4.288***	0.811	5.286

X^2 Log-L -856.93792; Chi-square = 108.36, p-v. 0.00 n=501

***, **, * Indicates estimated coefficient is significant at the .01 level, 0.05 level, 0.10 level

^{a, b, c}, Excludes the gender male, the single marital status, the 18-24 age group category

^{d, e, f}, Excludes the non white race, the less than high school category, the \$200,000 or more income category

Table 4.11 Results of Ordered Probit Analysis of Consumers' WTP for SPREAD B (Spread that reduces cholesterol)

Variable	Variable name	Coefficient	Standard Error	z	P> z
Gender ^a					
Female	FEMALE	0.046	0.113	0.41	0.685
Marital Status ^b					
Married	MARRIED	-0.064	0.130	-0.49	0.624
Age ^c					
25-34	AGE2	0.013	0.321	0.04	0.967
35-44	AGE3	0.145	0.315	0.46	0.647
45-54	AGE4	0.127	0.311	0.41	0.683
55-59	AGE5	0.145	0.337	0.43	0.668
60-64	AGE6	0.287	0.343	0.84	0.403
65-74	AGE7	0.100	0.335	0.30	0.766
75 or older	AGE8	0.002	0.344	0.01	0.995
race ^d	RACE	-0.094	0.153	-0.61	0.541
Number of children in the home	CHILDREN	-0.012	0.060	-0.20	0.844
Number of adults in the home	ADULTS	0.058*	0.033	1.74	0.081
Education ^e					
High school graduate	EDUC2	-0.391	0.283	-1.38	0.168
Some college, no degree	EDUC3	-0.571**	0.281	-2.03	0.042
Associate degree	EDUC4	-0.757**	0.310	-2.44	0.015
Bachelor degree	EDUC5	-0.491*	0.291	-1.69	0.091
Graduate or professional degree	EDUC6	-0.681**	0.293	-2.32	0.020
Income ^f					
Less than \$10,000	INCOME1	-0.340	0.376	-0.90	0.367
\$10,000 - \$14,999	INCOME2	-0.524	0.408	-1.28	0.200
\$15,000 - \$24,999	INCOME3	-0.410	0.343	-1.19	0.232
\$25,000 - \$34,999	INCOME4	-0.310	0.322	-0.96	0.335
\$35,000 - \$49,999	INCOME5	-0.342	0.296	-1.15	0.249
\$50,000 - \$74,999	INCOME6	-0.357	0.285	-1.25	0.210
\$75,000 - \$99,999	INCOME7	-0.300	0.295	-1.02	0.308
\$100,000 - \$149,999	INCOME8	-0.312	0.299	-1.04	0.296
\$150,000 - \$199,999	INCOME9	-0.195	0.383	-0.51	0.610
Knowledge of nutrition and health	KNOWNH	-0.096	0.327	-0.29	0.768
Knowledge of functional foods	KNOWFF	-0.130	0.120	-1.08	0.278
Beliefs about nutrition and health	NUTRITIN	0.349***	0.131	2.65	0.008
Lost family member/close associate to a chronic disease	LOSTFAM	-0.010	0.145	-0.07	0.946
Have regular check-ups	CHECKUP	0.142	0.132	1.07	0.283
Doctor advised you to change your diet	DOCADVISE	-0.034	0.110	-0.31	0.754
Level of concern for various chronic diseases	CONCERN	0.062**	0.030	2.10	0.036
Frequency and level of exercise	EXERCISE	-0.044	0.060	-0.72	0.469
Current consumption and purchasing patterns	PATTERN	0.248***	0.083	2.99	0.003
Beliefs about functional foods	BELIEFS	0.037	0.101	0.37	0.713
Attitude towards functional foods	ATTITUDE	0.297***	0.092	3.22	0.001
Ordered Probit Thresholds	Coefficient (β)	Standard Error (SE)		(β/SE)	
τ ₁	1.621**	0.795		2.038	
τ ₂	2.597***	0.799		3.250	

Table 4.11 (Continued)

τ_3	3.343***	0.801	4.177
τ_4	3.663***	0.801	4.573
τ_5	4.085***	0.802	5.091
τ_6	4.473***	0.807	5.544
τ_7	4.687***	0.812	5.771

X^2 Log-L -746.70877; Chi-square = 78.44, p-v. 0.00 n=498

***, **, * Indicates estimated coefficient is significant at the .01 level, 0.05 level, 0.10 level

a, b, c, Excludes the gender male, the single marital status, the 18-24 age group category

d, e, f, Excludes the non white race, the less than high school category, the \$200,000 or more income category

Table 4.12 Results of Ordered Probit Analysis of Consumers' WTP for "Functional" BREAD A

Variable	Variable name	Coefficient	Standard Error	z	P> z
Gender ^a					
Female	FEMALE	0.152	0.111	1.38	0.169
Marital Status ^b					
Married	MARRIED	-0.142	0.127	-1.12	0.261
Age ^c					
25-34	AGE2	-0.171	0.308	-0.56	0.578
35-44	AGE3	-0.288	0.304	-0.95	0.344
45-54	AGE4	-0.390	0.300	-1.30	0.194
55-59	AGE5	-0.252	0.326	-0.77	0.440
60-64	AGE6	-0.342	0.331	-1.03	0.302
65-74	AGE7	-0.615*	0.323	-1.90	0.057
75 or older	AGE8	-0.549*	0.332	-1.65	0.098
race ^d	RACE	0.402***	0.153	2.63	0.009
Number of children in the home	CHILDREN	-0.066	0.059	-1.11	0.266
Number of adults in the home	ADULTS	0.084**	0.033	2.53	0.011
Education ^e					
High school graduate	EDUC2	-0.284	0.300	-0.95	0.343
Some college, no degree	EDUC3	-0.369	0.297	-1.24	0.214
Associate degree	EDUC4	-0.344	0.323	-1.07	0.286
Bachelor degree	EDUC5	-0.363	0.305	-1.19	0.234
Graduate or professional degree	EDUC6	-0.383	0.307	-1.24	0.213
Income ^f					
Less than \$10,000	INCOME1	-0.185	0.373	-0.50	0.619
\$10,000 - \$14,999	INCOME2	-0.886**	0.407	-2.18	0.029
\$15,000 - \$24,999	INCOME3	-0.234	0.338	-0.69	0.489
\$25,000 - \$34,999	INCOME4	-0.245	0.315	-0.78	0.437
\$35,000 - \$49,999	INCOME5	-0.225	0.292	-0.77	0.441
\$50,000 - \$74,999	INCOME6	-0.336	0.282	-1.19	0.233
\$75,000 - \$99,999	INCOME7	-0.146	0.292	-0.50	0.617
\$100,000 - \$149,999	INCOME8	-0.008	0.296	-0.03	0.979
\$150,000 - \$199,999	INCOME9	-0.053	0.375	-0.14	0.888
Knowledge of nutrition and health	KNOWNH	-0.174	0.323	-0.54	0.590
Knowledge of functional foods	KNOWFF	-0.084	0.117	-0.72	0.472
Beliefs about nutrition and health	NUTRITIN	0.499***	0.133	3.76	0.000
Lost family member/close associate to a chronic disease	LOSTFAM	-0.055	0.142	-0.39	0.700
Have regular check-ups	CHECKUP	0.030	0.130	0.23	0.816
Doctor advised you to change your diet	DOCADVISE	-0.167	0.108	-1.55	0.121
Level of concern for various chronic diseases	CONCERN	0.065**	0.029	2.20	0.028
Frequency and level of exercise	EXERCISE	-0.066	0.059	-1.11	0.265
Current consumption and purchasing patterns	PATTERN	0.408***	0.082	4.97	0.000
Beliefs about functional foods	BELIEFS	0.074	0.099	0.76	0.450
Attitude towards functional foods	ATTITUDE	0.253***	0.091	2.79	0.005
Ordered Probit Thresholds	Coefficient (β)	Standard Error (SE)		(β /SE)	
τ_1	2.575***	0.816		3.155	
τ_2	2.714***	0.817		3.320	
τ_3	3.172***	0.820		3.868	
τ_4	3.711***	0.822		4.515	

Table 4.12 (Continued)

τ_5	4.040***	0.823	4.910
τ_6	4.751***	0.825	5.759
τ_7	4.983***	0.826	6.034

X^2 Log-L -910.99814; Chi-square = 126.42, p-v. 0.00 n=503
 ***, **, * Indicates estimated coefficient is significant at the .01 level, 0.05 level, 0.10 level
 a, b, c, Excludes the gender male, the single marital status, the 18-24 age group category
 d, e, f, Excludes the non white race, the less than high school category, the \$200,000 or more income category

It was hypothesized that the more favorable one's attitude towards functional foods is, the more willing one will be to pay a premium for functional foods. The estimate on the variable ATTITUDE is positive in all the three models indicating that ceteris paribus, a person with a more favorable attitude towards functional foods will be more willing to pay a premium for spread A, spread B, and bread A. This result is in agreement with Bech-Larsen and Grunert's (2003) study which found that the Finnish respondents were more positive about functional foods than the Danish respondents and explained why functional foods in Finland enjoyed considerable success compared to Denmark.

Figure 4.4 shows the predicted probabilities of paying a premium for spread A as the attitude score changes from 1 (least positive) to 5 (most positive) while all other variables are held constant. As attitude changed from 1 to 5, the probability of paying \$0.00, or not paying a premium, for the functional products decreased while the probability of paying some premiums increased, for example the probability of paying \$1.00. This implies that as one's attitude towards functional foods improves, one is more willing to pay a premium for the spread that maintains a healthy heart (spread A). The same result was observed for spread B and bread A as can be seen in the figures in Appendix I.

The probability of not paying a premium (represented by the \$0.00 probability curve in Figure 4.4) is dual to the probability of paying a premium and it can be used to represent the respondent's decision to pay or not to pay for functional foods. The plotted probabilities

in Figure 4.4 and Appendix I also show that the effect of attitude on WTP is more pronounced in regards to the decision of whether to pay or not to pay a premium, than the magnitude of premium. The relatively flat lines, representing the predicted probabilities of paying a particular premium show that changes in predicted probabilities for the premiums

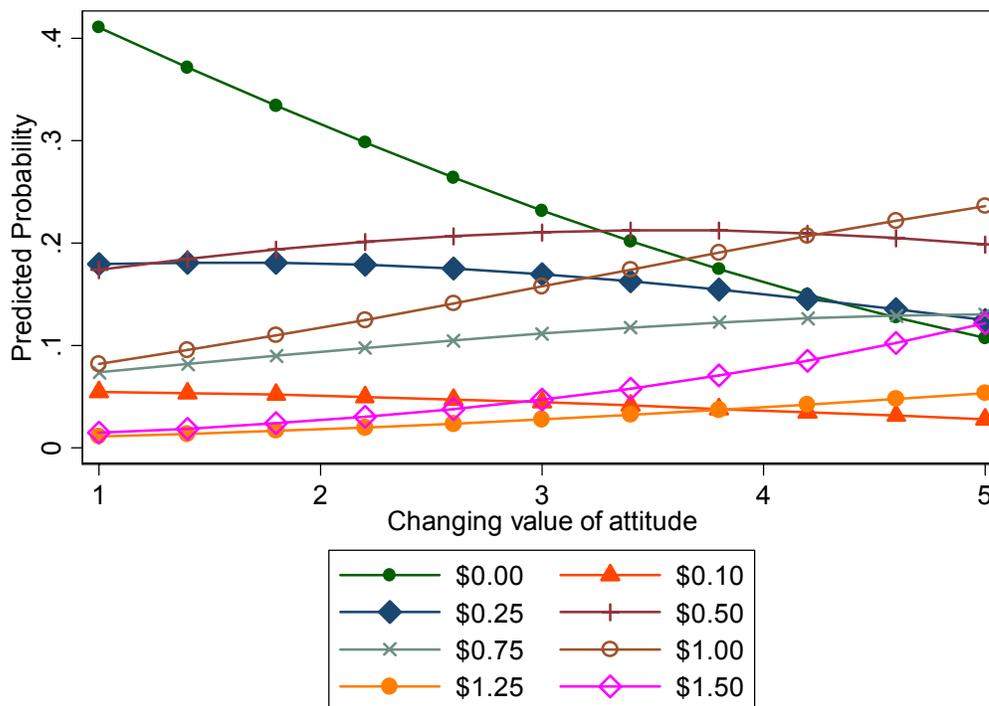


Figure 4.4 Probability curve showing the effect of attitude on WTP for the spread that helps maintain a healthy heart (spread A)

are relatively small as compared to changes in the probability for “NO” premium. It can be deduced from this result that one’s attitude towards functional foods is a significant determinant of one’s decision to pay for functional foods. However, attitude towards functional foods is an insignificant determinant of “how high” a premium one is willing to pay for functional foods. This implies that different factors may determine the decision of “how much” to pay for the particular functional food in question. It has been reported in the literature (Lusk et al., 2001) that consumption of many food items often involves a two step process; the first step being the consumer’s decision of whether to pay, and the second being

how much to pay. Figure 4.5 further supports the proposition that the two step process of deciding to pay for functional foods may be influenced by different factors. The figure shows that as belief in the link between nutrition and health increases from low (1) to high (5), with

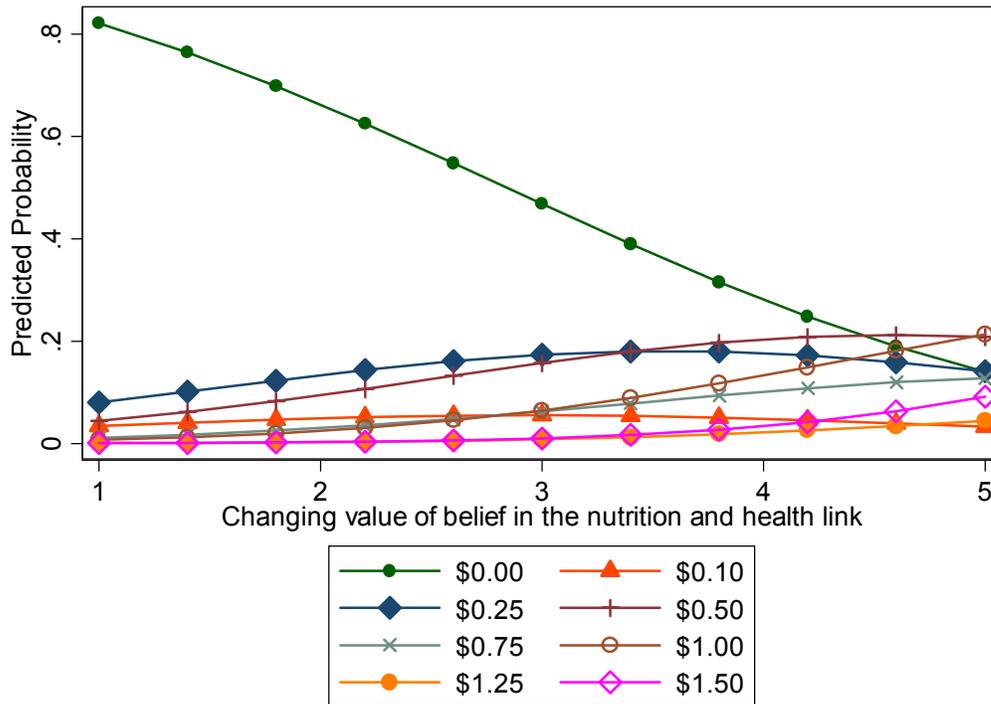


Figure 4.5 Probability curve showing the effect of belief in nutrition and health on WTP for bread A

all other variables held constant, the probability of paying \$0.00 decreases relatively more than the probability of paying any other premium. Just like attitude, the effect of beliefs on one’s willingness to pay for functional foods is more pronounced in regards to the decision of whether to pay a premium than the magnitude of the premiums.

For the NUTRITIN variable, it was hypothesized that the stronger the individual’s perception of a link between nutrition and health the more willing the individual will be to pay a premium for functional foods. The estimates of this variable were significant (1% level) and positive in all the three models indicating that with all other things equal, a person with a stronger perception of a link between nutrition and health will be more willing to pay

a premium for spread A, spread B and bread A. The KNOWNH variable, representing respondents' objective knowledge of nutrition and health, was not significant in any of the three models. It is interesting to note that a person's subjective knowledge, which is a belief about the link between nutrition and health, may influence the decision to purchase functional foods more than the objective knowledge of nutrition and health would. Based on Webster's dictionary definition of belief and knowledge, it intuitively makes sense because belief is a conviction/confidence in the link between the two concepts, nutrition and health, whereas objective knowledge is just acquaintance with facts regarding the link between nutrition and health.

Regarding the CONCERN variable, it was hypothesized that people who are more concerned about different health conditions (cancer, heart disease, diabetes and high cholesterol) are more willing to pay a premium for functional foods than those who are less concerned. The estimated coefficients associated with this variable were significant (5% level) and had the expected (positive) sign in all the three models. This implies that the more the concern for the health conditions considered, *ceteris paribus*, the more the willingness to pay a premium for spread A, spread B, and bread A. Figure 4.6 shows the change in the predicted probabilities of paying particular premiums as the concern for different health conditions increases while all other variables are held constant. As the level of concern increases, the probability of not paying a premium for bread A decreases while the probabilities of paying particular premiums, such as \$1.00 and \$1.50, slightly increase. This variable (CONCERN) just like ATTITUDE and NUTRITIN seems to affect the decision of paying a premium more than the magnitude of the premium. The effect of CONCERN on the decision to pay, however, is less than the effect of NUTRITIN as indicated by the slopes of

the \$0.00 premiums in figures 4.5 and 4.6. This should be expected since the ordered regression results (Table 4.12) showed that the effect of CONCERN on WTP was significant at the 5% level while the effect of NUTRITIN was significant at the 1% level. This implies that with all things equal, an individual with a strong belief in the link between nutrition and health is more likely to pay a premium for the functional bread than an individual with a strong concern about various chronic diseases. The same trend was observed for all the other products considered in this study (Appendices E and F).

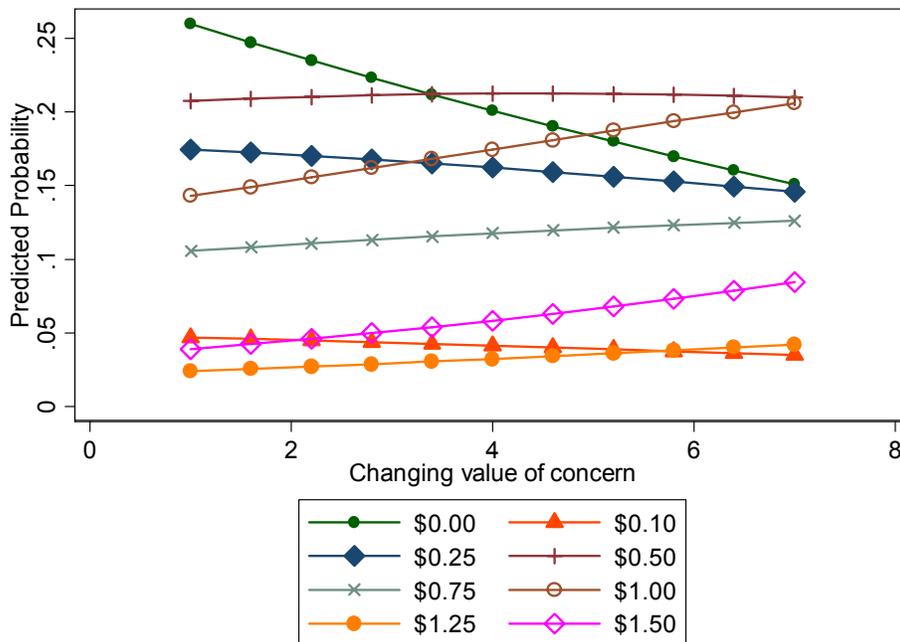


Figure 4.6 Probability curve showing the effect of concern about different chronic diseases on WTP for bread A

Current consumption patterns were measured using a set of seven items that sought to determine how health-conscious the respondent is regarding purchasing and consumption of different food items. These items were measured on a scale of 0 (never health-conscious) to 4 (always health-conscious) and were averaged to create a composite index (PATTERN). It was hypothesized that the effect of current consumption behavior and purchase patterns on

willingness to pay for functional foods may be positive or negative. For instance, a customer who purchases organic products may have a negative attitude towards foods that have been manipulated by addition of artificial ingredients, while a customer that does not buy organic products but is health-conscious may have a positive attitude and be more willing to pay a premium for novel functional food products.

The coefficient of PATTERN, however, was positive and significant at the 1% level of confidence for all the three products evaluated in this study (Tables 4.10, 4.11, and 4.12). The probability curves showing the effect of current consumption patterns on the probability of paying particular premiums, while holding all other variables constant, are found in Appendix H. The probability of paying a premium of \$0.00, in other words not paying a premium, for any of the functional food products valued in this study decreased as the value of PATTERN increased from 0 to 4. This implies that consumers who seek out healthier food alternatives are the ones who would be more willing to pay for functional foods. These consumers could also be referred to as the health-conscious, in which case our results would agree with those of Maynard and Franklin (2003) who found that the health-conscious were more likely to pay a premium for cancer-fighting dairy products.

The four variables discussed above (ATTITUDE, NUTRITIN, CONCERN and PATTERN) had the same effect on willingness to pay for all the three functional food products evaluated in this study. Subjective knowledge of functional food products (KNOWFF), however, was insignificant in two of the three models estimated, but was marginally significant (10% level of confidence) in one of the models. It was hypothesized that the more knowledge an individual has about functional foods, the more accepting and therefore the more willing that individual would be to pay a premium for functional foods.

Our results, however, showed a negative coefficient associated with this variable regarding willingness to pay for spread A (Table 4.10). A possible explanation for this unexpected sign is the type of knowledge (subjective) that was measured in our study. Wansink (2005) reported that when trying to understand consumers' knowledge-behavior link, the type of knowledge that is measured is important. According to House et al. (2004), subjective knowledge may not be interpreted as the amount of correct knowledge that the consumer has. This variable (KNOWFF) therefore may not be a good indicator of knowledge of functional foods. Another possible explanation for the unexpected sign is the information that the consumer has about functional foods. According to Frewer et al. (2003), consumer negativity towards the genetic modification of food products is a possible block to acceptance of specific functional foods. Sometimes, seemingly conflicting healthy-eating information to consumers may also be a hindrance, for example an individual who knows that fat is bad finds a functional food product like spread confusing. This is argued by Frewer et al. (2003) who reported that the potential difficulty often mentioned by consumers regarding acceptance of novel "healthy foods" is the sheer volume of messages to which they are exposed concerning healthy eating and that many of these messages are conflicting. These arguments seem to support Wansink's (2005) view that how much a person knows about functional foods is less important than what a person knows about them. Wansink (2005) also argues that knowledge of a food's nutritional attributes or knowledge of the consequences of consumption does not relate strongly to one's consumption of that food. Instead, these types of knowledge increase consumption only when the individual is able to link them together.

The effect of the demographic variables on willingness to pay depended on the type of product, which is comparable with the results of Jong et al.'s (2003) study (of demographic and lifestyle characteristics of functional food consumers) who found that determinants of functional food use depended on the type of product. The socio-demographic variables that were included in our model were gender, marital status, age, race, number of children in the household, adults in the household, education and annual income.

Gender and marital status were not significant in any of the three models. Age was not a significant determinant of the willingness to pay for the spread that is proven to significantly lower cholesterol (spread B, Table 4.11). These results are in agreement with the study of Jong et al. (2003) which found that age did not have a significant effect on use of cholesterol-lowering margarine. The coefficients for the age categories, 45-54, 60-64 and 75 and older were negative and significant at the 10% level for the spread that helps maintain a healthy heart (spread A, Table 4.10). The negative coefficients imply that respondents in these age categories were less willing to pay for the spread that helps maintain a healthy heart than the youngest age category in the sample (18-24). The coefficient for the 55-59 age category was also negative and significant (5% level) for this spread. Generally the respondents of 45 years and above were less willing to pay for spread A as compared to the respondents in the 18-24 age category. Likewise the coefficients associated with age categories 65-74 and 75 or older were negative and significant at the 10% level for the functional bread (bread A, Table 4.12). This indicated that respondents of 65 years and older were less willing to pay for the bread that may reduce the risk of heart disease and certain cancers (bread A) than the youngest age category (18-24).

Our results regarding the effects of age on willingness to pay for functional foods are similar to the findings of Childs and Poryzees (1997). They reported that older respondents (65+) were more likely to improve their nutrition by choosing “natural” unprocessed foods rather than “novel” functional foods. The products evaluated in our study may be considered unnatural novel foods, and this possibly explains the result that respondents of 65 years and above were less willing to pay for bread A than the 18-24 age group. According to Childs and Poryzees (1997), purchase intent was significantly lower in the 65+ age category than among other age categories, probably due to the older populations being faced with remedy issues than with preventative concerns. This may partly explain why some age groups (45 and above) in our study are less willing to pay for a spread that “maintains” a healthy heart than the youngest age group. The 18-24 age groups may be more concerned (if at all) with preventative issues than remedy issues. Childs and Poryzees (1997) also reported that strong belief in the efficacy of nutraceuticals has increased in all age groups except those aged 55 and above implying that while younger adults are becoming more interested in preventative issues of age and disease, ailing seniors see little association between food and disease prevention. Gilbert (2000) also reported that whereas 54% of shoppers do not believe many of the health claims on food packages, shoppers between 50 and 64 are the most skeptical of any age group. This may also partly explain why the 45 and above age categories were less willing to pay for spread A than the 18-24 age group. According to Urala and Lahteenmaki (2003), consumers perceive functional food products as a member of the general product category such as spread and only secondarily as a functional food. The implication for our results is that when the respondents view spread A as spread, the health claim “helps

maintain a healthy heart” may not be able to counteract their skepticism about spread, especially depending on the age group.

Race was only significant (1% level) in the bread model (Table 4.12). The positive coefficient indicated that the respondents of the white race were more willing to pay a premium for bread that may reduce the risk of heart disease and certain cancers (bread A) than respondents of the other race. Increasing number of children in the household was not significant for spread B (Table 4.11) and bread A (Table 4.12) but was significant (5% level) for the spread that helps maintain a healthy heart. The negative coefficient for this variable implies that as the number of children in the household increases, the respondent’s willingness to pay a premium for the spread that helps maintain a healthy heart reduces. The coefficients for number of adults in the household were positive and significant at the 5% and 10% levels for bread A (Table 4.12) and spread B (Table 4.11) respectively. This indicates that increase in number of adults in the home is associated with an increase in the willingness to pay a premium for the functional bread A and for the spread that is proven to significantly reduce cholesterol. Income dummy variables were not significant in the case of the bread that may reduce the risk of heart disease and certain cancers, two education variables were significant in the case of spread A (Table 4.10) and four variables were significant in the case of spread B (Table 4.11). The estimated coefficients for the “some college no degree” and the “graduate or professional degree” category were negative and significant at the 10% level, for spread A. This indicates that the two categories which include the highest education category were less willing to pay a premium for the spread that maintains a healthy heart, than the lowest education category (less than high school). Similar results were observed for the cholesterol-reducing spread (Table 4.11). The negative signs on the significant (5% or

10%) coefficients for education, show that the more educated respondents were less willing to pay a premium for the cholesterol-reducing spread than the respondents in the “less than high school” category. One plausible explanation for this is the perceived healthiness of the product and probably the knowledge that one can consume a healthy diet composed of foods currently available.

Finally the income dummy variables were not significant in the model that was estimated for spread B, one income group was significant (5%) in the case of bread A (Table 4.12) and two income variables were significant (5% and 10% level) in the case of spread A (Table 4.10). The negative signs on the coefficients of these variables indicate that the willingness to pay a premium was lower for respondents in the \$10,000-\$14,999 age category relative to the “\$200,000 or more” income category. This was also true for the \$50,000-\$74,999 category in the case of the spread that helps maintain a healthy heart (Table.4.10.). These differences in the effect of different demographic variables on consumers’ willingness to pay for functional food may be related to the type of functional product and probably the health claim. Other studies that have considered the effect of different demographic factors on attitude or functional food use have reported somewhat similar findings. Urala and Lahteenmaki (2003), found that gender and age had no effect on the use frequency or the evaluated healthiness of the functional products. Poulsen (1999) found that income or educational level did not affect consumer attitudes towards functional foods. Childs and Poryzees (1997) findings suggested that higher education and higher income groups are more aware of the benefits of functional foods and are more willing to pay for them. The study of Jong et al. (2003) that concluded that generalization of consumer characteristics over different functional foods is not legitimate, found that consumption of

products containing Echinacea or multivitamin and minerals was more in the high education groups. But, consumption of products containing extra calcium by the middle and high education groups was less likely than in the low education group. The seemingly inconsistent results in literature, regarding effect of different demographic variables on consumption of functional foods would probably emphasize that generalization of consumer characteristics over different functional foods is not legitimate (Jong et al., 2003). This also further implies that consumers perceive functional foods first as a general product category then as a functional food. This implies that perceived healthiness of the product category, for example spread, may affect the acceptability of the associated functional food.

The other explanatory variables (LOSTFAM, CHECKUP, DOCADVISE, EXERCISE and BELIEFS) included in our model were not significant for any of the three products (Table 4.10, 4.11 and 4.12) evaluated in this study.

4.11 Probabilities of Paying a Premium for Spread A, Spread B and Bread A

Predicted probabilities of willingness to pay a particular premium for product *i*, were computed holding all explanatory variables at their means, and the results are shown in Table 4.13. On average the probability of paying a premium for any of the products evaluated is highest for the \$0.50 premium. The probability of paying a \$0.50 premium for spread A is 0.27, for spread B is 0.37, and that for bread A is 0.21. In other words, respondents (on average) are more likely to pay an additional \$0.50 premium than any other premium for the three functional products considered. The additional \$0.50 is equivalent to a 47% price premium (percent over conventional) for spread A. The current grocery store price of a functional spread with a similar health claim is about 45% price premium. This point is further illustrated as follows. As explained in section 3.4.1.1, the foods selected to be valued

in this study were based on functional foods that are already available on the grocery store shelves. Some examples of these foods can be found in Appendix B. A product that bears a health claim, “helps maintain a healthy heart....”, costs \$1.54 while a conventional alternative (non-functional and bears no health claim) costs \$1.07. Our results show that respondents are willing to pay a total of \$1.57 for the same functional spread. This implies that on average respondents in this study are at least willing to pay the current grocery store price premium for the spread that helps maintain a healthy heart (spread A).

For spread B the \$0.50 premium represents about a 156% price premium while the current store price of a similar functional spread is about 500% price premium. For bread A, the additional \$0.50 that respondents are willing to pay, represents about a 33% price premium while the current store price of similar functional bread is approximately 40% price premium. This means that on average respondents are willing to pay less, for spread B and bread A, than the current grocery store premiums of the products with similar health claims.

These results imply that WTP and especially the decision of how much to pay may be affected by other factors including type of product and price. In terms of the product type, consumers may not see the need to pay extra for a particular product. For instance, one comment in the returned surveys was that, “bread does not have to be that expensive, one can get a loaf of bread with the same ingredients at a cheaper price.” The message here is that people may know the benefits of a particular product but they do not see the need for the extra cost (“bread doesn’t have to be that expensive”). In the case of the cholesterol-lowering spread B, the probability of paying the \$0.50 premium is higher than for the other two products evaluated in this study. This premium (156%) is not even half of the current grocery store price premium (500%) of the product, which implies that on average people will not be

willing to buy this product. The influence of price on acceptance of functional foods has been reported in literature. According to Frewer et al. (2003), even a functional food with desirable and proven health benefits may not be attractive to consumers if it is simply too expensive to warrant purchase.

Table 4.13 Probability of paying a premium for spread A, spread B and bread A

Probability of paying:	Means of determining variables
\$0.00	0.249
\$0.05	0.007
\$0.10	0.058
\$0.25	0.155
\$0.50	0.267
\$0.75	0.128
\$1.00	0.099
\$1.50	0.037

a. Overall probability of paying a premium for spread A (helps maintain a healthy heart)

Probability of paying:	Means of determining variables
\$0.00	0.257
\$0.50	0.370
\$1.00	0.231
\$1.50	0.060
\$2.00	0.047
\$2.50	0.021
\$3.00	0.006
\$4.00	0.008

b. Overall probability of paying a premium for spread B (proven to significantly lower cholesterol)

Probability of paying:	Means of determining variables
\$0.00	0.187
\$0.10	0.040
\$0.25	0.158
\$0.50	0.213
\$0.75	0.120
\$1.00	0.183
\$1.25	0.035
\$1.50	0.065

c. Overall probability of paying a premium for spread B (may reduce the risk of heart disease and certain cancers)

CHAPTER V: SUMMARY AND CONCLUSIONS

5.1 Introduction

Scientific research has shown a connection between diet and chronic diseases including diabetes, cancer and heart disease and the focus is now turning to the use of food components that can positively affect human function and reduce the risk of disease. As much as individual compounds are known to be effective against certain diseases, scientists are considering the properties of whole foods rather than single compounds. This has led to an escalating interest in functional foods, foods that provide health benefits beyond meeting nutritional needs of growth and maintenance. Accordingly, the food industry is focused on developing food products that promote good health. The agricultural industry, the pharmaceutical industry, and food manufacturing companies are positioning themselves to benefit from the increasing opportunities in the rapidly-growing field of diet and health.

Major resources are being committed to functional food innovation and value added production, although, considerable uncertainties still exist regarding public perception of functional foods. Consequently, understanding consumer behavior will be important if the impact of functional foods on public health is to be realized. The purpose of this study was to measure and evaluate the factors that affect consumers' willingness to pay (WTP) for functional foods.

The specific objectives were to: (1) evaluate consumer behavior and attitudes regarding the consumption of functional foods, and (2) measure willingness to pay for selected functional foods, and to evaluate price premiums that consumers are willing to pay for different functional foods containing different health claims. To accomplish these objectives, survey data was collected from randomly selected participants within the five

geographical regions of the United States. The survey consisted of eight different sections, including a contingent valuation section that used a payment card method to elicit respondents' willingness to pay for a spread that helps maintain a healthy heart, a spread that is proven to significantly reduce cholesterol and a loaf of bread that could reduce the risk of heart disease and certain cancers. An ordered probit regression analysis was used to evaluate the effect of different explanatory variables, including demographics, on the willingness to pay a premium for the three different functional food products valued in this study.

5.2 Results

The first section was grouped into three subsections. The first subsection which could be referred to as a “nutrition quiz”, evaluated consumer knowledge of nutrition and health using a set of five, true/false questions. Eighty nine percent of the respondents were aware that cancer and cardiovascular disease are the leading causes of death in the US and 71% knew that their diets affect their risk of developing heart disease and cancer. This knowledge however did not affect the respondents' willingness to pay for any of the three products evaluated in this study. Evaluating respondents' subjective (opinion) knowledge of functional foods revealed a relatively low level (46%) of knowledge of functional foods among the consumers. Even though 96% of the respondents agreed that some foods have specific health benefits that reduce one's risk of developing chronic diseases, only 46% disagreed with the statement that, “the only foods that can be categorized as functional foods are foods with a health claim on the nutritional label”, while 35% indicated that they are not sure. Overall, the subjective knowledge of functional foods was found to have no significant relationship with the respondents' willingness to pay for the cholesterol-reducing spread (spread B) and the functional bread (bread A). Our results, however, indicated a negative but only marginally

significant (10% level) relationship between this subjective knowledge and willingness to pay for spread A. Considering that subjective knowledge of functional foods, which may not be regarded as the amount of correct information that one has, was measured, this result is probably not a true representation of the relationship between knowledge and willingness to pay for functional foods.

Subsection three of consumers' knowledge and information addressed the respondents' source of nutrition information. Our results showed that 51% of the respondents use food advertisements, 39% use health care professionals, 30% use media and 55% use friends and family as their source of nutrition information. Furthermore only 15% indicated "always" reading nutrition labels before purchasing food products.

Section two of the survey evaluated beliefs about nutrition and health. Contrasting this section with the true objective knowledge of nutrition and health, this section sought to determine the strength with which respondents perceive a link between nutrition and health. It was hypothesized that respondents with a stronger belief in the link between nutrition and health will have a better attitude towards the foods that could improve or enhance one's health and will be more willing to pay a premium for functional foods. Results of the ordered probit analysis supported this hypothesis. It was also noted that respondents' subjective beliefs about nutrition and health affected their willingness to pay for functional foods, while their objective knowledge of nutrition and health did not have an effect on willingness to pay. Plotting the predicted probabilities against belief scores revealed another interesting result. As the belief in nutrition and health changed from weak to strong, the probability of paying \$0.00 for the functional bread drastically decreased, however, the probability of paying any other premium did not change as much as was indicated by probability curves associated

with all other premiums lying below the probability of 0.2. This revealed that WTP for functional foods is a two step process, (1) the decision to pay a premium for functional foods and, (2) what premium to pay for functional foods. Our results indicated that beliefs in nutrition and health would affect the first step more than the second step of the process. This implies that the fact that people care about health and believe in the nutrition and health link does not automatically translate into willingness to pay a “high” premium for the functional food products. However, if our result that 84% (including those who believe they have always been on a healthy diet, those who switched to a healthy diet more than five years ago, or in the last five years) of the respondents are now on a healthier diet is true, it means that the message about healthy eating is being heeded. According to Frewer et al (2003), however, over 80% of Western consumers have a false perception that they eat a healthy diet probably due to the fact that few people monitor their dietary intakes closely.

Section three of the survey asked the respondents about their health and exercise history. Our results indicated that concern for chronic diseases positively and significantly (5%) affected the WTP for all the three products evaluated. Section four evaluated current consumption habits and purchasing patterns and revealed that the importance of nutrition as a factor influencing purchasing decision came only second to taste or flavor of the food in question. The results also showed that only 8% of the respondents “always” eat at least five servings of fruit a day, implying that the government’s message through the “Five-a-Day for Better Health program” is not yet taken seriously by the majority of the respondents. Generally, current consumption patterns, a composite index of the seven items that sought to determine how health-conscious the respondent was regarding purchasing and consumption of different food items, significantly (1% level) and positively affected the respondents’

WTP for all the three products used in this study. The predicted probability curves showed that as the pattern changed from “never health-conscious” to “always health-conscious”, the probability of not paying a premium for the functional foods decreased.

Sections five and six addressed beliefs about functional foods and attitude toward functional foods, respectively. Attitude toward functional foods was positive and significant (1% level) in determining WTP a premium for all the three products. Curves of predicted probabilities associated with different premiums showed that as the attitude changed from least positive to most positive the probability of paying \$0.00 for the functional products decreased while the probability of paying particular premiums increased, for example the probability of paying \$1.00 for spread A. It was also deduced from this result that the effect of attitude on WTP may be more pronounced in regards to the decision of whether to pay or not to pay for functional foods than the decision of paying particular premiums.

For the demographic characteristics that were addressed in section eight of the survey, their significance in determining the respondents’ WTP depended on the type of the product. The study of Jong et al. (2003) that evaluated demographic and lifestyle characteristics of functional food consumers found that determinants of functional food use depended on the type of products and they recommended that generalization of consumer characteristics over different foods is not legitimate. In the present study, for the age factor, generally above 45 years of age was significant and negatively associated with WTP for the spread that helps maintain a healthy heart. Education was generally important in explaining WTP for the spread that is proven to significantly lower cholesterol. The results showed respondents with some college education and higher were less willing to pay a premium for this spread than respondents with less than high school education. For the functional bread,

education was not a significant factor but just like the case of WTP for the heart healthy spread, only two income groups (\$10,000-\$14,999 and \$50,000-\$74,999) were less willing to pay for the bread than the highest income group (\$200,000 or more). Likewise, only the two highest age categories (65-74 and 75 & older) were significant and negatively related with the willingness to pay a premium for the functional bread. Race was significant (and positive) only in the case of WTP for bread while the number of adults in the household was positive and significantly related with WTP for the functional bread as well as the cholesterol-lowering spread. Number of children in the household was only significant and negatively related with WTP for the spread that helps maintain a healthy heart.

Overall, the following four factors significantly affected the respondents' willingness to pay a premium for all the three products evaluated: beliefs about nutrition and health, concern about different chronic diseases, current purchasing and consumption patterns, and attitude towards functional foods. These factors seem to have different effects on the decision of whether to pay a premium for functional foods and the decision of how much to pay for functional foods. The significance of demographic variables depended on the product being valued.

Finally, section seven of the survey dealt with the contingent valuation section, which used the payment card method to elicit the premiums respondents were willing to pay for the three different products: a spread that helps maintain a healthy heart, a spread that is proven to significantly reduce cholesterol and the bread that may reduce the risk of heart disease and certain cancers. Predicted probabilities of paying particular premiums were calculated for the three products with all other variables held at their means. On average the probability of paying a premium for any of the products evaluated was highest (spread A = 0.267, spread B

= 0.370, bread A = 0.213) for the \$0.50 premium. Based on this result a number of observations can be made. First, respondents (on average) are willing to pay the current grocery store premium for the spread that helps maintain a healthy heart. For the cholesterol-reducing spread, on average respondents are not willing to pay even half of the current grocery store 500% premium. Finally, for bread respondents are willing to pay a 33% premium while its current grocery store price is a 40% premium. This result indicates that WTP and especially the decision of how much to pay is affected by other factors including type of product and price. People may know the benefits of a particular product but they may not see the need for the extra cost and this may explain the lower premium respondents are willing to pay for bread. On the other hand, people may see the need for the extra cost as indicated by the probability of paying a \$ 0.50 premium towards the cholesterol-lowering spread B, which was higher than the probability of paying this same premium towards any of the other two products evaluated. However, on average the premium that people are willing to pay is not even half of the current price of the product. This is probably due to the prohibitive price. Even a functional food with desirable and proven health benefits may not be attractive to consumers if it is simply too expensive to warrant purchase (Frewer et al., 2003). Considering the stated WTP, about 42% of the respondents expressed a willingness to pay at least a 50% premium for the bread and about 38% expressed a WTP at least a 200% premium for the cholesterol-lowering spread. Nine percent of the respondents, majority of who are probably current purchasers of the cholesterol-lowering spread, indicated a WTP of at least a 400% premium.

5.3 Implications

The findings of this study are important to functional food developers and marketers as well as government bodies that are interested in designing effective health programs. A number of factors including price and taste are competing with nutrition as determinants of what product the consumer decides to purchase. Our results indicated that beliefs about the nutrition and health link, concern about different chronic diseases, current purchasing and consumption patterns, and positive attitude towards functional foods significantly affected WTP regardless of the food being evaluated. This implies that sensitization programs that are geared toward these factors may be effective in helping consumers move toward actual dietary change. The associated finding, however, that these factors have a different effect on the decision to pay, and the decision of how much to pay, implies that there is more to learn about the consumer. Specifically for the functional food marketer there is need to determine what factors significantly influence the decision of what premium to pay.

Overall, this study has contributed to further understanding of the functional food consumer especially concerning WTP for functional foods. The finding that a strong belief in the nutrition and health link does not result in respondents foregoing high premiums in order to acquire the functional foods evaluated in this research confirms the message echoed by other authors (McConnon et al., 2002; Frewer et al., 2003). According to Frewer et al. (2003), the assumption that functional foods with specific health advantages are likely to deliver population-wide benefits may not automatically hold. Understanding the consumer is going to be “key” in determining whether the functional food concept will be sustainable and will achieve the intended results.

5.4 Limitations and Future Research

In order to include (on the payment card) premiums representing actual grocery store prices of the products considered, and to also be able to provide reasonable mark-ups, our study used unequal intervals between the different premiums on the payment cards. This limited our ability to estimate actual WTP values and instead we determined the probability of paying a particular premium. Another limitation arising from the same issue was the inability to use other methods like double hurdle and structural equation modeling, which would have probably provided more insight in the causal relationships of the factors considered in this study. Future research focused on evaluating the factors that lead to formation of particular attitudes and the overall attitude towards functional foods would further enhance the understanding of why people make particular dietary choices and may not choose foods with proven health benefits, why people would not choose a novel food even when there is a concrete and tangible consumer benefit. Another topic for future research would be to examine the effects of functional foods on health care costs, and whether a consumer's WTP for functional foods is affected by the expectation that consumption of these types of foods will lower health care costs. Consumer's willingness to pay for functional foods may also be affected by whether their health insurance is paid by public or private sources.

Given that this study evaluated products that are already present on the market, more insight could be gained by using secondary data to compare stated willingness to pay obtained through the survey with the revealed willingness to pay based on actual consumer purchases of the functional foods already present on the market.

Regarding the issue of the two-stage process of consumers' WTP for functional foods, more research is needed to further explore the different factors that are important to the first decision of willingness to pay for functional foods and the second decision of how much to pay for a particular functional food. Future research applying the double hurdle model would reveal more information regarding which factors affect the decision to pay for functional foods and which factors affect the decision of how much to pay.

Another limitation of the study was the over- or under-representation of some demographic factors including the age categories from 45 and over, the white race, the education level categories and some of the annual income categories. Future research could stratify according to select demographic variables.

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APPENDIX A: A SURVEY OF CONSUMER ATTITUDES CONCERNING FUNCTIONAL FOODS



- Please complete the questionnaire and return it in the postage-paid return envelope
 - Your answers are completely confidential. **Do not write your name on the questionnaire**

Thank you for your help



Louisiana State University

Section Ia. Consumer Information and Knowledge of Nutrition and Health

1. The two leading causes of death in the United States are cancer and cardiovascular disease.
 True False I don't know

2. Two of the major risk factors of heart disease are high blood pressure and smoking.
 True False I don't know

3. My diet affects my risk of developing heart disease, but not my risk of developing cancer.
 True False I don't know

4. The food pyramid is a set of dietary guidelines that describes a healthy diet as one that is low in saturated fats, trans fats, cholesterol, salt, and high in dietary fiber, whole grains, vegetables and fruits.
 True False I don't know

5. The risk of developing a deadly chronic disease does not increase with overweight and obesity.
 True False I don't know

Section Ib. Consumer Information and Knowledge of Functional Foods

	Strongly agree	Somewhat agree	Not Sure	Somewhat disagree	Strongly disagree
1. Some foods have specific health benefits that reduce your risk of developing chronic diseases.	<input type="checkbox"/>				
2. Functional foods include whole, enriched, or enhanced foods that have ingredients incorporated into them to provide a specific health benefit.	<input type="checkbox"/>				
3. The only foods that can be categorized as a functional food are foods with a health claim on the nutritional label.	<input type="checkbox"/>				
4. Eating is a better way to obtain health-enhancing substances than taking dietary supplements like vitamins.	<input type="checkbox"/>				
5. Functional foods should not replace a healthy diet, but should be consumed as part of a varied diet.	<input type="checkbox"/>				

6. Please list a specific food that you know has a health benefit associated with it _____.

Section Ic. Consumers' Source of Nutrition Information

1. How often do you read nutrition labels when you purchase food products?

- Always Most times Sometimes A few times
 Never

2. Please indicate the information sources that you use most often when making your food buying decisions (Please mark all that apply).

- Food advertisements Media Healthcare professionals Public seminars
 Internet/web Friends and family Health food store Government
 Other, please specify _____

Section II. Beliefs about Nutrition and health

Please indicate the extent to which you agree or disagree with the following statements

	Strongly agree	Somewhat agree	Not Sure	Somewhat disagree	Strongly disagree
1. Some foods increase the risk of developing some diseases while other foods reduce this risk.	<input type="checkbox"/>				
2. Foods that reduce the risks of disease should be eaten regularly throughout one's lifetime.	<input type="checkbox"/>				
3. Diet and nutrition play a major role in my health.	<input type="checkbox"/>				
4. Adopting better dietary habits is essential to reduce deaths from a variety of chronic diseases.	<input type="checkbox"/>				
5. I believe I have some control over my health.	<input type="checkbox"/>				

6. Have you switched to a more healthy diet? (Please mark the appropriate response).

- Have always been on a healthy diet
 Switched to a healthy diet more than 5 years ago
 Switched to a healthy diet in the last 5 years
 Not yet switched to a healthy diet
 I don't plan to

Section IIIa. Health and Exercise History

Please mark the answer that best describes your situation:

	Yes	No
1. Have you ever lost a family member or close associate to a chronic disease such as cancer, heart disease, or diabetes?	<input type="checkbox"/>	<input type="checkbox"/>
2. Do you have regular check-ups.	<input type="checkbox"/>	<input type="checkbox"/>
3. Has your doctor ever advised you to change your diet in response to a health concern?	<input type="checkbox"/>	<input type="checkbox"/>
4. If YES, do you follow his or her recommendations when shopping for food?	<input type="checkbox"/>	<input type="checkbox"/>

4. On a scale of 1 to 7, 1 being very unconcerned and 7 being very concerned, please check your level of concern about the following health conditions:

Cancer	<input type="checkbox"/>						
	1	2	3	4	5	6	7
Heart disease	<input type="checkbox"/>						
	1	2	3	4	5	6	7
Diabetes	<input type="checkbox"/>						
	1	2	3	4	5	6	7
High Cholesterol	<input type="checkbox"/>						
	1	2	3	4	5	6	7

5. How many days during the week do you exercise outside your normal daily activities?

- Don't exercise at all
 Less than 3 days per week
 3 to 5 days per week
 More than 5 days per week

6. Please rate the level of your exercise (e.g., walking, jogging, biking, aerobics, gardening, etc.).

- Less than 30 minutes per day
 30 to 60 minutes per day
 More than 60 minutes per day

Section IV. Current consumption habits and purchasing patterns

1. Please rank the following factors according to their importance in influencing your purchasing decisions (please mark a 1 for most important and 6 for least important).

- ___ Nutritional content of the food
- ___ Price of the food
- ___ Taste or flavor of the food
- ___ Safety
- ___ Brand name
- ___ Convenience

2. Please indicate whether you buy any of the following foods (Please mark all that apply)

- Orange juice Great Value bread
- Yogurt Sara Lee bread
- Black tea Oro wheat bread
- Green tea Soy products
- Margarine/ butter/ spread
- V8 juices
- Cranberry juices

Please read each statement below and mark the box which best describes your shopping practices.

	Always	Most times	Sometimes	A few times	Never
1. I try to eat healthy foods.	<input type="checkbox"/>				
2. I eat five or more servings of fruits and vegetables a day.	<input type="checkbox"/>				
3. I buy herbal, natural, or organic foods.	<input type="checkbox"/>				
4. I buy dietary supplements.	<input type="checkbox"/>				
5. I avoid high-salt foods.	<input type="checkbox"/>				
6. I avoid high-cholesterol foods.	<input type="checkbox"/>				
7. I avoid high-sugar foods.	<input type="checkbox"/>				

Section V. Beliefs about functional foods

	Strongly agree	Somewhat agree	Not Sure	Somewhat disagree	Strongly disagree
1. I trust foods that promise to improve my health.	<input type="checkbox"/>				
2. Health-enhancing foods are affordable.	<input type="checkbox"/>				
3. Health-enhancing foods are meant only for sick people and the elderly.	<input type="checkbox"/>				
4. Healthy foods taste as good as conventional foods.	<input type="checkbox"/>				
5. Some functional foods may have harmful effects.	<input type="checkbox"/>				

Section VI. Consumer Attitude towards functional foods

	Strongly agree	Somewhat agree	Not Sure	Somewhat disagree	Strongly disagree
1. Eating health-enhancing foods is beneficial for me.	<input type="checkbox"/>				
2. All grocery stores should carry health-enhancing food products.	<input type="checkbox"/>				
3. Foods enriched with health-enhancing ingredients are worth the extra costs.	<input type="checkbox"/>				
4. We can obtain health-enhancing substances from existing foods. So there is no need to develop new products fortified with health-enhancing substances.	<input type="checkbox"/>				
5. Functional foods are only a temporary fad, they are here today and will be gone tomorrow.	<input type="checkbox"/>				

Section VII. Willingness to pay for Functional foods

Next, we would like you to please read the following information before answering the last set of questions

Deadly chronic diseases including diabetes, heart disease and cancers are among the most common and most costly health problems in the United States. The incidence of these diseases could be reduced if Americans would adopt risk-lowering behaviors. One such risk-lowering behavior is our diet. Foods that supplement our diet by increasing our intake of health- enhancing substances and reduce our chance of contracting disease are called FUNCTIONAL FOODS. ***The position of the American Dietetic Association is that “functional foods including whole foods and fortified, enriched or enhanced foods, have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels.”*** These health-enhancing foods are not just intended for the sick but for the healthy – they prescribe to the notion that “prevention is better than cure.”

As a result the food industry is developing functional food products, some of which are already in supermarkets or grocery stores. Most of these foods contain a health claim that tells you about how consumption of a particular food would enhance your health, for example you may come across a health claim like “helps maintain a healthy heart...” but these foods may cost a bit more than conventional foods.

In the section that follows, we present several “hypothetical” foods. It has been our experience that usually people tend to overestimate what they would actually pay for functional foods. In the following questions, we ask that you please respond exactly as you would if you were in the grocery store and had to spend your own money. Your honest opinion is the key that will make this survey useful.

Hypothetical Scenario

You walk into the grocery store to purchase spread/margarine and bread. There are different types of these products on the shelves, some are regular and some contain health-enhancing properties as shown on the labels. Please indicate your purchase decision below:

Product

Please read and make your purchase decision

SPREAD A

Typical price of regular 15oz spread is \$ 1.07

Helps maintain a healthy heart when substituted for butter or margarine as part of a diet low in saturated fat and cholesterol

Would you be willing to pay extra for a healthy heart spread? Yes No

If YES please mark the most you would pay for this product in addition to the regular price

\$1.50 \$1.00 \$0.75 \$0.50 \$0.25 \$ 0.10 \$0.05

How sure are you about your purchase decision?

100% 90% 80% 70% 60% 50% less than 50%

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the heart healthy spread in addition to the regular price of \$1.07

SPREAD B

Typical price of regular 8oz spread is \$ 0.50

Proven to significantly lower cholesterol

Would you be willing to pay extra for a cholesterol-lowering spread? Yes No

If YES please mark the most you would pay for this product in addition to the regular price

\$4.00 \$3.00 \$2.50 \$2.00 \$1.50 \$ 1.00 \$0.50

How sure are you about your purchase decision?

100% 90% 80% 70% 60% 50% less than 50%

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the cholesterol-lowering spread in addition to the regular price of \$0.50

BREAD A

Typical price of regular bread is \$ 1.50

In a low fat diet, whole grain foods, multi grains, 100% whole wheat breads may reduce the risk of heart disease and certain cancers. Diets rich in whole grain foods and other plant foods low in total fat, saturated fat and cholesterol may help reduce the risk of heart disease and certain cancers

Would you be willing to pay extra for this health-enhancing bread? Yes No

If YES please mark the most you would pay for this product in addition to the regular price

\$1.50 \$1.25 \$1.00 \$0.75 \$0.50 \$ 0.25 \$0.10

How sure are you about your purchase decision?

100% 90% 80% 70% 60% 50% less than 50%

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the health-enhancing bread in addition to the regular price of \$1.50

Section VIII. Consumer Characteristics and Demographics (All information is confidential)

1. Do you live in rural or urban area?
 Rural Urban

2. Gender
 Female Male

3. Marital status
 Married Single

4. Which of the following categories describes your age?
 18-24 25-34 35-44
 45-54 55-59 60-64
 65-74 75 or older

5. Which of the following best describes your ethnic background?
 Caucasian (white) African American
 Asian American Indian
 Hispanic Other _____

6. Please choose one category that most closely describes your occupation
 Business Engineering Government
 Housewife Retired Unemployed
 Education Healthcare Student
 Self-employed
 Other _____

7. Do you consider yourself the primary household shopper? Yes No

8. Excluding yourself, how many members of your household are in the following age groups
 Infants 0-24 months _____
 Children 2-17 years _____
 Adults 18 or older _____

9. Please indicate your highest level of education attained
 Less than High School
 High School graduate
 Some College, no degree
 Associate Degree
 Bachelor Degree
 Graduate or Professional Degree

10. Which of the following best describes your annual household income?
 Less than \$10,000
 \$10,000 - \$14,999
 \$15,000 - \$24,999
 \$25,000 - \$34,999
 \$35,000 - \$49,999
 \$50,000 - \$74,999
 \$75,000 - \$99,999
 \$100,000 - \$149,999
 \$150,000 - \$199,999
 \$200,000 or more

APPENDIX B: SOME OF THE FUNCTIONAL FOODS ON THE SHELVES OF WALMART
GROCERY STORE – BATON ROUGE, LA

Functional Food	Health Claim as they appear on the Food labels	Price \$	Alternative Food	Price \$	Price Difference \$
Lite Tofu	Diets low in saturated fat and cholesterol that include 25 grams of soy protein a day may reduce the risk of heart disease. One serving of Lite Tofu provides 7g of soy protein	1.68			
Meatless meat balls	Contains 10g soy protein	2.94			
Perfectly protein vanilla chai tea (beverage)	Contains soy protein	1.50			
Green goodness fruit juice blend	Packed with 14 powerful nutrients delivering unmatched healthy green phytonutrients = 2 servings of fruits and vegetables	1.50			
Northland Cranberry juice (100% juice)	Enjoy the health benefits of cranberries – diets rich in fruits and vegetables may reduce the risk of some types of cancer and other chronic diseases. Products containing 27% canberry juice may help maintain a healthy urinary tract. The juice is an excellent source of antioxidant vitamin C	2.78	Ocean Spray cranberry juice	2.43	0.35
Bone health V8 100% vegetable juice	Meets American Heart Association standards. V8 provides as much calcium as milk for strong bones and teeth. An excellent source of antioxidant vitamins A and C for healthy eyes and skin. Calcium and vitamin C contribute to bone health	2.16	V8 vegetable juice	1.98	0.18
Spicy Hot V8	Red group provides powerful natural antioxidants; tomatoes naturally rich in lycopene which helps protect against cell damage; orange group delivers vitamin A to help maintain vision and a healthy immune	2.16			

	system; green group rounds out your diet with other nutrients and minerals and natural antioxidants				
Smart Balance Buttery Spread	Patented to help improve cholesterol ratio (48Oz)	4.38	Country Crock (48Oz)	1.94	2.44
Promise Fat free spread with heart health essentials	Promise helps maintain a healthy heart when substituted for butter or margarine as part of a diet low in saturated fat and cholesterol (15Oz)	1.54	Country Crock (15Oz)	1.07	0.47
Cholesterol-free I can't believe its not butter	(48Oz)	3.77	Country Crock (48Oz)	1.94	1.83
Take Control Spread	Proven to significantly lower cholesterol; made with natural soybean extract; contains 1.9g plant sterol esters; may reduce the risk of heart diseases (8Oz)	2.97			
Minute Maid heart healthy orange juice	2Qts	1.98	Minute Maid orange juice	1.98	0.00
Healthy heart yoghurt		1.58	Low fat yoghurt	1.50	0.08
Sara Lee 100% whole wheat and multi grain bread	In a low fat diet, whole grain foods like Sara Lee heart healthy varieties, multi grains, classic 100% whole wheat breads may reduce the risk of heart disease and certain cancers. Diets rich in whole grain foods and other plant foods low in total fat, saturated fat and cholesterol may help reduce the risk of heart disease and certain cancers	2.68	Sarah Lee honey white bread	2.68	0.00
Oro Wheat 12 grain bread	Will help you toward the goal of 6-11 servings of bread, cereal, rice and pasta recommended by USDA food pyramid	3.46	Oro wheat white bread	2.32	1.14
Oro Wheat whole wheat bread	Will help you toward the goal of 6-11 servings of bread, cereal, rice and pasta recommended by USDA food pyramid	3.08	Oro wheat white bread	2.32	0.76
Oro Wheat healthy nut bread	Will help you toward the goal of 6-11 servings of bread, cereal, rice and pasta recommended by	3.24	Oro wheat white bread	2.32	0.92

	USDA food pyramid				
Soy beans	Soy protein may reduce the risk of heart disease; contains soy isoflavones; high in protein; cholesterol-free	3.97			
European Baker's Ltd multi-grain sub rolls		1.98	European Baker's Ltd white sub rolls	1.50	0.48
Banana nut sugar-free crème cake		2.87	Banana nut crème cake	2.50	0.37
Sugar-free chocolate muffins		2.88	Chocolate muffins	2.50	0.38

APPENDIX C: COVER LETTER FOR THE FIRST MAIL-OUT



Department of Agricultural Economics and Agribusiness

101 Agricultural Administration Building

Louisiana State University

Baton Rouge, LA 70803-5604

(225) 578-3282

(225) 578-2716

Chronic diseases including diabetes, heart disease and cancer are very prevalent in our country. We as a society are turning more and more to **food** as a source of substances that can improve our health and decrease our risk of these chronic diseases.

The department of Agricultural Economics and Agribusiness at Louisiana State University is conducting a study on consumers' awareness and opinions about such foods and we are interested in getting your opinion.

The enclosed survey is intended to collect information about your knowledge of health-enhancing foods, also called functional foods, and your attitude towards these foods, as well as the factors that influence your decision to purchase certain foods and not others.

The survey will help us better understand what consumers know and think about foods that could improve their health, and how they can be aided in making healthier food choices and adopting healthier lifestyles.

All of your responses are strictly confidential and will not be used for any purposes other than this study. Please take a few minutes to fill out the questionnaire and return it in the postage-paid envelope. If you have any question please don't hesitate to call or e-mail.

Thank you.

Sincerely,

Dr. R. Wes Harrison
Associate Professor
(225) 578-2727
wharrison@agctr.lsu.edu

Cate Munene
Graduate Research Assistant
(225) 578-8579
cmunene@lsu.edu



APPENDIX D: FOLLOW-UP COVER LETTER

Department of Agricultural Economics and Agribusiness

101 Agricultural Administration Building

Louisiana State University

Baton Rouge, LA 70803-5604

(225) 578-3282

(225) 578-2716

About three weeks ago, a questionnaire seeking information about your knowledge of health-enhancing foods, also called functional foods, and your attitude towards these foods was sent to you. The survey will help us better understand what consumers know and think about foods that could improve their health.

As of today, we have not yet received your completed questionnaire. Although we sent questionnaires to people living in every state, it's only by hearing from nearly everyone in the sample that we can be sure our results are truly representative. You were selected as an important participant in this survey and your response is very important to the success of the study.

If you have already completed and returned the survey, please accept our sincere thanks. If not, we have enclosed another copy for your convenience. We urge you to please take a few minutes to fill out the questionnaire and return it in the postage-paid envelope.

Please be assured that all responses are strictly confidential. You may notice an identification number printed on the back of the questionnaire. The only purpose for this number is to check your name off our mailing list when the questionnaire is returned. The list of names is completely destroyed when we complete the survey so that individual names can never be connected to the results in any way. Protecting people's answers is very important to us as well as the University.

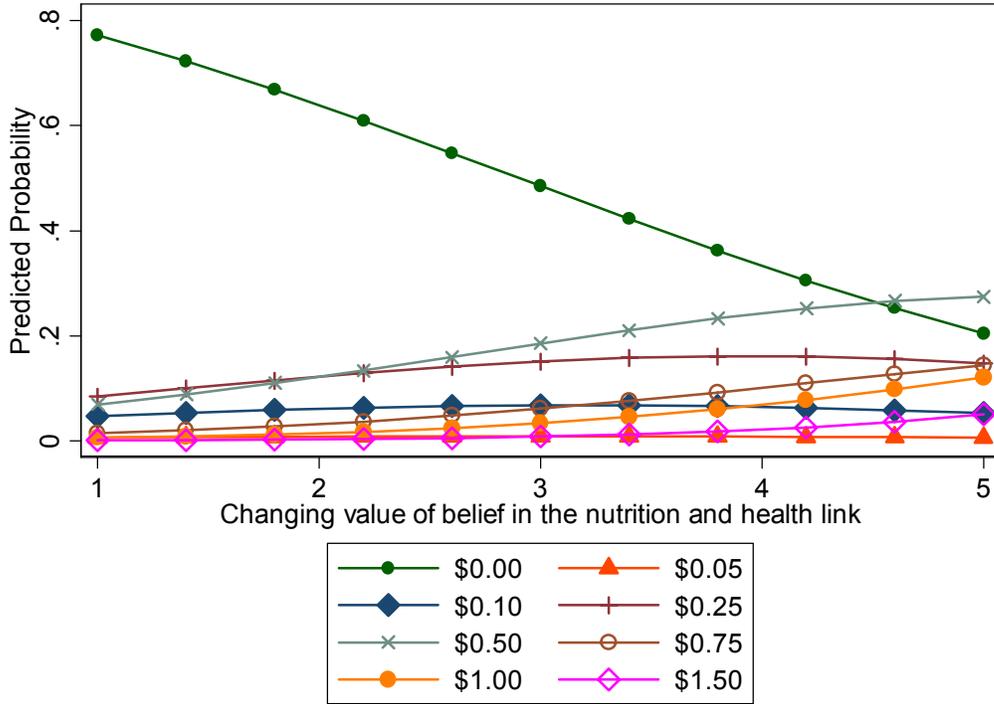
We hope you fill out and return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning a note or a blank questionnaire in the enclosed postage-paid envelope. If you have any question please don't hesitate to call or e-mail.

Sincerely,

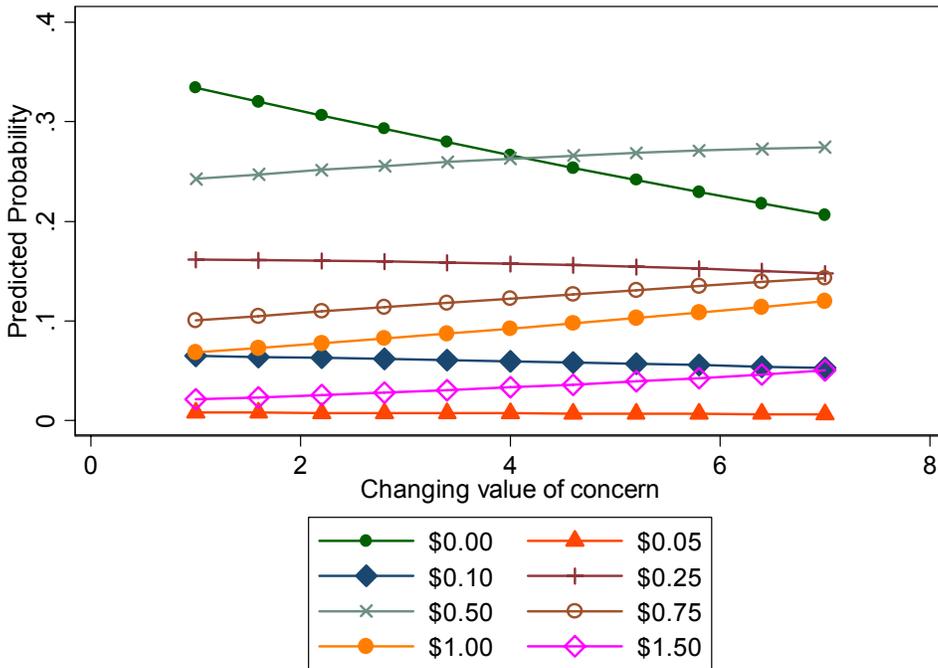
Dr. R. Wes Harrison
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(225) 578-2727
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Cate Munene
Graduate Research Assistant
(225) 578-8579
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APPENDIX E: COMPARISON OF EFFECT OF CHANGING VALUE OF BELIEF IN NUTRITION AND HEALTH AND EFFECT OF CHANGE IN CONCERN ON PROBABILITY OF WTP A PREMIUM FOR SPREAD A

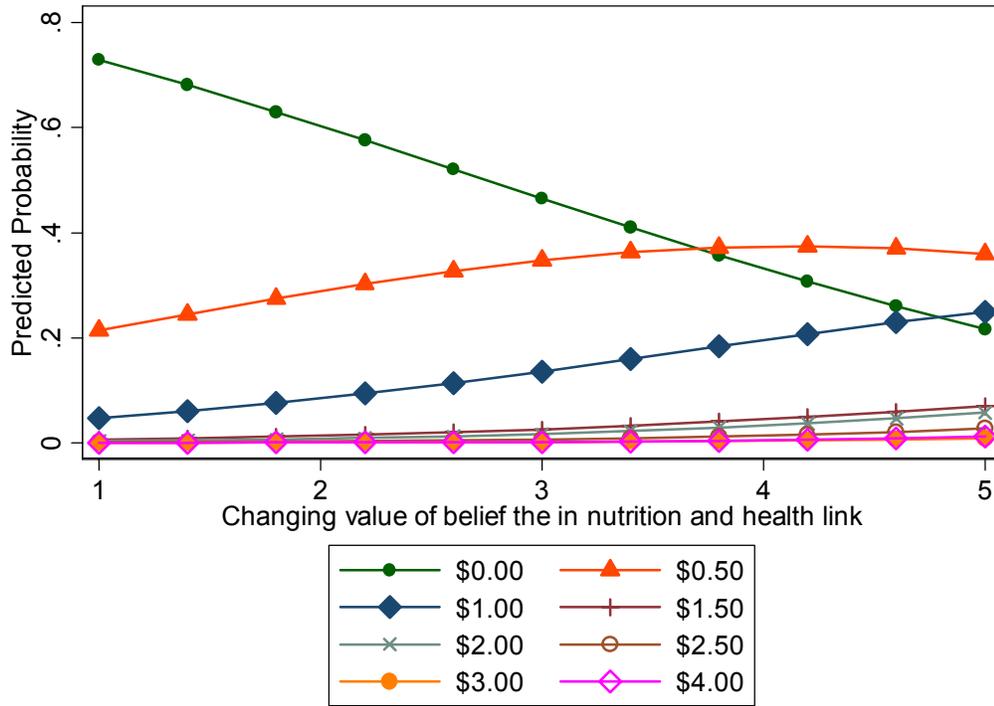


Probability curve showing the effect of belief in nutrition and health on WTP for spread A

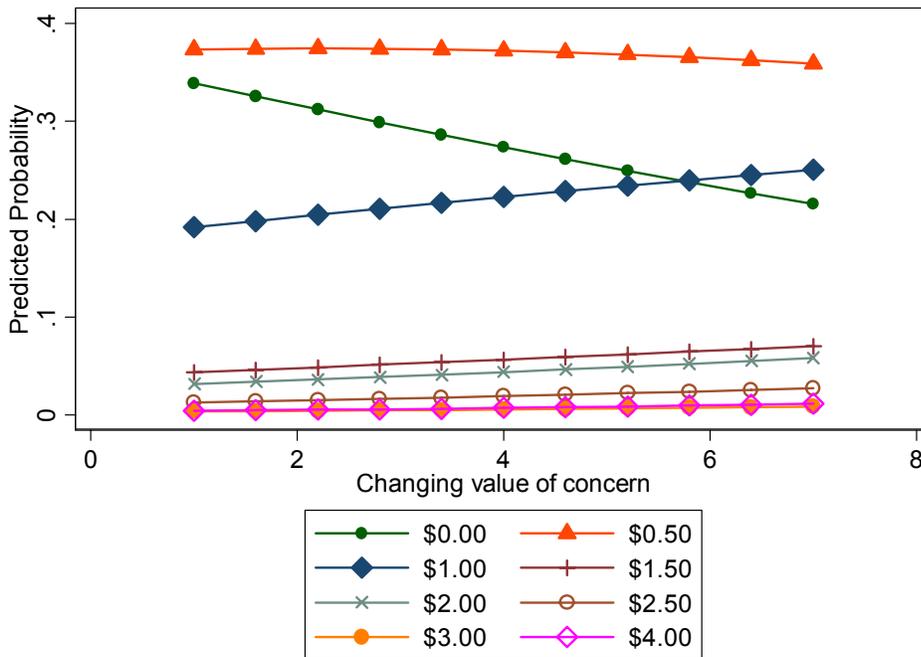


Probability curve showing the effect of concern about different chronic diseases on WTP for spread A

APPENDIX F: COMPARISON OF EFFECT OF CHANGING VALUE OF BELIEF IN NUTRITION AND HEALTH AND EFFECT OF CHANGE IN CONCERN ON THE PROBABILITY OF WTP A PREMIUM FOR SPREAD B

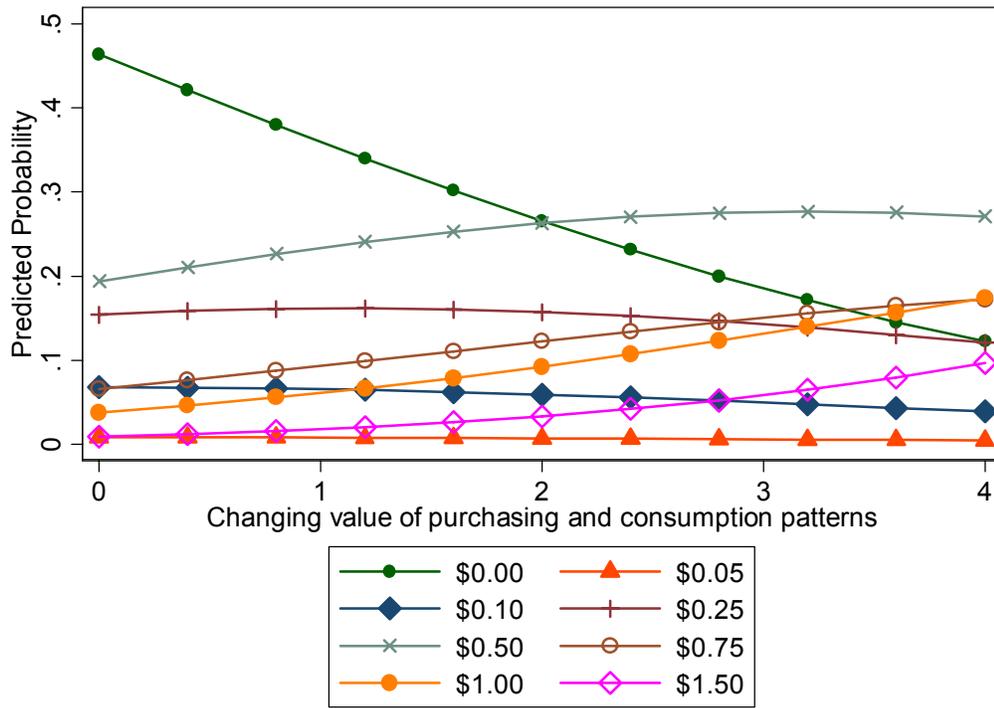


Probability curve showing the effect of belief in nutrition and health on WTP for spread B

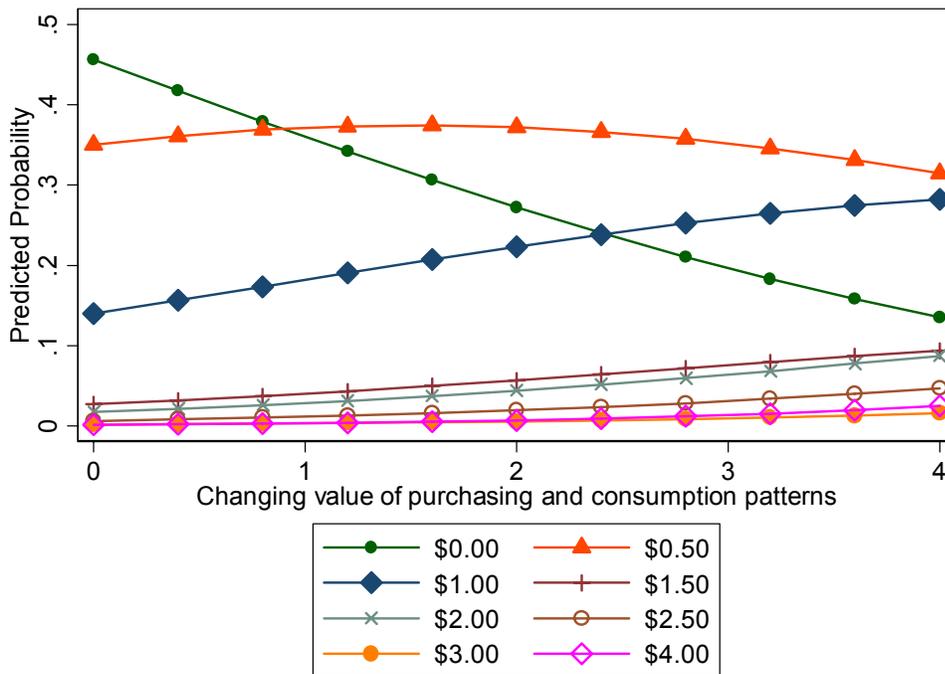


Probability curve showing the effect of concern about different chronic diseases on WTP for spread B

APPENDIX G: EFFECT OF CURRENT CONSUMPTION PATTERN ON THE PROBABILITY OF PAYING A PREMIUM FOR SPREAD A & SPREAD B

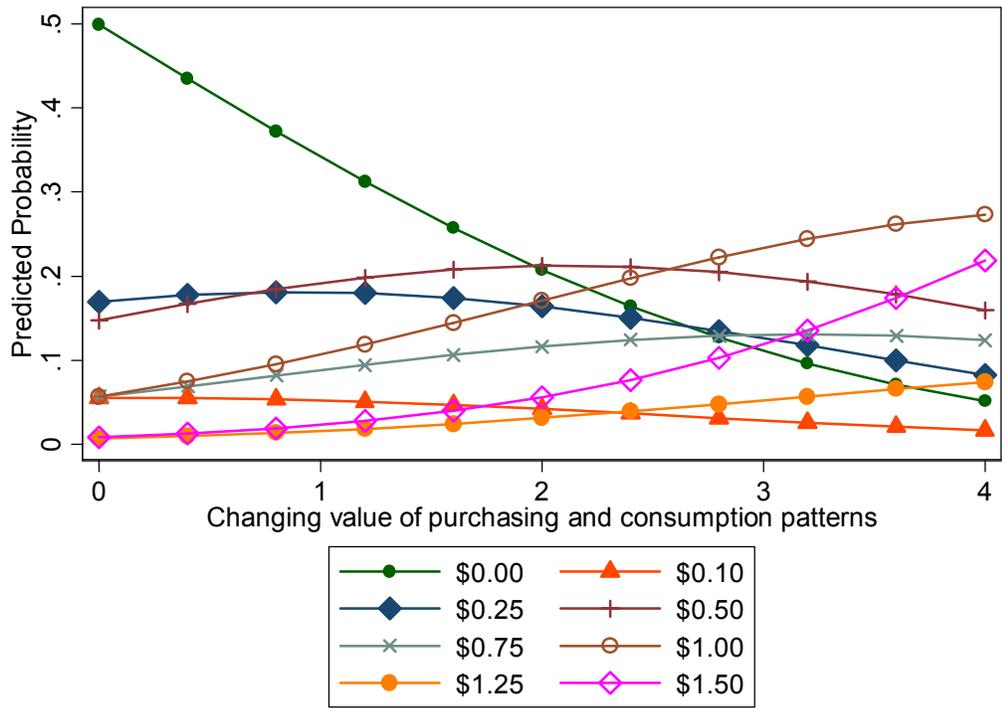


Probability curve showing the effect of current purchasing and consumption patterns on WTP for spread A



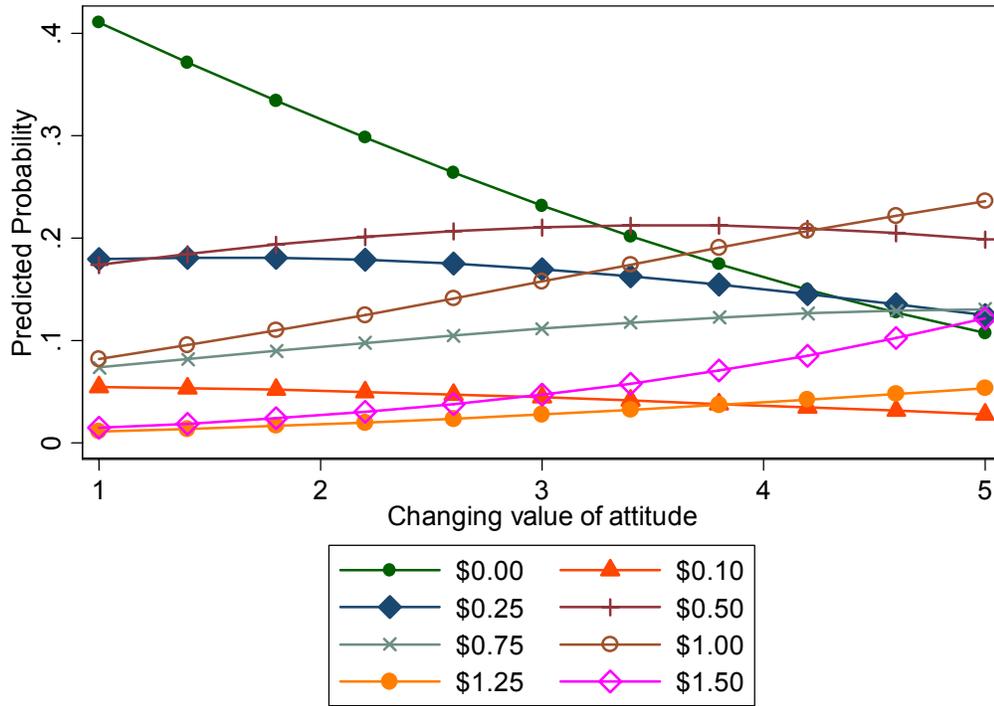
Probability curve showing the effect of current purchasing and consumption patterns on WTP for spread B

APPENDIX H: EFFECT OF CURRENT CONSUMPTION PATTERN ON THE PROBABILITY OF PAYING A PREMIUM FOR BREAD A

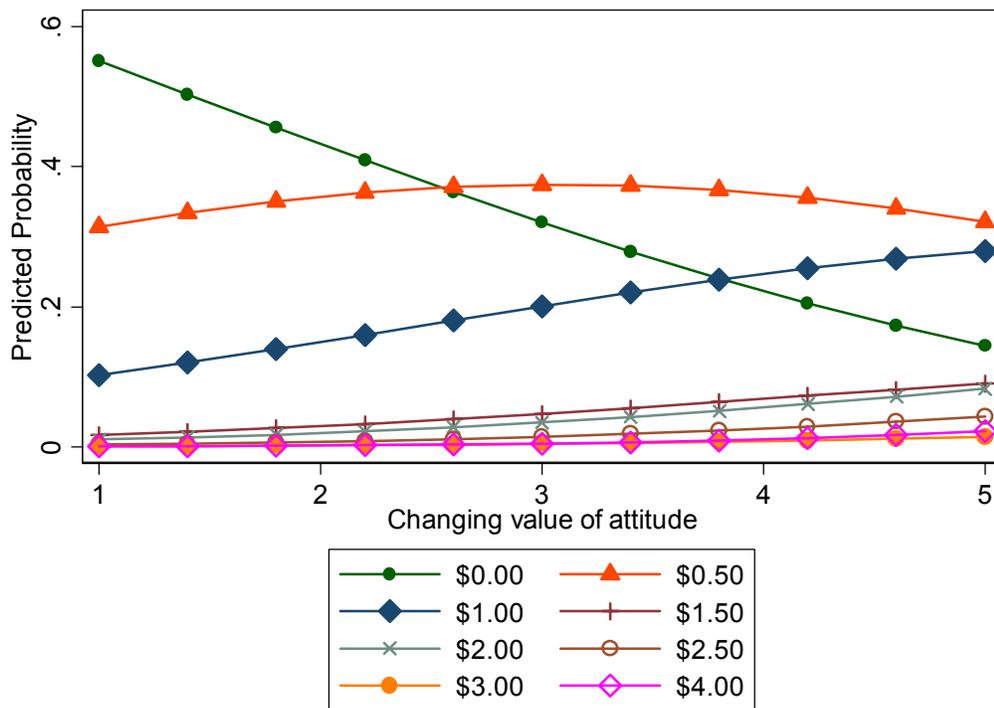


Probability curve showing the effect of current purchasing and consumption patterns on WTP for bread A

APPENDIX I: EFFECT OF ATTITUDE ON THE PROBABILITY OF PAYING A PREMIUM FOR BREAD A AND SPREAD B



Probability curve showing the effect of attitude on WTP for bread A



Probability curve showing the effect of attitude on WTP for spread B

APPENDIX J: SUMMARY STATISTICS OF ALL THE VARIABLES INCLUDED IN THE
SURVEY INSTRUMENT

Section Ia. Consumer Information and Knowledge of Nutrition and Health (**KNOWNH**)

Question	Correct (%)	Incorrect (%)	#of Observations	Mean	Std. Dev.
1. The two leading causes of death in the United States are cancer and cardiovascular disease. LEADCAUS	89.63	10.37	627	0.90	0.31
2. Two of the major risk factors of heart disease are high blood pressure and smoking. RISKFACT	90.45	9.55	628	0.90	0.29
3. My diet affects my risk of developing heart disease, but not my risk of developing cancer. DIETRISK	28.50	71.50	628	0.71	0.45
4. The food pyramid is a set of dietary guidelines that describes a healthy diet as one that is low in saturated fats, trans fats, cholesterol, salt, and high in dietary fiber, whole grains, vegetables and fruits. PYRAMID	89.21	10.79	621	0.89	0.31
5. The risk of developing a deadly chronic disease does not increase with overweight and obesity. RISKOBES	5.88	94.12	629	0.94	0.24

Section Ib. Consumer Information and Knowledge of Functional Foods (**KNOWFF**)

Question	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean	Std. Dev.
1. Some foods have specific health benefits that reduce your risk of developing chronic diseases. SPECBEN	68.99	27.06	3.01	0.47	0.47	632	4.64	0.61
2. Functional foods include whole, enriched, or enhanced foods that have ingredients incorporated into them to provide a specific health benefit. FFINCLUD	28.46	34.98	29.09	4.29	3.18	629	3.81	1.00
3. The only foods that can be categorized as a functional food are foods with a health claim on the nutritional label. FFCLAIM	3.82	14.47	35.5	23.85	22.42	629	3.47	1.10
4. Eating is a better way to obtain health-enhancing substances than taking dietary supplements like vitamins. EBWAY	39.37	41.11	6.98	9.21	3.33	630	4.04	1.06
5. Functional foods should not replace a healthy diet, but should be consumed as part of a varied diet. FFNREP	38.24	43.68	15.36	1.60	1.12	625	4.16	0.82

Section Ic. Consumers' Source of Nutrition Information (**NUTSOCE**)

Question	Always (%)	Most times (%)	Sometimes (%)	A few times (%)	Never (%)	#of Observations	Mean	Std. Dev.
1. How often do you read nutrition labels when you purchase food products? READLAB	14.58	39.30	33.12	8.08	4.91	631	2.51	1.00

Section Ic. Consumers' Source of Nutrition Information (**NUTSOCE**)

2. Please indicate the information sources that you use most often when making your food buying decisions (Please mark all that apply).

	Yes (%)	No (%)	#of Observations	Mean	Std. Dev.
Food advertisements	51.29	48.71	620	0.51	0.50
Healthcare professionals HCPROF	39.68	60.32	620	0.40	0.49
Internet/web WEB	10.32	89.68	620	0.10	0.30
Health food store HFSTO	14.68	85.32	620	0.15	0.35
Media MEDIA	30.16	69.84	620	0.30	0.46
Public seminars PUBSEM	2.90	97.10	620	0.03	0.17
Friends and family FRFAM	54.35	45.65	620	0.54	0.50
Government GOVT	6.77	93.23	620	0.07	0.25
Other OTHSOC	20.16	79.84	620	0.20	0.40

Section II. Beliefs about Nutrition and health (NUTRITIN)

Please indicate the extent to which you agree or disagree with the following statements

Question	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean	Std. Dev.
1. Some foods increase the risk of developing some diseases while other foods reduce this risk. FINCRIS	57.21	34.39	6.02	1.27	1.11	631	4.45	0.76
2. Foods that reduce the risks of disease should be eaten regularly throughout one's lifetime. REDREG	70.84	26.62	1.58	0.48	0.48	631	4.67	0.58
3. Diet and nutrition play a major role in my health. DIETROLE	74.44	21.43	1.59	1.27	1.27	630	4.67	0.70
4. Adopting better dietary habits is essential to reduce deaths from a variety of chronic diseases. BDHAB	69.41	25.2	3.96	1.11	0.32	631	4.62	0.65
5. I believe I have some control over my health. CONTHT	67.78	29.21	1.90	0.95	0.16	630	4.63	0.59

Section II. Beliefs about Nutrition and health (**NUTRITIN**)

Question	Always been on health diet (%)	Switched to a healthy diet more than 5 years ago (%)	Switched to a healthy in the last 5 years (%)	Not yet switched to a healthy diet (%)	Don't plan to	#of Observations	Mean	Std. Dev.
6. Have you switched to a more healthy diet? (Please mark the appropriate response). SWITCH	23.44	25.04	29.82	18.02	3.67	627	2.47	1.14

Section IIIa. Health and Exercise History (**HEALTH1**)

Question	Yes (%)	No (%)	#of Observations	Mean	Std. Dev.
1. Have you ever lost a family member or close associate to a chronic disease such as cancer, heart disease, or diabetes?	86.51	13.49	630	0.87	0.34
2. Do you have regular check-ups. CHECKUP	77.27	22.73	629	0.77	0.42
3. Has your doctor ever advised you to change your diet in response to a health concern? DOCADV	43.9	56.1	631	0.44	0.50
If YES, do you follow his or her recommendations when shopping for food? FOLREC	86.12	13.88	281	0.86	0.35

Section IIIa. Health and Exercise History (CONCERN)

4. On a scale of 1 to 7, 1 being very unconcerned and 7 being very concerned, please check your level of concern about the following health conditions:

Question	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6(%)	7(%)	#of Obs	Mean	Std. Dev.
Cancer	7.64	4.62	8.60	11.94	16.08	12.10	39.01	628	5.17	1.94
Heart disease	8.90	5.56	8.43	10.97	13.51	14.79	37.84	629	5.10	2.01
Diabetes	13.30	10.26	9.94	14.10	14.10	9.94	28.37	624	4.49	2.14
Cholesterol	11.82	7.35	10.54	12.3	15.02	11.18	31.79	626	4.72	2.10

EXERCISE

Exercise							
Question	Zero exercise (%)	<3 days per week (%)	3 to 5 days per week (%)	>5 days per week (%)	#of Observations	Mean	Std. Dev.
5. How many days during the week do you exercise outside your normal daily activities?	19.21	35.40	35.87	9.52	630	1.36	0.90
		Less than 30 minutes per day	30 to 60 minutes per day	More than 60 minutes per day	#of Observations	Mean	Std. Dev.
6. Please rate the level of your exercise (e.g., walking, jogging, biking, aerobics, gardening, etc.).		30.43	52.57	17.00	506	1.87	0.68

Section IV. Current consumption habits and purchasing patterns (PATTERN)

1. Please rank the following factors according to their importance in influencing your purchasing decisions (please mark a 1 for most important and 6 for least important).

	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	6 (%)	# of Observations	Mean	Std. Dev.
Nutritional content of the food NUTRI	37.59	24.82	17.20	10.46	6.21	3.72	564	2.34	1.42
Price of the food PRICE	21.55	17.67	22.26	16.25	10.60	11.66	566	3.12	1.63
Taste or flavor of the food TASTE 1	45.61	25.61	16.32	5.26	4.56	2.63	570	2.05	1.29
Safety SAFETY	22.48	10.97	15.83	19.24	15.29	16.19	556	3.42	1.76
Brand name BRAND	3.60	5.59	14.23	13.87	22.34	40.36	555	4.67	1.44
Convenience CONVEN	4.48	10.04	20.07	20.43	21.68	23.30	558	4.15	1.46

2. Please indicate whether you buy any of the following foods (Please mark all that apply)

	Yes (%)	No (%)	# of Observations	Mean	Std. Dev.
Orange juice OJUICE	81.12	18.88	625	0.81	0.39
Yogurt YOGURT	73.12	26.72	625	0.73	0.45
Black tea BTEA	34.24	65.76	625	0.34	0.47
Green tea GTEA	45.44	54.56	625	0.45	0.50
Margarine/ butter/ spread SPREAD	87.52	12.48	625	0.88	0.33
V8 juices VJUICE	32.64	67.36	625	0.33	0.47
Cranberry juices CJUICE	56.32	43.68	625	0.56	0.50
Great Value bread GVBREAD	19.52	80.48	625	0.20	0.40
Sara Lee bread SLBREAD	17.12	82.88	625	0.17	0.38
Oro wheat bread OWBREAD	19.20	80.80	625	0.19	0.39
Soy products SOYP	25.60	74.40	625	0.26	0.44

Section IV. Current consumption habits and purchasing patterns (**PATTERN**)

Please read each statement below and mark the box which best describes your shopping practices.

Question	Always (%)	Most times (%)	Sometimes (%)	A few times (%)	Never (%)	#of Observations	Mean	Std. Dev.
1. I try to eat healthy foods. EATHT	14.42	67.35	15.85	1.74	0.63	631	2.93	0.65
2. I eat five or more servings of fruits and vegetables a day. FIVEAD	8.08	27.89	31.38	22.19	10.46	631	2.01	1.12
3. I buy herbal, natural, or organic foods. NATORG	3.21	8.97	30.13	28.04	29.65	624	1.28	1.08
4. I buy dietary supplements. DIETSUP	17.38	15.47	21.53	14.99	30.62	627	1.74	1.47
5. I avoid high-salt foods. AVDSALT	19.59	34.71	28.66	9.39	7.64	628	2.49	1.14
6. I avoid high-cholesterol foods. AVDCHOL	14.01	42.04	28.18	9.71	6.05	628	2.48	1.04
7. I avoid high-sugar foods. AVDSUG	16.38	37.84	29.25	11.45	5.09	629	2.49	1.06

Section V. Beliefs about functional foods (BELIEFS)								
Question	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean	Std. Dev.
1. I trust foods that promise to improve my health. TRUSFOOD	12.44	44.34	21.05	15.95	6.22	627	3.41	1.09
2. Health-enhancing foods are affordable. HFCHEAP	5.74	29.35	20.73	30.94	13.24	627	2.83	1.16
3. Health-enhancing foods are meant only for sick people and the elderly. HFSICK	3.82	3.66	9.24	21.82	61.46	628	4.33	1.04
4. Healthy foods taste as good as conventional foods. HFTASGO	15.68	41.44	12.96	23.84	6.08	625	3.37	1.18
5. Some functional foods may have harmful effects. HARMFUL	5.6	20.96	59.04	8.96	5.44	625	2.88	0.85

Section VI. Consumer Attitude towards functional foods (ATTITUDE)								
	Strongly agree (%)	Somewhat agree (%)	Not Sure (%)	Somewhat disagree (%)	Strongly disagree (%)	#of Observations	Mean	Std. Dev.
1. Eating health-enhancing foods is beneficial for me. BENEFIC	41.49	42.29	13.99	1.91	0.32	629	4.23	0.78
2. All grocery stores should carry health-enhancing food products. ALLCARY	43.74	36.29	14.74	4.12	1.11	631	4.17	0.91
3. Foods enriched with health-enhancing ingredients are worth the extra costs. WRTCOST	14.9	37.08	29	14.9	4.12	631	3.44	1.04
4. We can obtain health-enhancing substances from existing foods. So there is no need to develop new products fortified with health-enhancing substances. NONEW	9.70	28.14	27.34	27.34	7.47	629	2.95	1.11
5. Functional foods are only a temporary fad, they are here today and will be gone tomorrow. TEMPFAD	3.83	16.45	35.3	26.36	18.05	626	3.38	1.07

Section VII. Willingness to pay for Functional foods - **SPREAD A**

Question	Yes (%)	No (%)	# of Observations					Mean	Std. Dev.	
Would you be willing to pay extra for a healthy heart spread?	71.59	28.41	623					0.72	0.45	
SPREADA										
Question	\$1.50 (%)	\$1.00 (%)	\$0.75 (%)	\$0.50 (%)	\$0.25 (%)	\$0.10 (%)	\$0.05 (%)	# of Observations	Mean	Std. Dev.
If YES please mark the most you would pay for this product in addition to the regular price FOLLOW-UP QUESTION?? Enter values as is (HMWTPSA)	8.11	14.86	15.99	33.33	19.37	7.43	0.90	444	0.61	0.38
Question	100% (%)	90% (%)	80% (%)	70% (%)	60% (%)	50% (%)	<50% (%)	# of Observations	Mean	Std. Dev.
How sure are you about your purchase decision? (HWSURSA) Enter values as is	26.08	26.08	32.43	5.44	2.72	5.22	2.04	441	84.35	14.42

Section VII. Willingness to pay for Functional foods - SPREAD A

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the heart healthy spread in addition to the regular price of \$1.07. **(TMSOTSA) Enter value as is**

\$ 0.00 (%)	6.25
\$ 0.03 (%)	3.13
\$ 0.07 (%)	3.13
\$ 0.08 (%)	3.13
\$ 0.11 (%)	3.13
\$ 0.20 (%)	3.13
\$ 0.22 (%)	3.13
\$ 0.23 (%)	3.13
\$ 0.25 (%)	6.25
\$ 0.28 (%)	6.25
\$ 0.30 (%)	6.25
\$ 0.35 (%)	3.13
\$ 0.40 (%)	3.13
\$ 0.42 (%)	3.13
\$ 0.43 (%)	9.38
\$ 0.50 (%)	3.13
\$ 0.60 (%)	3.13
\$ 0.68 (%)	3.13
\$ 0.73 (%)	3.13
\$ 0.75 (%)	6.25
\$ 0.83 (%)	3.13
\$ 0.88 (%)	3.13
\$ 0.93 (%)	3.13
\$ 1.00 (%)	3.13
\$ 1.50 (%)	3.13
# of observations	32
Mean	0.44
Std. Dev.	0.34

Section VII. Willingness to pay for Functional foods - **SPREAD B**

Question	Yes (%)	No (%)	#of Observations					Mean	Std. Dev.	
Would you be willing to pay extra for a cholesterol-lowering spread? SPREADB	71.45	28.55	620					0.71	0.45	
Question	\$4.00 (%)	\$3.00 (%)	\$2.50 (%)	\$2.00 (%)	\$1.50 (%)	\$1.00 (%)	\$0.50 (%)	# of Observations	Mean	Std. Dev.
If YES please mark the most you would pay for this product in addition to the regular price Enter values as is (HMWTPSB)	1.59	1.37	2.96	7.29	8.43	31.21	47.15	439	1.00	0.69
Question	100% (%)	90% (%)	80% (%)	70% (%)	60% (%)	50% (%)	<50% (%)	#of Observations	Mean	Std. Dev.
How sure are you about your purchase decision? (HWSURSB) Enter values as is	27.06	25.5	34.17	3.44	1.83	4.13	3.90	436	84.45	14.99

Section VII. Willingness to pay for Functional foods - SPREAD B

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the cholesterol-lowering spread in addition to the regular price of \$0.50. **(TMSOTSB) Enter value as is**

\$ 0.00 (%)	6.06
\$0.10 (%)	15.15
\$ 0.15 (%)	3.03
\$ 0.20 (%)	6.06
\$ 0.25 (%)	39.39
\$ 0.29 (%)	3.03
\$ 0.30 (%)	3.03
\$ 0.40 (%)	3.03
\$ 0.50 (%)	6.06
\$ 0.60 (%)	3.03
\$ 0.75 (%)	6.06
\$ 1.00 (%)	3.03
\$ 1.50 (%)	3.03
# of observations	33
Mean	0.33
Std. Dev.	0.30

Section VII. Willingness to pay for Functional foods - **BREAD A**

Question	Yes (%)	No (%)	#of Observations					Mean	Std. Dev.	
Would you be willing to pay extra for this health-enhancing bread? BREDA	77.69	22.31	623					0.78	0.42	
Question	\$1.50 (%)	\$1.25 (%)	\$1.00 (%)	\$0.75 (%)	\$0.50 (%)	\$0.25 (%)	\$0.10 (%)	#of Observations	Mean	Std. Dev.
If YES please mark the most you would pay for this product in addition to the regular price Enter values as is (HMWTPBA)	11.64	4.57	23.7	13.93	24.53	16.84	4.78	481	0.74	0.41
Question	100% (%)	90% (%)	80% (%)	70% (%)	60% (%)	50% (%)	<50% (%)	#of Observations	Mean	Std. Dev.
How sure are you about your purchase decision? (HWSURBA) Enter values as is	39.5	28.8	26.68	1.26	0.63	1.68	1.47	476	89.43	11.85

Section VII. Willingness to pay for Functional foods - **BREAD A**

If you are less than 80% sure please indicate in the space below the most you would be willing to pay for the health-enhancing bread in addition to the regular price of \$1.50. **(TMSOTBA) Enter value as is**

\$ 0.25 (%)	50.00
\$ 0.40 (%)	50.00
# of observations	2
Mean	0.33
Std. Dev.	0.11

Section VIII. Consumer Characteristics and Demographics (All information is confidential) -**DEMOGRAPHICS**

Question	Rural (%)	Urban (%)	# of Observations							Mean	Std. Dev.
1. Do you live in rural or urban area? METROP	37.34	62.66	616							1.63	0.48
Question	Female (%)	Male (%)	# of Observations							Mean	Std. Dev.
2. Gender GENDER	51.75	48.25	630							1.48	0.50
Question	Married (%)	Single (%)	#of Observations							Mean	Std. Dev.
3. Marital status MSTATUS	64.97	35.03	628							1.35	0.48
Question	18-24 (%)	25-34 (%)	35-44 (%)	45-54 (%)	55-59 (%)	60-64 (%)	65-74 (%)	>=75 (%)	# of Observations	Mean	Std. Dev.
4. Which of the following categories describes your age? AGE	3.34	10.33	16.53	20.35	10.81	11.45	13.99	13.20	629	4.81	2.04
Question	Caucasian (white) (%)	Asian (%)	Hispanic (%)	African American (%)	American Indian (%)	Other (%)	# of Observations		Mean		
5. Which of the following best describes your ethnic background? ETHNIC	87.08	2.39	4.15	3.51	0.32	2.55	627		1.35		

Section VIII. Consumer Characteristics and Demographics (All information is confidential) -**DEMOGRAPHICS**

6. Please choose one category that most closely describes your occupation **OCCUP**

Business (%)	17.20
Engineering (%)	6.21
Government (%)	3.34
Housewife (%)	7.64
Retired (%)	28.50
Unemployed (%)	1.75
Education (%)	6.05
Healthcare (%)	8.12
Student (%)	1.43
Self-employed (%)	9.39
Other (%)	10.35
# of observations	628
Mean	5.51
Std. Dev.	3.25

S Section VIII. Consumer Characteristics and Demographics (All information is confidential) -**DEMOGRAPHICS**

Question	Yes (%)	No (%)	# of Observations	Mean	Std. Dev.
7. Do you consider yourself the primary household shopper? PSHOP	72.28	27.72	624	0.72	0.45

Section VIII. Consumer Characteristics and Demographics (All information is confidential) - DEMOGRAPHICS

8. Excluding yourself, how many members of your household are in the following age groups? 0-24 moths **INFANTS**

0 (%)	94.61
1 (%)	4.38
2 (%)	1.01
# of observations	594
Mean	0.06
Std. Dev.	0.28

8. Excluding yourself, how many members of your household are in the following age groups? 2-17 years **CHILDREN**

0 (%)	71.14
1 (%)	11.88
2 (%)	11.71
3 (%)	3.40
4 (%)	1.36
5 (%)	0.34
12 (%)	0.17
# of observations	589
Mean	0.55
Std. Dev.	1.07

8. Excluding yourself, how many members of your household are in the following age groups? 18 or older **ADULTS**

0 (%)	25.75
1 (%)	51.15
2 (%)	15.10
3 (%)	5.86
4 (%)	1.42
5 (%)	0.53
28 (%)	0.18
# of observations	563
Mean	1.12
Std. Dev.	1.46

Section VIII. Consumer Characteristics and Demographics (All information is confidential) - **DEMOGRAPHICS**

Question	Less than High School (%)	High School graduate (%)	Some College, no degree (%)	Associate Degree (%)	Bachelor Degree (%)	Graduate or Professional Degree (%)	#of Observations	Mean	Std. Dev.
9. Please indicate your highest level of education attained EDUCAT	4.93	19.24	24.48	9.54	20.67	21.14	629	3.85	1.58
10. Which of the following best describes your annual household income? INCOME									
Less than \$10,000 (%)							5.44		
\$10,000 - \$14,999 (%)							4.08		
\$15,000 - \$24,999 (%)							9.52		
\$25,000 - \$34,999 (%)							11.39		
\$35,000 - \$49,999 (%)							18.20		
\$50,000 - \$74,999 (%)							21.26		
\$75,000 - \$99,999 (%)							13.10		
\$100,000 - \$149,999 (%)							11.22		
\$150,000 - \$199,999 (%)							2.72		
\$200,000 or more (%)							3.06		
# of observations							588		
Mean							5.43		
Std. Dev.							2.12		

VITA

The author was born in Kampala, Uganda, on December 13, 1972, and had the privilege of being raised by her grandmother, a very wise and tough old lady. The author attended St Thereza Gayaza Girls Primary School and attained the Primary Leaving Examination Certificate in 1987. In 1990 she obtained a first division Uganda Certificate of Education at Mt. St. Mary's College Namagunga, and in 1993 a Uganda Advanced Certificate of Education at Nabisunsa Girls' School. For the advanced level education, the author majored in physics, chemistry, biology and subsidiary mathematics. She joined Makerere University and obtained the degree of Bachelor of Science in food science in January 1998 and joined the Department of Food Science, Louisiana State University, in August 1998 to pursue a master's degree. She worked as a graduate assistant and obtained the degree of Master of Science in December 2000. She obtained the degree of Doctor of Philosophy in December 2004. The author had her first born son Michael Moriasi on November 15th, 2004. Thereafter she enrolled in a master's program in the department of Agricultural Economics and Agribusiness and she will be awarded the degree of Master of Science in May 2006.