Influence of Food Signals on Consumer Choice

by

Neesha Miriam Mathew

A Thesis
Presented to
The University of Guelph

In partial fulfillment of requirements
for the degree of
Master of Science
in
Marketing and Consumer Studies

Guelph, Ontario, Canada
© Neesha Miriam Mathew, January, 2014
Abstract

INFLUENCE OF FOOD SIGNALS ON CONSUMER CHOICE

Neesha Miriam Mathew

Advisor: Dr. Vinay Kanetkar

University of Guelph, 2014

This research attempts to examine the application of signaling theory to determine the influence of food attributes, specifically, search, experience and credence attributes on consumer choices. It also explores the extent to which consumers are willing to pay a premium for the given attributes. Lastly, consumer’s responses to a picture along with word description versus word description alone. Discrete Choice Experiment was used to assist in analyzing the influence of each attribute choice by analyzing search, experience and credence attributes and the level of price sensitivity. Findings indicate clear preferences to attributes; especially credence based attributes have the highest influence on consumer choice. From a policy maker and marketing standpoint, this finding is indicative of the fact that consumers do use information provided on food packages.
ACKNOWLEDGEMENTS

There are a number of people I would like to thank and acknowledge for their continued support and guidance throughout this Master’s Thesis process.

First and foremost, I would like to express my deepest appreciation to Dr. Vinay Kanetkar, whom I was extremely fortunate to have as my advisor. His wealth of knowledge, patience and stimulating suggestions made this a tremendous educational experience. Without his guidance and persistent help this thesis would not have been possible.

I would also like to thank the members of my committee, Dr. Joe Barth and Dr. Sergio Meza who have taken the necessary time to help me during this process. Their expertise, insightful comments and suggestions has significantly helped improvise this thesis. In addition, a thank you to Dr. Towhidul Islam for accepting to chair my defense and providing follow-up feedback. I must acknowledge Prof. Lianne Foti, Ms. Cori Wells, Ms. Rita Raso and Ms. Domenica Alderton for the encouragement and continuous support.

A special thanks to my extended family, friends and soul sisters for their love and support, especially those who assisted me with my data collection, editing and defense preparation.

Finally and most importantly, I owe my deepest gratitude to my parents and brother for their unending love, support and encouragement throughout this process.
# Table of Contents

CHAPTER 1: INTRODUCTION ................................................................................................................ 1
  1.1 RESEARCH OBJECTIVE: ................................................................................................................ 5
  1.2 RESEARCH DESIGN: ...................................................................................................................... 5
  1.3 RESEARCH QUESTION: .................................................................................................................. 6

CHAPTER 2: LITERATURE REVIEW .................................................................................................... 7
  2.1 THEORETICAL FRAMEWORK ...................................................................................................... 7
  2.2 FOOD PACKAGE LABELING: ...................................................................................................... 16
  2.3 PREVIOUS BEEF LITERATURE .................................................................................................... 17
    2.3.1 Search attributes .................................................................................................................. 18
    2.3.2 Experience Attributes ........................................................................................................ 19
    2.3.3 Credence Attribute .......................................................................................................... 19
  2.4 CONSUMER PREFERENCES ....................................................................................................... 23
  2.5 WILLINGNESS-TO-PAY: ............................................................................................................ 25
  2.6 SUMMARY OF RESEARCH GAPS AND THEORETICAL CONTRIBUTIONS: ......................... 28
  2.7 FRAMEWORK AND RESEARCH OBJECTIVES: ...................................................................... 29

CHAPTER 3: HYPOTHESES ................................................................................................................ 31
  3.1 RESEARCH HYPOTHESES .......................................................................................................... 31
  3.2 CONCEPTUAL MODEL ................................................................................................................ 33

CHAPTER 4: METHODOLOGY ............................................................................................................ 35
  4.1 TYPE OF STUDY .......................................................................................................................... 35
  4.2 RESEARCH DESIGN ....................................................................................................................... 35
    4.2.1 SAMPLE SELECTION AND SIZE ...................................................................................... 36
    4.2.2 SAMPLE SIZE CALCULATION FOR DISCRETE CHOICE EXPERIMENT ...................... 36
    4.2.3 DECISION ABOUT PRODUCT AND ATTRIBUTES .......................................................... 37
    4.2.4 PRE-TEST: ......................................................................................................................... 39
      4.3.2.1 Pre-Test Sample ......................................................................................................... 39
      4.3.2.2 Best-Worst Survey ................................................................................................... 40
  4.4 DISCRETE CHOICE EXPERIMENT DESIGN: .............................................................................. 42
  4.5 SURVEY DESIGN AND DEVELOPMENT .................................................................................. 43
  4.6 DATA COLLECTION ...................................................................................................................... 46
  4.7 DISCRETE CHOICE MODEL SPECIFICATION .......................................................................... 48
  4.8 OVERALL ESTIMATED MODEL FIT ......................................................................................... 53

CHAPTER 5: RESULTS ........................................................................................................................ 51
  5.1 SAMPLE CHARACTERISTICS AND GROCERY PURCHASE BEHAVIOR .................................... 51
  5.2 DISCRETE CHOICE FINDINGS .................................................................................................. 52
  5.4 DISCRETE CHOICE EXPERIMENT SURVEY: .......................................................................... 52
  5.5 HYPOTHESES TEST ..................................................................................................................... 53

CHAPTER 6: CONCLUSIONS ............................................................................................................... 76
  6.1: SUMMARY OF RESULTS .......................................................................................................... 76
  6.2 THEORETICAL CONTRIBUTIONS .............................................................................................. 76
  6.3 MANAGERIAL CONTRIBUTIONS ............................................................................................... 77
  6.4 LIMITATIONS ............................................................................................................................... 78
  6.5 ASSUMPTIONS ............................................................................................................................. 79
  6.6 FUTURE RESEARCH ..................................................................................................................... 79

REFERENCES ....................................................................................................................................... 81
APPENDICES ....................................................................................................................................... 87
**List of Tables:**

Table 1: Best-Worst Example ................................................................. 40
Table 2: Estimated model for Steak: predicting influence of attribute choice .......... 55
Table 3: Estimated model for Ground Beef: predicting influence of attribute choice .... 56
Table 4: Estimated model for Steak – Pictures + Words (P) ........................................ 58
Table 5: Estimated model for Steak – Words (W) ...................................................... 59
Table 6: Estimated model for Ground Beef – Pictures + Words (P) .............................. 60
Table 7: Estimated model for Ground Beef – Words (W) ............................................ 62
Table 8: Willingness-to-pay Steak .................................................................................. 68
Table 9: Willingness-to-pay Ground beef ...................................................................... 68
Table 10: Final Estimate Ground Beef Model – with standard error ......................... 74
Table 11: Final Estimate Steak Model – with standard error ......................................... 75
List of Figures:

Figure 1: Hypotheses about the impact of attributes and visual condition on consumer choice .......................................................................................................................................................... 34
Figure 2: Result of Best-Worst Survey .......................................................................................................................... 42
Figure 3: Addition of credence attributes: Grass-fed and Hormone-free ........................................ 64
Figure 4: Addition of experience attribute: Quality Taste and Guaranteed Tenderness... 65
Figure 5: Addition of search attribute: Color, Marbling (ground-beef) and Grade (steak) ........................................................................................................................................... 66
Figure 6: Price sensitivity graphs for Ground-beef................................................................. 70
Figure 7: Price sensitivity graphs for Steak ........................................................................................................ 70
Figure 8: Picture + Words vs. Words (Ground Beef) ............................................................... 72
Figure 9: Picture + Words vs. Words (Steak) ........................................................................ 73
List of Appendices

APPENDIX A: Attribute List ................................................................. 87
APPENDIX B: Generating BIBD ............................................................... 88
APPENDIX C: Best-Worst Survey Results ............................................... 89
APPENDIX D: Survey Option Example (Picture + Word condition) ........... 90
APPENDIX E: Survey Option Example (Word condition) ....................... 91
APPENDIX F: Survey (Picture+ Word condition) .................................... 92
APPENDIX G: Pre-check list ................................................................. 100
APPENDIX H: Consent Form ............................................................... 101
APPENDIX I: Survey Poster ................................................................. 104
APPENDIX J: De-Brief Form ................................................................. 105
APPENDIX K: Signature ....................................................................... 106
APPENDIX L: Willingness-to-pay (Preferred Condition – Steak) ............... 107
APPENDIX M: Willingness-to-pay (Preferred Condition – Ground Beef) ....... 108
Chapter 1: Introduction

The idea of signaling goes way back in time. Humans, animals, the environment, and other things have been giving out signals or identifying signals to incite some form of response. Understanding or perceiving individuals, places, and products may not be observed directly, instead we look for various cues or signals. Signals assist in inferring hidden information. Individuals thus tend to rely on signals to proceed with any decisions or actions. It is thus used across a spectrum of human decision-making and activity. For instance, a high-end car signals wealth, or a different speaking-accent signals country of origin or residence. Signals are inherent in competitive environments like the workplace, stock markets, food industry etc. Spence (1973) coined the term ‘market signal’, looking at the economic perspective of Signaling Theory. An example he used was in relation to job market signaling, where an employer relies on signals from a resume’, for instance, the level of education, to predict the candidates’ suitability for the job. Similarly, in a grocery store, consumers tend to look for signals to purchase products.

There are usually two parties involved with signaling, one conveying the information (signaler) and the other seeking the information (receiver). Signalers send out intentional signals that are positive in nature and beneficial to them. Receivers too benefit from the signals being conveyed. Individuals seeking information (the receivers) tend to look for signals that are honest and reliable to assist in making the right decisions.

In the area of food consumption, the cues or attributes on food packages seem to influence a consumer’s purchase and consumption decision. Food signaling in most recent times has played a major role in grocery stores. Particularly, fresh food like meat, dairy, seafood, etc. Consumers seem to be more aware and share their thoughts and
attitudes towards the where the food is grown, whether it is environmentally friendly, animal friendly or a healthier food option. Recognizing this trend, various companies have started including and advertising attributes that would benefit consumers and the company sales.

Over the past years there has been an increase in the supply and variety of food available to consumers both locally and globally. In fact, as the variety of choices becomes more extensive, consumers have been seeking for clearer information about the food they consume or purchase (CFIA, 2010). A number of these consumers review information provided on the packages when deciding to shop for themselves or their family members (Health Canada, 2008). They seek for information that is meaningful and credible about the food they purchase (CFIA, 2010), information that gives a form of reassurance to the consumers regarding the quality of the food being purchased.

Packaged food has evolved over the years, especially here in North America, with the introduction of various regulations by the Food and Drug Administration (FDA) in the United States and Canadian Food Inspection Agency (CFIA) in Canada. Companies and producers have been putting out signals through advertising or labels on food packaging.

Food packaging labels aid as an information unit to the buyers and also assist as a persuading agent for consumers to purchase them. Thus manufacturers add key content or visuals to attract consumers to purchase their product. Food package labeling has different standards and requirements across the globe (Foodpackaginglabels, 2013). Food labeling has three primary purposes: (i) provide basic information (ingredients, grade/quality, name- country of origin- address, etc.). (ii) Provides nutrition, health and
safety information (specific dietary use, nutrition facts table, handling and storage instructions). (iii) Acts as a channel for food marketing information (label claims, promotional information and label vignettes) (CFIA, 2011).

This research determines a consumer’s purchase behavior through various attribute signals by using the Signaling theory. Previous research has shown consumers base their purchase decisions on brand attributes such as price, certifications or origin (Grunert et al, 2006; Umberger & Mueller, 2010). Food markets today include various such signals on food packages. To name a few categories commonly seen on retail products: Brand Name, Price, Quantity, Ingredients List, Claims and Origin. Consumers today expect quality, convenience, nutritional information and diverse set of attributes to make their purchase decision easier. A common example in the meat purchase section is the use of grading. The certified Angus Beef is known to be the highest grade of beef in comparison to the Canadian AAA and AA grades (GFS, 2013).

Signaling Theory is a practical tool in understanding consumer needs, mapping consumer behavior and a key marketing approach. Previous research on signaling theory looked at consumers purchase decisions and determination of product quality through various attribute signals communicated by the seller (Kirmani & Rao, 2000; Connelly et al, 2011). In general, the signals portrayed to consumers tend to be positive attributes about the product being sold (Connelly et al, 2011) and the type of signals revolve around brand names, price (Kirmani & Rao, 2002) and nutrition content (Rao & Munroe, 1989). The aforementioned examples of signals can be further categorized as search, experience and credence attributes or signals. The question arises when products with no information are being sold. Does this effect their purchase decision? Particularly, can
product information disclosure help consumers understand products better in comparison to the lack of it?

One of the main deterrents in a consumers purchase decision towards certain food products is the uncertainty towards various signals conveyed by the seller. Thus it is important to maintain the credibility of the product or brand being sold by giving out honest signals (Connelly et al, 2011).

Lastly, this study also investigates the consumers’ willingness to pay for various attributes. Akerloff (1970) termed the ‘Lemon’ perception by illustrating the sale of good and bad cars (Lemons). It claimed when the average price of used cars fall, the perception of its quality changes as well. The potential for ‘lemons’ in a market does exist and this reflects in the consumers’ purchase behavior. However, signaling literature and studies have also proven products to not being categorized as ‘Lemons’. Most of these studies signaled various product attributes such as, advertisement and price (Nelson 1970; 1974), size (Rosenmann & Wilson, 1991) and labels (Miller et al, 2011). Previous signaling literature on the Washington cherry market (Rosenmann & Wilson, 1991) and wine (Miller et al, 2011) is in closer relation to packaged products; making it easier to apply the same concept to this research. Would signaling various qualities of food attributes justify the consumers purchase decision and their willingness to pay?

Finally, understanding the influence of these attributes can help the policy makers and marketers in the food industry understand their consumers purchase influences and make it easier to communicate the consumer requirements.
1.1 Research Objective:

The aim of this research is to understand the influence of food attribute signals on consumer choice. The study will also estimate the importance of various food attributes and further classify these attributes into search, experience and credence categories.

Along with identifying the attitude towards food attribute information, this research will be establishing the premium consumers are willing to pay for the inclusion of these attributes. An understanding of the signaling theory will be used in the construction of the research design and hypotheses.

To be specific, the aim is to see how including search, experience or credence attributes will influence consumer purchase behavior. This study is specifically interested in understanding consumer purchase behavior and the price premium they are willing to pay for product attributes on packaged products.

1.2 Research Design:

In this study the Discrete Choice Experiment (DCE) methodology is used to understand how consumers make retail purchase choices with a combination of search, experience, credence attributes and price. DCEs have been conducted frequently to obtain direct measures (Umberger & Mueller, 2010). This method is also preferred over other measures due to its ability to estimate values of numerous product attributes (intrinsic and extrinsic) and predict the actual market behavior of a consumer (Lusk 2000; Umberger & Mueller, 2010).

Specifically, this research assesses the relative importance of food attributes to consumers who purchase beef via DCE. Consumers choose from varying choice options of provided attributes and this includes testing their willingness to pay for each option.
1.3 Research Question:

1. Are consumers’ purchase decisions driven by the disclosure of signaled attributes on food packages?

2. Are consumers willing to pay a price premium for the inclusion of these signaled attributes on the packaged good?

3. How does Signaling work under different conditions (picture with words vs. words alone)?

For the purpose of this study, the assumption made is that the consumers purchase decision will be similar to their consumption decision. It is suspected that various attributes provided influence consumer purchase decision, specifically those attributes that convey quality information about products in comparison to no information disclosure. Further, products that include such cues can also influence a consumer’s willingness to pay. Thus, this study has been designed to answer the aforementioned research questions.
Chapter 2: Literature Review

The following literature review will look at the use of signaling theory, food package labeling, previous beef literature. This study extends the attributes from beef literature into search, experience and credence attributes. The literature also examines consumer preferences and their willing to pay.

2.1 Theoretical Framework

Signaling theory was initially developed in economics (Spence, 1973). The main idea behind Signaling theory is analyzing the types of signals being communicated and the responses received from it. It provides a very practical approach in understanding various processes in marketing and consumer behavior.

Signaling theory, initially used in economics, used a common human resource example, i.e., when a hiring manager is looking for prospective employees for his/her company, a group of highly-educated individuals will be distinguished under the high-quality prospective employee category compared to low-quality prospects and this is classified due to the signal of higher education (Spence, 1973). In this example, one group has undertaken an action to signal its stimulating quality to the other party. The concept of signaling theory is based on the idea of asymmetric information.

What is Information Asymmetry? Information today is easily accessible and when information is communicated in different forms it influences the decision-making process for many businesses, government organizations and households (Connelly et al, 2011). The information asymmetry occurs when one party holds more information than the other, which could have assisted with better decision-making (Stiglitz 2002, Connelly et al, 2011). In economics it is the unequal access to information by two parties (Kirmani &
Stiglitz (2000) has further categorized information asymmetry into two types. The first being information about quality, where information asymmetry is important when one party is not completely informed about the characteristics of the other party and second, information about intent, where information asymmetry is also required when one party is interested in the other party’s behavioral intent (Connelly et al, 2011). Akerlof (1970) discusses information asymmetry through the example of the sale of cars. A car owner has a clear awareness of the quality of the machine over the length of time. When trying to resell the car, it gives a probability that the car being sold is a lemon (bad car). It is generally difficult for buyers to differentiate a good car from a bad car; however, a used car will not have the same estimated value compared to a new car. Thus, the owner cannot receive the original value of the car and neither can the owner receive the estimated value of a new car. This has created an information asymmetry as the sellers have more knowledge about the car being sold in comparison to the buyers (Akerlof, 1970). However, information asymmetry is not always advantageous when trying to sell a particular product or brand. Taking the potential of lemons in a market situation and the response via consumer purchase decisions, Rosenman & Wilson (1991), looked at counteracting institutions where buyers should be able to recognize the quality differences in sellers and make purchase decisions based on it. They analyzed the Washington cherry market and suggested that product or the signalers attributes signal quality to the buyers and thus the buyers are willing to pay a premium to sellers or signalers with quality signals (Rosenman & Wilson, 1991).

This theory’s fundamental focus is to reduce the information asymmetry between the two groups, namely, buyers and sellers (Spence, 2002’ Connelly et al, 2011). Spence
(1973) applied the labor market to demonstrate the signaling function of education (Connelly et al, 2011).

As illustrated in the labor market example earlier, Spence’s (1973) research led to a vast amount of work in different fields using signaling theory as a framework, including marketing (Connelly et al, 2011). An example in marketing would be when we look at a product-based market; signaling theory can be explained as a framework to understand the stand of consumers and sellers when they have access to different forms of information (Gamoh et al, 2006 & Connelly et al, 2011). The seller decides on the type of information that is required to be communicated (or signaled) to the buyer and the buyer interprets the signal communicated to them (Connelly et al, 2011). Signaling theory tends to focus on positive information to convey attributes of the product to catch the attention of the buyers (Connelly et al, 2011). The information provided revolves around the price, advertising appeals and brand names (Kirmani & Rao, 2000), which are all seen as extrinsic cues; this also includes nutrition content (Rao & Munroe, 1989). In quality signaling, information asymmetry takes place when the seller has more information about the product in comparison to the buyer. The buyer makes purchasing decisions based on the information provided by the seller on the product (Kirmani & Rao, 2000; Connelly et al, 2011). With information asymmetry the quality of the product cannot be observed until after purchase and consumption of the product (Nelson, 1970).

Other than price signaling, package design signaling can also be used to understand the consumers purchase behavior. For instance, previous research has found that marketing of the product (Alkerlof, 1970) and package design (Alpert et al, 1993) tends to influence a consumers opinion on the quality of the product. Consumers also use
different cues to assume the quality of a product; these include extrinsic or intrinsic cues (Rao & Munroe, 1989; Liu, 2010). The extrinsic cues are obtained directly from the physical aspects of the product, for example, the brand name, price and store name whereas intrinsic cue would be the derived directly from the product, for instance, nutrient content (Rao & Monroe, 1989).

As set out by Connelly et al (2011), signaling theory transpires through a timeline or progresses through various stages. This involves the signaler or sender choosing the signal or how the message would be communicated to the receiver and how the signal is finally interpreted by the receiver (Connelly et al, 2011). Akerlof (1970) explained this with an example of new cars and used cards. The market includes good cars and bad cars, where bad cars are termed as ‘Lemons’. Buyers in this market look at a variety of information to purchase a car, where the car (whether new or used) may be a good car or a ‘lemon’ (Akerlof 1970).

Signaling theory’s primary elements can be reviewed through a timeline. The primary elements include the Signaler, Signal, Receiver and Feedback. The Signaler which consists of the insiders, that is, the executive team or managers in an organization collecting information (Connelly et al, 2011) from organizations (Ross, 1977; Connelly et al, 2011), products (Kirmani & Rao, 2000; Connelly et al, 2011) or individuals (Spence, 1973; Connelly et al, 2011). This information is usually private and unavailable to outsiders; this information could also be classified under the initial stages of research and development for the organizations (Connelly et al, 2011). “Simply stated, this private information provides insiders with a privileged perspective regarding the underlying quality of some aspect of the individual, product, or organization” (Connelly et al, 2011,
In management literature a signaler represents an organization, product or person (Connelly et al, 2011). Previous management literature by Davila, Foster & Gupta (2003) have used the term credibility, which describes the signaler as honest and signals match up with the signaler quality (Connelly et al, 2011).

The second stage in the timeline is the **Signal**, during this stage the Signaler or insider collects positive and negative information and makes decisions as to what they would like to communicate to the receiver. Most signals communicated are positive attributes or qualities of the insider (Connelly et al, 2011).

Connelly et al (2011) stated two main characteristics of effective signals, Signal Observability and Signal Cost. The former is when outsiders notice the signal communicated if the message to be communicated is not promptly observed. The latter signal (Signal Cost) has a more central characteristic and signalers have higher chances of absorbing the associated costs.

Management scholars have identified a variety of signals of quality. They stated that signals could be ‘weak’ or ‘strong’ (Gulati & Higgins, 2003; Connelly et al, 2011). If the signal does not match what the signaler intended, it could lead to a discrepancy between the signal and signaler, owing to poor signaling (Connelly et al, 2011). Connelly et al (2011) also raises issues of signal fit, i.e., “statistical description of the relationship between public information (the signal) and private information (the signaler’s unobservable quality)” (P53). Another issue is signal consistency, i.e., use of various signals to communicate a message from one single source, which helps reduce information asymmetry (Janney & Folta, 2003, 2006; Park & Mezias, 2005; Balboa &
Marti, 2007; Gao et al., 2008; Connelly et al, 2011). Conflicting signals can also confuse the receivers (Chung & Kalnins, 2001, Connelly et al, 2011).

The third element of the timeline is the Receiver. “According to signaling models, receivers are outsiders who lack information about the organization in question but would like to receive this information” (Connelly et al, 2011 P 45). Thus the signalers should have a strategy on the signal they wish to communicate and in response benefit from an action taken by the receiver. Similarly, the receivers (considered the outsiders) should also gain something in return through the information communicated by the signals (Connelly et al, 2011). “Customers would gain from purchasing goods and services that are associated with signals of high quality,” (Connelly et al, 2011, P 45).

In management literature receivers are categorized as groups of individuals (investors) or individuals (consumers) (Connelly et al, 2011).

Management research has also found how a signaling process will not work if the receiver is unsure of what to look for or not looking for the particular signal being communicated. Connelly et al (2011), has defined this as “receiver attention, that is, the extent to which receivers vigilantly scan the environment for signals.” (P. 54)

Another term discussed by Connelly et al (2011) and discussed by previous literature is receiver interpretation, which is the process of perceiving the signals being communicated, which varies between individuals (Perkins & Hendry, 2005; Srivastava, 2001).

Once the receivers perceive the signals, the process of feedback is also important. Connelly et al (2011) explain how information asymmetry is a two way process: “Receivers desire information about signalers, but signalers also desire information about
receivers so that they may know which signals are most reliable, to which signals receivers are paying the most attention, and how receivers are interpreting signals.” (P. 55). Consequently, making the process more effective and improvise for any future signals to be communicated.

Apart from the communication between the signaler and receiver, the signaling environment also plays an important role. It could either help reduce information asymmetry or create environmental distortion (Carter, 2006; Connelly et al, 2011). An example used by Connelly et al (2011), “Branzei et al. (2004) describe how external referents, such as other receivers, can also change the relationships between signalers and receivers. For example, rankings signal educational quality for universities, but prospective students calibrate rankings based on the opinions of peers (i.e., other receivers).”

Management literature has seen that honest signalers create signal reliability compared to deceptive signalers (Connelly et al, 2011). In the market today, consumers are similarly exposed to various signals, for the purpose of this study the focus will be on food packaging labels.

Front of package (FOP) labeling is available in a few pre-packaged food. It is used as a medium for consumers to make informed food choices. The Canadian market system that includes non-profit health groups, manufacturers and food retailers has developed around eight proprietary FOP systems (Emrich et al, 2012). The article further brings into perspective about how FOP being developed to provide healthier choices, which are simple and easier to interpret. FOP also encourages a standardized format (Emrich et al, 2012).
Feunekes et al (2008) experimented with a variety of front-of-pack nutrition labeling formats by looking at how effective they were for consumers to make healthier purchase decisions. The design included a within subject factorial design and a between subject with countries: 6 (Labeling format: Healthier Choice Tick, Health Protection Factor, Smileys, Starts, Multiple Traffic Light, Wheel of Health) x 3 (Product Category: Dairy drink, Ice cream, Spreads) x 2 (Healthiness of product: Healthier product, Less healthy product). The results proved accurate, that the labels helped consumers make healthier purchase decisions. Labels are available in different formats, detailed or simple. Detailed label information (Guideline Daily Amounts – ‘GDA’) assist consumers to make informed purchase decisions and simple format (Smart Spot) assists in providing an understanding of healthiness towards the product. It also makes the purchasing decision easier and faster (Scott & Worsley, 1994; Feunekes et al, 2008). Detailed formats like the Guideline Daily Amounts (GDA) provides information on calories and nutrients consumers of different ages can consume based on portion sizes (FDF, 2012). Simple formats like Smartpot are certified symbols available on the front of product packages (Pepsico, 2012). Products with these labels are also known as ‘Better-for-you’ or ‘Smart-Choice’ products.

Signals can be associated with various attributes. We could further categorize the attributes on package products to Search, Experience or Credence. The signaler presents select attributes from each of the aforementioned categories and consumer/receivers interpret these signaled attributes ultimately influencing their purchase decision. Nelson (1970) looked at two qualities of consumer purchase goods, that is, search and experience attributes. Search attributes are those which are determined prior to purchase of the good.
(Nelson 1970), a few of the common search attributes are, price, color, fat content (leaness and marbling), style etc. An example used by Nelson (1970): consumers that purchase a dress based on the style and price. Search attributes also have low pre-costs with regards to determining the quality of the product being shopped for, as it is done through scanning the products (Darby and Karni, 1973). Experience attributes on the other hand can be determined only after purchase or usage of the product (Nelson 1970), a few common experience attributes being services, taste, etc. An example mentioned by Nelson (1970): a consumer would continue to purchase a particular brand of canned tuna after several purchases. Experience attributes have an initial high pre-cost, however, followed by lower post-costs as the quality of the product is determined only after purchase of the product. Based on the experience, the decision on repeated purchases would be made (Darby & Karni, 1973).

Apart from the above mentioned two-way attribute category, Darby & Karni (1973) includes a third category, called the credence attribute. The credence attribute is one which consumers may find difficult to evaluate even after the purchase or consumption of the product purchased. A few common examples of a credence attribute are nutrition symbols, country of origin symbols, grass fed vs. grain fed, etc. Darby & Karni (1973), explain the credence attribute through two examples: repair of malfunctioning parts of a durable good (electronics, automobile, etc) and that of a human being. They state that the services offered to consumers will be difficult to measure, as the purchaser/consumer will have no different experience whether or not the organ was diseased which will also apply to automobile or electronic repairs. This again is mostly because a consumer does not know the procedures or details regarding the processes.
Credence attributes have high pre and post-costs as the quality of the product purchased is depends on the sellers credentials (Darby & Karni, 1973).

2.2 Food Package Labeling:

Food labeling is any form of written or graphic information written on a food package. The nutrition label has become a necessity in any packaged food in most countries. Every country has different requirements and regulations with regards to the information included in the label. Food labels can have various uses or functions. For example, for companies, a food label can be seen as a marketing tool or to prove it is Food and Drug Administration (FDA) approved and follows regulations. For consumers, it is a communication tool, where it passes on information about the food product with regards to the ingredients, nutrients, allergy warnings and beneficial health or nutrient claims. It also helps consumers make healthy and informed choices with regards to their daily food intake.

According to Colby, “Nutrition/Food marketing can be defined as any marketing (including marketing on television, radio, or food labels) of food or beverages using health or nutrition information beyond minimum requirements” (Colby et al, 2010, P 92).

In 1990, the US Nutrition Labeling and Education Act (NLEA) was passed and applied in 1994. By the implementation of this act, nutrition labeling was mandatory on most packaged food in the US (Health Canada, 2002, Canadian Grocer, 1993). One of the reasons for the legislations of the NLEA was due to the increase in diseases related to obesity (Drichoutis et al, 2007). The influence and exposure of the US labeling system with the nutrition fact table, nutrient claims and health claims reached many Canadians.
This led to the requirement for the extended use of voluntary nutrition labeling by Canadians on an increased number of products (Health Canada, 2002).

Food Package Labeling has been introduced in various countries and has become mandatory in many. The Nutrition labeling information found in most pre-packaged food includes legislated information such as the Nutrition Facts Table, ingredient list and optional nutrient claims (Health Canada, 2010).

In Canada, the labeling of food products is regulated by Health Canada; this is done through the Food and Drugs Act. It was introduced and passed on January 1, 2003 and then later became mandatory on December 12, 2005. The act included the compulsory inclusion of nutritional labels on most food labels; bring up to date the requirements for nutrient content claims and authorization for diet related health claims (Health Canada, 2008). The Canadian Food Inspection Agency enforces Canada’s food package and labeling laws. It ensures accuracy in the information provided and ensures the information provided is truthful and not misleading (CFIA, 2013). The purpose of this research is to help provide an understanding of the impact food package labels have on Canadian consumer’s food choices and purchase decisions.

2.3 Previous Beef Literature

Signaling theory as seen above has looked into the intentional use and understanding of signals between buyers and sellers. This also helps understand consumer wants and purchase behavior. The theory has been used in understanding a labor market hiring process, used car purchases and front-of-package labeling. As the theory suggests signals (extrinsic or intrinsic cues) are usually positive in nature and assists in determining the quality of the product. To sum up, it is evident that products
communicating various cues or attributes would have a higher purchase behavior compared to ones without any information, especially if it is advantageous to the consumer.

Minimal number of studies has been conducted on beef research looking into the consumers’ willingness to pay for extrinsic attributes like brand or package of beef (Froehlich 2009). A product like beef has so many different attributes. Since the product choice in this study is beef as well, the following literature review looks at previous studies conducted on food packaging and beef. Majority of the literature so far either includes a lot of information or focuses on one particular attribute based on auction literature and the consumers’ willingness to pay for each attribute.

This study further expands previous literature by categorizing the attributes into Search, Experience and Credence attributes.

### 2.3.1 Search attributes

Umberger et al (2009) state that when purchasing goods, consumers tend to use two categories of visual cues to identify the quality of the product. This holds for retail beef purchasing too. One being intrinsic cues, which are those characteristics that cannot be changed without altering the physical properties of the product itself, this includes, color, fat content (leanness or marbling) and meat cut. The other category is extrinsic cues, which are characteristics that can be altered without changing the physical properties of the product, this category includes, price, nutrition panels and brands (P 604). The grade standards for Canada (A, AA, AAA and Prime) include the maturity, muscling, red color and fat (marbling level) (Justice Laws, 2013).
In relation to Signaling theory, these pre-purchase search attributes such as fat content (marbling) and price are cues that assists the consumer in making the purchase decision and gives a perception of the product quality prior to purchase.

2.3.2 Experience Attributes

With International trade, consumers are provided with a variety of products to choose or consume, however, with regards to cattle feeding and management practices, these vary across different countries. Thus, this leads to beef having various taste attributes from different countries (Umberger et al, 2002). Even factors such as aging, length, feeding process contributes to the taste or flavor of the beef (Umberger et al, 2002). These factors can be categorized as intrinsic attributes or cues. Marbling length, also an intrinsic attribute is associated with the flavor of the beef (Umberger et al, 2002).

This is similar to the Receiver stage in the signaling timeline, where the consumer purchases the product based on the quality perceived from the search attribute and then consumes or experiences the product. Once this product quality is perceived or experience, the feedback from the receiver is also important. Thus, if the consumer has had a positive experience, then there would repeat purchases towards the product. This will also be an incentive to the signalers or sellers as the products signal good quality.

2.3.3 Credence Attribute

A credence and intrinsic attribute useful to consumers (Ward et al, 2008) is beef products being grass fed versus being grain fed. Grass fed beef is known to have various health benefits receptive to health-conscious consumer (McCluskey et al, 2005). Grass
fed beef various more natural vitamin E (Arnold et al, 1992, Xue et al, 2010) and more omega 3 fatty acids (Duckkett et al, 1993; McCluskey et al, 2005; Xue at al, 2010).

The characteristics of a grass fed cattle compared to other conventional beef or grain fed cattle differs in terms of quality characteristics such as marbling, flavor, color, juiciness and texture (Duckkett et al, 1993; Xue et al, 2010). After World War II, with the surplus of grain, many producers, more specifically the U.S beef industry fed cattle with grain based diets until they reached “finishing” a procedure which confirms the cattle has reached the market weight of 1000 pounds (McCluskey et al, 2005).

Various researches have been done to obtain the consumer preference between grass fed and grain fed beef. Umberger et al (2002), results indicated there were demographic differences between corn or grain-fed versus grass-fed beef. Consumers were able to differentiate between the U.S corn fed beef and Argentinian grass fed beef. They were willing to pay a premium for their choice or preference of beef. A majority of the U.S consumers preferred conventional over imported grass fed beef (Xue et al, 2010).

Umberger et al (2009) also identified those consumers who were provided the health benefits of grass-fed beef and believed it was safer than conventional beef were willing to pay a higher premium for the grass fed beef. Similar results were identified by Xue et al (2010) where consumers were willing to pay $2 more for grass-fed compared to conventional beef. Grass fed beef thus has a higher potential of being seen as a healthier option compared to conventional or grain fed beef (McCluskey et al, 2005).

Another credence attribute (intrinsic) previously studied in beef literature is hormones or genetically modified food, which is a common practice for many food types today. Majority of the slaughtered cattle in the U.S. are excluded from the European
market due to administered growth-promoting hormones. Research shows that for intrinsic attributes like growth-promoting hormones and genetically modified food, EU consumers were willing to pay more for hormone free or non-genetically modified beef than American consumers. Thus, consumers are willing to pay more to avoid such attributes (Tonsor et al, 2005).

Beef literature has also looked at the combination of intrinsic and extrinsic attributes together. Previous research has combined grass-fed beef with country-of-origin labeling (COOL) (McCluskey et al, 2005). Country-of-origin labeling (COOL) is an important factor in the beef industry and is used to differentiate domestic versus imported beef (Umberger et al, 2002), this is also considered a credence attribute. COOL also assists in distinguishing the taste of beef (Umberger et al, 2002). Even if beef is certified by all the required USDA specifications, the countries through which the beef is imported may have various management practices thus producing a unique flavor to the beef. If consumers are not made aware of the origin was the product (beef), the product may result in an unfavorable experience thus it is important that consumers are informed of COOL (Umberger et al, 2002).

Studies have shown consumers place a higher value for COOL when purchasing beef and are willing to pay more for COOL, as it is used as a sign of food safety and quality (Umberger & Lourier, 2007; Umberger et al, 2010).

COOL has been a part of various studies done previously. Some of the focus areas included, consumer preferences and WTP for domestic versus imported beef products, traceability (Loueiro & Umberger, 2007, Ward et al, 2008) and food safety (Lusk et al, 2006). Apart from consumers in the U.S preferring their own products (Tonsor et al,
2005; Loureiro & Umberger, 2007), consumers across the globe such as Koreans (Chung et al, 2009) and Japanese (Peterson & Burbidge, 2012) preferred domestic beef products and were willing to pay more for COOL compared to imported beef (Peterson & Burbidge, 2012).

Based on the above information, consumers have a tendency to view COOL as a guide for food safety, quality and intrinsic attributes such as flavor (Umberger et al, 2002; Loreiro & Umberger, 2007, Peterson & Burbidge, 2012). Peterson & Burbidge (2012) also state how COOL “transforms a credence attribute into an observable search attribute, much like price and brand. COOL allows consumers to form images associated with products from various countries analogous to brand images” (P. 58).

Apart from the communication of signals and perception of it, the signaling theory also includes the importance of reliability. Signaling reliability is similar to a credence attribute, consumers are exposed to various signaling cues on a daily basis and having credentials to a product may an important influential factor to purchase behavior. This also assists the consumer in determining the product quality.

Brands can be one of the most influential factors for consumer purchase decisions and evaluation of a products quality. Brands are beneficial to producers and important to consumers for various reasons. It creates value, accountability, and identity for manufacturers and earns trust of consumers (Keller, 2003; Froehlich, 2009). Brands signal quality to consumers and help make their purchase decisions less risky (Keller, 2003). Brehdahl (2004) notes that in-store food purchasing decisions regarding quality could be difficult to determine and thus food product branding is particularly important, as consumers tend to rely on extrinsic cue/attributes like price, branding and package. For
beef products this may be precise as its quality is difficult to ascertain in store until after experiencing it (Froehlich 2009).

Branding is an extrinsic descriptive attribute or cue and can only be considered valuable if the signaler is able to get the consumer of the product to pay for the association or benefits of the brand name or company. Mennecke et al (2007) study looked at factors influencing consumer preferences, attitudes and price sensitivity to beef products found that consumers used extrinsic cues like branding to assess the health quality of the product. It was also found that there was a relationship between the brand as an attribute/cue and the familiarity of the product. The brand name was used as a primary attribute if the consumers were less familiar with the product, however, consumers that were familiar with the product used intrinsic cues/attributes (Mennecke et al, 2007).

It has also been noted based on previous research done in the U.S. that consumers were willing to pay more for specific quality attributes in exchange of a generic product (Froehlich, 2009). The study conducted by Froehlich (2009) shows that beef products represented by brands with specific cues or attributes have a higher consumer demand over generic products.

2.4 Consumer Preferences

Consumers preferences evolve in the industry for specialty products, they have become increasingly aware of their food choice and the health benefits or risks from it (McCluskey et al, 2010).

Consumers tend to use various cues (intrinsic or extrinsic) to base their decision on the quality of the product (Umberger et al, 2009; Umberger & Mueller, 2010), these
cues also include the search, experience and credence attributes. Extrinsic cues include, nutrition panel, certifications, origin, health, safety – these are also known as credence attributes (Umberger & Mueller, 2010). Consumers have been using these attributes to make purchase decisions (Grunert, 2006; Umberger & Mueller, 2010) and many of these decisions are usually connected to health and nutrition (Grunert, 2006).

For most consumers food and diet are important aspects of their lifestyles. Over the years consumers have become increasingly conscious about their health and well being, thus looking at health benefits in their food choices. Previous research indicates that having nutritional product attributes (extrinsic cues or credence attributes) have also been a driver for the consumers’ willingness to pay for the product (Umberger et al, 2009; Xue et al, 2010). Umberger et al (2009) also found that “labeling information regarding grass-fed beef’s nutritional content is vital for maintaining and growing premium niche markets for grass-fed beef in the US” (P 603). Consumers with more knowledge about nutrition have a higher capacity of processing the nutrition information and its attributes (Xue et al, 2010). Such credence attributes also affect the perception of experience and search attributes. For instance, the price consumers are willing to pay for the above attributes and perception of flavor based on grass or grain fed beef products (Umberger et al, 2002).

Nutrition labeling plays a vital role in most consumers purchase decisions towards a food product. In 1990, the NLEA increased the amount of nutrition information on food products, by including a nutrition facts panel. It also included serving sizes, health claims, nutrient claims and front of package descriptors (e.g. “Healthier Choice”). Since these claims and descriptors are regulated, they are seen as credible. Therefore, allowing
consumers to grasp more information from brands or products (Balasubramanian & Cole, 2002).

The use of label information is affected by several factors such as situational, behavioral and attitudinal factors, product involvement factors, knowledge, motivation, dietary changes, individual characteristics and other factors such as use of claims or descriptors (Drichoutis et al, 2006).

Thus in the beef industry, extrinsic/credence attributes (nutrient and health claims, branding, front-of-package descriptors, meat standards) (Umberger & Mueller, 2010), search (price, marbling level) and experience (flavor) are relatively important to influence beef consumer purchase behavior.

2.5 Willingness-to-pay:

Price has always been a strong influence on consumer purchase decisions. It is often associated with the quality of a product (Caswell & Mojduszka, 1996). Based on the theoretical framework created by Drichoutis et al (2006), one of product involvement factors that affect consumer purchase behavior is price. In beef literature various studies have showed consumers preferences and their willingness-to-pay for specific extrinsic and intrinsic attributes. These have been useful to the beef industry and policy makers (Loureiro and Umberger, 2007; Tonsor et al., 2005; Umberger & Mueller, 2010). Similarly, search, experience and credence attributes have shown consumers willingness to pay (Umberger et al, 2002; Umberger & Loureiro, 2007; Umberger & Mueller, 2010).

Consumers willing to pay price premiums for intrinsic cues like marbling and fat-trim (search attribute) are reasonably high (Umberger & Mueller, 2010),

Similarly for experience attributes such as taste (Umberger et al, 2002). The study
conducted by Umberger et al (2002) included participants (144 each from Chicago and San Francisco) that met four criteria’s, (primary grocery shopper or shared shopping duties, between the ages of 19 to 59, purchase beef on a regular basis and willing to consume beef). In addition, they represented gender, age, economic and ethnic background. There were twenty-four taste panels which included 12 participants for each. The method used was the Vickery bid auction and the participants had to bid an amount they felt the beef product was worth to them. They were provided with bid sheets to write their bid price for each beef steak ($/Lb.). Steaks were cooked with an internal temperature of 70 degree Celsius and same doneness. If their bid was successful, they had to purchase the product based on the auction market price (Umberger et al, 2002). The consumers were provided with credence and search attributes to determine their willingness to pay (search attribute) for an experience attribute. The products were U.S corn-fed beef vs. Argentine grass-fed beef steaks and high versus low marbled steaks (Umberger et al, 2002). The results regarding consumer taste preference, “141 consumers, (62%) were willing to pay an average of $1.61 more per pound for the domestic sample, 51 consumers (23%) were willing to pay an average of $1.36 more per pound for the Argentine sample and 34 consumers (15%) were indifferent between the domestic and Argentine steak” (Umberger et al, 2002 P. 500).

Research on extrinsic cues related voluntary and mandatory labeling programs such as origin of beef and certifications (credence attributes) have also identified consumers WTP premiums for the product in purchase (Umberger et al, 2002; Umberger & Louriero, 2007; Umberger & Mueller, 2010).

The study conducted by Umberger & Louriero (2007) looked at search,
experience and credence attributes. A choice-modeling experiment was conducted to obtain preferences and willingness to pay for selected attributes. Prior to the choice experiment, a pre-test was conducted in different supermarkets via interviews, followed by mail surveys to obtain information about consumer purchase attitudes and behavior towards beef products, beef qualities, food safety, socio-demographic and choice modeling experiment. (P. 503). They were also provided the choice between two ribeye steaks with various attributes, information about each attribute was provided as well. The results showed the top attribute choice as, food safety (credence attribute), price (search attribute) and tenderness (experience attribute). Umberger & Louriero added two more attributes to the list, country-of-origin labeling and traceable to farm of origin (both credence attributes). The credence attributes included credentials guaranteeing the origin or USDA inspected. The choice set included options of labeled versus non-labeled beef products with around 12 choice sets. “The empirical specifications of the utility levels underlying the multinomial conditional logit make references at the attributes of each choice and were formulated as follows:

\[ U_{ij} = b_1 \text{Price}_{ij} + b_2 \text{COOL}_{ij} + b_3 \text{Traceable}_{ij} + b_4 \text{Food Safety}_{ij} + b_5 \text{Tenderness}_{ij} + e_{ij} \]  

“Results indicate that although the country-of-origin label carries a positive premium ($2.568 per pound of steak) this is not the largest premium among the considered attributes. This premium implies that, on average, $2.568 per pound is the premium that makes consumers indifferent between the two levels of utility, associated with no COOL of the steak, and the payment of $2.568 per pound and the presence of a label denoting the country-of-origin. The label that certifies that the steak has been
inspected by USDA food safety inspectors (Food Safety) carries the highest premium of $8.068 per pound of steak. The large magnitude of this premium may denote that food safety certification is a mandatory requirement for consumers in order to select a beef product.” (Umberger & Louriero, 2007, pg 507). “The other remaining attributes indicating that the product is traceable to the farm where the animal was produced on (Traceable) and that it is guaranteed tender (Tenderness) carry lower premiums of about $1.899 per pound, and $0.953 per pound, respectively.”(Umberger & Louriero, P.507)

Thus price is influential factor for consumer purchase behavior with regards to how much more they are willing to pay for products with specific attributes beneficial to them. Thus reinforcing that consumers purchasing in-store retail beef have a higher tendency to pay premium for products that include labels with attributes, which could be search, credence or experience related in comparison to non-labeled beef products.

2.6 Summary of Research Gaps and Theoretical Contributions:

1. Previous studies in Signaling theory have looked into the quality and uncertainty in the labor and automobile market (Akerlof, 1970). It mostly focused on single signaling attributes. Research has also been conducted on products focusing on intrinsic or extrinsic attributes (Kirmani & Rao, 2002), however, there has been limited research on the search, experience and credence attributes, specifically those related to food attributes within this theory. Thus, this is an extension to Signaling Theory to specific and multiple levels of attributes.

2. Similarly, with beef literature, previous studies have looked at consumers purchase decisions based on various intrinsic attributes such as marbling
level, fat content, grass-fed versus grain-fed beef (Ward et al, 2008; Loreiro & Umberger, 2007; Umberger et al, 2009; Peterson & Burbidge, 2012) and the health benefits of grass-fed beef in comparison to grain-fed beef (McCluskey et al, 2005). Research on extrinsic attributes included country of origin (McCluskey et al, 2005; Tonsor et al, 2005; Loureiro & Umberger, 2007; Xue et al, 2010) and branding/packaging (Froehlich 2009). Previous research also suggests that when shopping in store consumers rely on extrinsic attributes to determine the quality of the product (Bredahl 2004). The studies also focused on either one specific attribute or a combination of two. This research is extending attribute type and the willingness to pay for each.

3. Majority of the research on Nutrition Labeling conducted in the past focused on consumers and the consumption behavior of individuals from the US and EU regions (Balasubramanian & Cole, 2002; Drichoutis et al, 2006) limited amount of research have been conducted specific to individuals within Canada. Thus trending the consumption patterns of Canadian consumers will always be beneficial to the market and companies within the region.

2.7 Framework and Research Objectives:

This section explains the research objectives and research framework that addressed the gaps identified in the literature. This research has two main objectives. The first is to test the use of signaling theory to identify the attributes on food packages consumers are will be more likely to purchase in comparison to no attribute disclosure.
The second objective is to investigate how much consumers are willing to pay for the stated attributes. Previous literature suggests that consumers are willing to pay premiums for added attributes and would consider making their food purchase decisions based on the attributed signals (Rosenman & Wilson, 1991; Umberger et al, 2002; Umberger & Loureiro, 2007).
Chapter 3: Hypotheses

3.1 Research Hypotheses

The following is an outline of the hypotheses explored in the study. The primary purpose of this research is to understand how the signaling of various attributes influence consumers purchase decision. The study further explores consumers’ price sensitivity towards the purchase of the signaled attributes. Additionally, will the inclusion of visual aids be influential in consumer choice. The following hypotheses were developed to address the research objectives:

Consumers have been using various cues to make purchase decisions (Grunert, 2006; Umberger et al, 2010) and many of these decisions are usually connected to health and nutrition (Grunert, 2006). For most consumers food and diet are important aspects of their lifestyles. Over the years consumers have become increasingly conscious about their health and well-being, thus looking at health benefits in their food choices. Previous research indicates that having nutritional product attributes (extrinsic cues) have also been a driver for the consumers’ willingness to pay for the product (Umberger et al, 2009; Xue et al, 2010).

The signaling theory also states that consumers use different cues to assume the quality of a product; these include extrinsic or intrinsic cues (Rao & Munroe, 1989; Liu, 2010). The extrinsic cues are obtain directly from the physical aspects of the product, for example, price and fat content (search), country-of-origin (credence) or intrinsic cue would be the quality of the product (Rao & Monroe, 1989), example, taste (experience) or grain vs. grass fed (credence). The buyer makes purchasing decisions based on the information provided by the seller on the product (Kirmani & Rao, 2000; Connelly et al,
For the purpose of the study the base condition will be the original variety.

\( H_{1a} \): Search attributes will have lower influence on choice than experience attributes

\( H_{1b} \): Credence attributes will have a higher influence on choice than experience attributes

In beef literature various studies have showed consumers preferences and their willingness-to-pay for specific search, experience and credence attributes. (Loureiro and Umberger, 2007; Tonsor et al., 2005; Umberger & Mueller, 2010). Research on credence such as origin of beef and certifications have also identified consumers WTP highest premiums for the product in purchase in comparison to search and experience attributes (Umberger & Louriero, 2007; Chung et al, 2009; 2011). Based on previous research price is an influential factor for consumer purchase behavior with regards to how much more they are willing to pay for products with specific attributes which are beneficial to them. Thus, this research will be looking at the consumers price sensitivity towards the attributes provided. The following hypothesis has been developed to understand the consumer’s price sensitivity for products based on the level of attributes.

\( H_2 \): Inclusion of signaling attributes results in a lack of price sensitivity.

Previous studies have shown that consumers likelihood of choice have varied with the inclusion of visual aids (Umberger et al, 2009). In this research, the participants will be provided with picture + word condition and a word only condition. The following hypothesis has been developed to understand consumer preferences based on visual cue
versus no visual options. The expected preferences are that individuals with the visual cue will have a higher preference of choice in comparison to the word condition. Within the hypothesis, we are also expecting that individuals with the word only condition will be more price sensitive compared to individuals under the picture + word condition. This would be a between subject hypothesis testing:

\[ H_3: \text{Picture of the product and the word description will have a higher probability of choice compared to the word description condition alone} \]

### 3.2 Conceptual Model

The following diagram is the proposed model for this study. It illustrates the various categories of attributes, its effects and interactions on consumer choice. The attributes have a direct effect on consumer choice.

The left side of Figure 1 below illustrates the list of the three attribute categories. This includes Credence attributes, Experience attributes and Search attributes. These attributes along with price (which is under the search category) have a direct influence on consumer choice. The interactions between each attributes category is illustrated as well, with Credence > Experience > Search on consumer choice. The willingness-to-pay for each of these categories has the same interactions. For example, if price is $1.00, the inclusion of a search attribute would be $1.25. At the same price, inclusion of an experience attribute, $1.50 and inclusion of credence $2.00. In addition, we test consumers likelihood of choice between a picture and word condition versus a word alone condition.
Figure 1: Hypotheses about the impact of attributes and visual condition on consumer choice
Chapter 4: Methodology

This section discusses the type of study conducted, the sample size, plan and design, research design and development.

4.1 Type of study

The primary objective of this research is to determine the influence of various food attributes on consumer purchase behavior. The study is thus designed to stimulate a real choice scenario where consumers are given various product choice options with a combination of attributes. The impact of search, experience and credence attributes on food packages and price on consumer purchase behavior is studied using Discrete Choice Experiments (DCE). DCE is often used to predict actual consumer behavior and provides choice options. These choice sets can be designed to mimic actual purchase situations where consumers have no option but to choose from products with various attributes provided to them (Umberger et al, 2010; Noseworthy, Wang & Islam, 2012; Islam 2014). Not including the ‘no-option’ scenario compels the participant to choose the “best” out of the options provided and gives them the opportunity to evaluate the question (Abidoye et al, 2011). DCE is consistent with McFaddens concept of Random Utility Theory (McFadden 1974). The following section will study the design of the pre-test and the DCE in further detail.

4.2 Research Design

The process of developing a discrete choice experiment includes: 1. selecting the participant sample and sample size, 2. selecting the attributes and its levels, 3. designing the discrete choice experiment, 4. designing and developing the survey. In this study the
signaling attributes have been further divided into search, experience and credence. The final seven attributes were chosen after the pre-test survey.

4.2.1 Sample Selection and Size

The participant recruitment included primary grocery shoppers that purchase the product of choice. The participants were male, female or other, 18 years of age and older. It was important to ensure that the participants purchased and consumed beef within the last 6 months.

The Mall intercept was used to select the sample study. The location was Stone Road Mall at 435 Stone Road West in Guelph, Ontario, Canada. Posters were set at the table, the individuals willing to participate were initially briefed on the study. They had to fill out a pre-checklist (APPENDIX G) to ensure they qualify to participate in the study. As mentioned above, the most important criterion was that they have purchased and consumed beef within the last 6 months. Upon completion of the study, they were compensated with a $5 Stone Road mall gift card.

4.2.2 Sample size calculation for Discrete Choice Experiment

The minimum sample size for discrete choice experiment is estimated through the formula below (Cohen, 1988). It will be based on the number of choice sets and attributes.

\[ n \geq \frac{z^2pq}{r \alpha^2} \]

In the above formula,
‘n’ represents the minimum number of participants
‘z’ represents the confidence level under normal distribution, assumed to be 95$^{th}$ percentile or 1.96

‘p’ is the choice share of a brand (each of the product is selected), which is 0.5

‘q’, where q = 1-p, this is the number times the product is not selected

‘r’ represents the total number of choice situations, which, in the current study is assumed to be 12

‘α’, represents the allowable margin of error assumed to be 0.5

\[
 n \geq \frac{1.96^2 (0.5)(0.75)}{12 \times 0.25} 
\]

\[
 n \geq 48 
\]

Based on the above calculation and results of the sample size calculation, the minimum sample size required for each of the discrete choice experiments was 49 respondents.

### 4.2.3 Decision about Product and Attributes

**a. Selection of type of Beef:**

The choice of beef was ground beef and steaks. The selection was based on the decision of selecting raw meat rather than cooked meat available in grocery stores. Previous literature by Ward et al (2008) and Lusk et al (2008) have researched and compared results between ground beef and steak cuts. Abidoye et al (2011) conducted visual choice based survey on various steak cuts. The types of beef chosen were steak and ground beef.
b. **Search, Experience, Credence**

Previous research suggests that the inclusion of attributes on a food package have influences on a consumers willingness-to-pay (Tonsor et al, 2005; Loureiro & Umberger, 2007). With a greater awareness about health benefits and other risks, consumers preferences tend to evolve (McCluskey et al, 2010) and they tend to base their purchase decisions on various cues provided on the product (Umberger et al, 2009; Umberger & Mueller, 2010). As mentioned previously, this research is extending literature by categorizing various food attributes into search, experience and credence. There were a total of 18 attributes selected based on previous researches. Each attribute was further categorized under search; experience and credence (see **APPENDIX A**). The final list attributes were based on the pre-test results. The top two attributes were selected under each category.

c. **Price:**

There were 5 levels selected for the price attribute, the price levels differed between steak and ground beef products. The prices were based on actual retail store prices (No-Frills, Metro, Loblaws). The price range is similar to those available in local retail stores. Ground beef: $5.00, $5.50, $6.00, $6.50, $7.00 and Steak (premium): $6.50, $7.00, $7.50, $8.00, $8.50.

d. **Picture vs. Word Condition:**

The respondents for each survey were given both steak and ground beef choice options. However, they were either given a word based survey or a picture + word based survey. The information and choice options for both surveys were exactly the same. The only difference was one survey had pictures while the other did not. The purpose of this
condition was to observe if individuals with a picture based survey have different choice preferences compared to individuals with a word based survey.

**4.2.4 Pre-test:**

The first objective of the study is to determine a consumer’s attitude towards food attributes and to clarify questions on all surveys. A list of attributes was selected based on previous literature and was then further categorized into search, experience and credence attributes (See APPENDIX A). To ensure the choice distribution of all 18 attributes were uniform, the BIBD (Balanced Incomplete Block Design) experimental design was generated. The BIBD method is a useful method for screening numerous values and distributing them equally. BIBD has two alternatives, Incomplete, where the blocks consists of only a few of the treatments and Balanced, where it appears in a balanced form (Colburn, 1985). The main feature of this design is to understand what food attributes consumers look for when purchasing a product. Proc OPTEX is used to optimize the experimental design and generate the BIBD (see APPENDIX B).

**4.3.2.1 Pre-Test Sample**

The survey was administered on an online survey website ‘Survey Monkey’, which was sent to respondents via e-mail. An e-mail was sent to 23 individuals advising them about the survey and requesting them to complete the survey if they qualify for it. These individuals varied between the ages of 21 to 69 years of age. The sample chosen represented the average adult consumer in Ontario and was the primary household grocery purchaser. 11 respondents completed the survey, out of which 10 of the pre-test responses were valid.
4.3.2.2 Best-Worst Survey

A best-worst survey scaling was designed to decipher the consumer’s preferences towards the list of attributes when purchasing a food item. The pre-test initially included three questions to ensure the participants qualify for the survey:

1. Do you eat Beef?
2. Are you the person who makes decisions about purchasing grocery products, including meat?
3. Have you purchased beef within the last 3-6 months?

If the participants answered ‘No’ to any of the aforementioned questions, they would be directed to the end of the survey and thanked for their time. If yes, then they were able to proceed with the survey. The participants were shown a set of attribute options and were asked to indicate which according to them is the best (MOST important) and the worst (LEAST important) attribute when purchasing food, in this case beef. The following is an example of the question and choice option:

Which attribute is MOST/LEAST important to you?

<table>
<thead>
<tr>
<th></th>
<th>MOST</th>
<th>LEAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omega 3 level</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Local</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Price</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Grade (i.e. A, AA, AAA)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Appropriate size of cut</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

Table 1: Best-Worst Example
The respondents had around eighteen attributes to choose from. Five attributes or treatments were presented at a time in a block, with a total of 25 choice options. The advantage of this model is that the values are measured based on importance as compared to being rated. For applications of best-worst scaling (see, Louviere et. al. 2013; Marley & Islam 2012; Islam & Meade 2013).

**Best-Worst Survey Results:**

All participants completed the survey within 20 minutes. The results of the best-worst survey had credence attributes being the most important attribute category with ‘Hormone-free/GMO free at 19%. Search attributes had a higher choice importance compared to experience attributes, however, it is important to note there were only three experience attributes compared to seven search attributes. The most important attribute under experience was ‘Taste’ at 9% choice share and ‘Grade’ at 8% under the search category. Top two attributes from each of categories were chosen, the final list of the top attributes included: Hormone-Free, Grass Fed (credence), Quality Taste, Guaranteed Tender (experience) and Marbling, Grade, Color, Price (search), see (Figure 1). For complete results for the Best-Worst survey, refer to **APPENDIX C**.
4.4 Discrete Choice Experiment Design:

The second objective of this study is to determine the impact of the selected attributes: Hormone-free, Grass fed, Guaranteed Tender, Quality Taste, Marbling, Color, Grade and Price have on consumer purchase decisions. In this study, DCE will be designed to study how consumers make choices based on combination of the aforementioned attributes. The package choices represents the consumer purchasing decision for the given attribute combination sets.

The DCE choice sets were designed based on the final list of attribute levels using PROC PLAN procedure in SAS (Statistical Analysis System). With PROC PLAN the attributes would be adjusted in a way that they would either occur an equal number of time and independently. Two DCEs were designed to test the influence of food attributes.
on packaged products. One design created for steak and the other for ground beef. Each participant was given 12 different choice situations for each product. Every choice set included a set of two options with different attribute options. The participants were required to select either one option to move forward with the survey. In addition, the surveys were designed with either a picture condition or word only option condition. Both these conditions have the same choice options.

SAS generated the design output providing the number of choice sets and the attributes for each choice set. The SAS generated choice set for steak product included: 2 levels (Hormone-free, Grass-fed, Quality Taste, Guaranteed Tender, Color) x 3 levels (Grade) x 5 prices ($6.50, $7.00, $7.50, $8.00, $8.50). The design created for the ground-beef choice sets included: 2 levels (Hormone-free, Grass-fed, Quality Taste, Color) x 3 levels (Marbling) x 5 prices ($5.00, $5.50, $6.00, $6.50, $7.00). The levels varied between each choice set. The research design had the picture versus word survey as between subject design. An example of the picture condition and word condition see APPENDIX D.

4.5 Survey Design and Development

The survey was a computer based. The DCE survey was designed in Microsoft PowerPoint. Interactive computer based surveys are more beneficial than computer based surveys. The Visual Basic programming language was included within MS PowerPoint. All questions were designed and coded using the Visual Basic programming script. The information automatically saved in the computer with the help of the program macros and additionally, it had the ability to record a respondent’s time as well. Please refer to APPENDIX F for the surveys. The electronic DCE followed the following order:
Introduction and Initial Screening

The participants willing to participate in the survey were initially provided a pre-participation checklist (see APPENDIX G). This was to ensure they qualify for the survey. The most important qualification questions were their age and whether they have purchased beef within the past six months. Once qualified for the survey, the participants had to sign a consent form (see APPENDIX H). After obtaining their consent to conduct the survey, the participants were randomly seated in front of either one laptop (one with the picture + word survey and the other was word only) and assigned a code to ensure their survey is recorded. Upon entering the code the following slide addressed instructions for the study. Specifically, the instructions directed participants to carefully review the information and respond to the best of their ability as they would be unable to return to the previous slide for corrections.

Consumption and Purchase Behavior

After reading the instructions it was important to note how often the participants consume beef a purchased beef and where they purchase their beef from. The former question’s options included: More than once a week, Every week, Bi-weekly, Monthly, and Occasionally. The latter question had grocery store options categorized into: No Frills, Freshco, Food Basics and Loblaws, Zehrs, Metro, Independent Store (i.e., Butchers). The participants could only select one category for both the questions.
**Attribute familiarity**

After the screening process, it was necessary to ensure the participants were well acquainted with the attribute terms. An instruction slide advised them to rate the importance of each attribute when they purchase beef for a regular weekday meal. There were 18 attributes provided from APPENDIX A. The participants were asked “How important is it for you to eat beef that is antibiotic-free?” Each question included a five point scale with end points “Not at all important” and “Extremely important”. The questions also included a glossary at the bottom explaining what each attribute meant. In this case, the glossary stated, ‘The cattle are guaranteed not to have been given any antibiotics while being raised.’

**Discrete Choice Task (Ground Beef):**

Prior to commencing the discrete choice survey, the participants were advised they will be provided with beef product options and to select the product they would more likely purchase for a regular weekday meal. Following this was a product screening question. Participants were asked if they have purchased ground beef within the last six months. If they responded ‘No’, the DCE task for ground beef would be skipped and they would be directed to the next product option. If ‘Yes’, they began the DCE task: “You are about to purchase a package of ground beef. You are offered two options. Both options are about same weight, about one pound or 450 grams. You are asked to select one option that best meets your needs.” Participants were shown 12 choice sets of ground beef product options. The choice set included all the different attributes and various levels. The participants had to select one of the two options from each choice set.
**Discrete Choice Task (Steak):**

On completion of the ground beef discrete choice, the screening question for steak was asked. Consumers were asked if they have purchased steak within the past six months. If they responded, ‘No’, they were directed to demographic questions. If ‘Yes’, they began the second DCE task: “You are about to purchase a package of steak. You are offered two options. Both options are about same weight, about half pound or 225 grams. You are asked to select one option that best meets your needs.” Similar to the earlier ground beef discrete choice, participants were shown 12 choice sets of steak product options. The choice set included all the different attributes and levels for steak. The participants had to select one of the two options provided within each choice set.

Towards the end of all surveys, demographic information collected included age and gender. These were to calculate the responses based on demographics, if needed. In this research, however, this information was not calculated. Before ending the survey, the participants were asked for suggestions or feedback regarding the survey. The concluding slide, thanked the participants for their time and they were asked to sign the incentive sheet and obtain their gift card. Participants were also encouraged to review the debrief form.

**4.6 Data Collection**

The participant sample consisted of grocery shoppers, aged 18 years and above who have consumed or purchased beef within the past 6 months. Data was collected from August 22, 2013 up to August 25, 2013. Two computers with identical specifications were set up in the mall. Signs and posters (see APPENDIX I) were posted on the tables stating participants would receive $5 gift certificates to complete a survey on food
attributes. Guests willing to participate approached the table to inquire about the survey. The following procedures were applied for each of the individuals:

- All individuals willing to participate were notified that the study was conducted in partial fulfillment of requirements for the degree of Masters of Science at the University of Guelph, and would be compensated with a $5 Stone Road gift card for their participation. Individuals were also advised the survey took around 15 minutes to complete. In addition, they were advised of the purpose of this study.

- Once individuals expressed their willingness to participate in the survey, a screening was done to determine the eligibility of the participants. The screening was processed to ensure the individuals were 18 years of age and over and if they have purchased and consumed beef from the grocery store within the past six months (see APPENDIX G).

- If the participants met the criteria they were asked to sign the consent form (see APPENDIX H). The consent form reassured participants that their information will be confidential and they could withdraw from the study if they do not wish to proceed with the study.

- Respondents were then seated in front of the laptops and were assigned a code number. The participants were also asked to follow the instructions provided on the computer.

- The participants were first made familiar with the attributes, which was followed by the DCE survey. At the completion of the survey, respondents were thanked for their time and de-briefed about the study (see
APPENDIX J. They were then provided the $5 gift certificate after signing the incentive form for their participation in the survey.

4.7 Discrete Choice Model Specification

This section examines the specification and estimates used to understand the participant’s choice between the steak and ground beef product choice options based on the search, experience and credence attributes provided. Thus, it assists in estimating consumption behavior based on actual product purchase simulation.

Discrete choice experiment is consistent with McFaddens concept of Random Utility Theory (RUT) (McFadden 1974), the theory assumes that consumers are rational and make decisions to maximize utility. Although an analysis of an individual’s preference between product choices can be elicited, there is always a proportion of the utility or decision making which remains unobservable. Thus, an individual’s utility can be categorized into two main components: systematic and random component (McFadden 1974). The equation below describes an individual utility:

\[ U_{ni} = V_{ni} + \epsilon_{ni} \]

Where:

- \( U_{ni} \) signifies the utility obtained from a consumer \( n \) from an alternative \( i \)
- \( V_{ni} \) is the systematic component of the utility of an alternative \( i \) derived by the consumer \( n \)
- \( \epsilon_{ni} \) is the stochastic or random component of the utility associated with an alternative \( i \) obtained by the consumer \( n \)

\( V_{ni} \), which represents the systematic part of the utility, can be identified as a function of a vector of causal variables \( X \) or attributes within the degree of this study as
provided below. It is assumed that $V_i$ represents the utility associated with option $i$ for beef product choices.

$$V_i = \text{Options} + \beta_1 \text{Color} + \beta_2 \text{Marbling} + \beta_3 \text{Grade} + \beta_4 \text{Quality Taste} + \beta_5 \text{Guaranteed Tenderness} + \beta_6 \text{Grass Fed} + \beta_7 \text{Hormone Free} + \beta_8 \text{Price}$$

where:

- $V_i$ is the utility associated with alternative $i$
- Two product options were used Steak and Ground Beef. The base model was a choice of first or second option. In this case, based on the differences in attribute options.
- Color is level of color in the alternative $i$. There were two levels of color in the options:
  - In the premium product option, in which the color level was ‘bright red’ coded as 1
  - In the base product option, color was ‘red’ and was coded as -1
- Marbling is the level of marbling in the alternative $i$. There were three levels of marbling (Extra Lean, Lean, Medium) in the product options:
  - In the premium product option, the levels of marbling Extra Lean and Lean was coded as 1, if Extra Lean or Lean was included in the choice option
  - In the base product option, the level of marbling Medium was coded as, -1; Extra Lean and –Lean, that is, -1; -1
- Grade is the level of grade in the alternative $i$. There were three levels of grades (AAA, AA, A) in the product options:
In the premium product option, the levels of grade was AAA and AA, coded as 1, if AAA or AA was included in the choice option.

In the base product option, the level of grade was ‘A’ and was coded as –AAA and –AA, that is, -1;-1.

- Quality Taste was coded as 1, if Quality Taste was included in the choice option, -1 otherwise.
- Guaranteed Tenderness was coded as 1, if Guaranteed Tenderness was included in the choice option, -1 otherwise.
- Grass-Fed was coded as 1, if Grass-Fed was included in the choice option, and -1 otherwise.
- Hormone-Free was coded as 1, if Hormone-free was included in the choice option, and -1 otherwise.

Price is charged in dollars. There were five different price levels for each product option:

- Steak: $6.50, $7.00, $7.50, $8.00, $8.50
- Ground Beef: $5.00, $5.50, $6.00, $6.50, $7.00
Chapter 5: Results

This chapter presents the data analysis of the discrete choice experiment survey. Choice share model between steak and ground beef products, attribute importance, price sensitivity and distinction between pictures and word options. Finally, the findings are applied to validate the proposed hypothesis based on the main objectives of this study.

5.1 Sample Characteristics and Grocery Purchase Behavior

Data analysis was based in the 118 responses that were collected for the discrete choice experiment survey. Out of the 118 respondents only 115 qualified for this study. A total of 58 respondents had completed the word survey and a total of 60 respondents that completed the picture survey. The socio-demographic data included age and gender. All participants were 18 years of age and above, and had purchased beef in the past six months prior to their participation in this study. In addition, each participant had purchased at least one of the product options within the past six months: ground beef or steak. Of the entire sample of participants approximately 55% were female and 45% male. With regards to age, approximately 42% were between the ages of 18 to 24 years, with little difference between the other age groups. The purpose of obtaining these sample characteristics was solely to determine who was completing the study and to understand if the topic area was relevant to these specific respondents.

The purchase behavior of the sampled participants was based on the stores they do they purchase beef from. Approximately 56% of the sampled participants purchased beef from high-end stores such as Loblaws, Zehrs, Metro or Independent Stores (i.e, Butchers). 44% (approximate) purchase beef from No-Frills, Freshco or Food Basics. The category of stores may be a vital factor towards the participants’ choice options.
5.2 Discrete Choice Findings

SAS 9.2 was the tool used to analyze the data collected through the discrete choice options. This choice experiment was designed to incorporate the most important attributes identified through the pre-test survey, which are, grass-fed, hormone-free (credence), quality taste, tenderness (experience) and marbling level, grade, color, price (search). Each respondent was provided with a two choice sets and were asked to select the choice set they were more likely to purchase. In addition, there were two types of surveys, keeping the same choice set, one survey included a picture of the product and the other survey only had words. The concept of this methodology provides us to analyze consumer preferences based on the various aforementioned attributes provided. The hypotheses were then tested to note consumer preferences towards the three attribute categories (search, experience and credence) and the difference between the word and picture survey. The advantage of the Discrete Choice Experiment is it, “allows a researcher to estimate the outcome of attributes on preferences and subsequently test hypotheses about preference processes” (Louviere et al, 2008).

5.4 Discrete choice experiment survey:

Attribute importance and price sensitivity were analyzed based on the collected DCE survey data. For each of the products (steak and ground beef), the choice model examined the importance of price and the attributes for each product. Furthermore, the responses to a picture based survey and word based survey were also examined. In this study, log-likelihood and chi-square were used to investigate the effect of attributes on product choices, as explained below:
5.5 Overall Estimated Model Fit

This section determines the estimated model fit based on the participants preferences. The Rho-square statistic was reviewed to determine the Goodness of Fit for each of the proposed models. Scores between the ranges of 0 to 1 determine whether the estimated parameters are no better than 0 or when closer to 1 perfectly predicted the choices of the participants. Specifically, looking at each of the hypotheses:

The attributes have been categorized into search ($\beta_1\text{Color} + \beta_2\text{Marbling} + \beta_3\text{Grade}$), experience ($\beta_4\text{Quality Taste} + \beta_5\text{Guaranteed Tenderness}$) and credence ($\beta_6\text{Grass Fed} + \beta_7\text{Hormone Free}$). If ($\beta_1, \beta_2, \beta_3 \leq \beta_4 \& \beta_5 \leq \beta_6 \& \beta_7$) then the estimated parameters is perfectly predicted. Second, we estimate the model for price sensitivity, $\beta_8$ being Price. If $\beta_8 \neq 0$, then the estimated parameters predict that the participants are not price sensitive. If $\beta_8 > 1$, then the estimated parameters would not be met and the participants result being price sensitive. The results from each of the estimated parameters will be reviewed separately based on the two conditions and the participant choice share between the two conditions will be measured.

**Estimated Model: Steak**

First, we look at the overall estimated model for steak (Table 2), which looks at the various attribute choices in the discrete choice questions and their estimates to predict the choices of the sampled participants. This model displays the addition of each attribute changing the maximum likelihood or probability of participant choice.
The first model looked at is Model 1. Model 1 looks at the base option without any added attributes. This model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2. Model 2 looks at the addition of search attributes, that is, color, grade and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.020).

Model 3 looked at the search attributes (including price) and the addition of experience attributes, which are, guaranteed tender and taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.030).

Model 4 and Model 5 looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.065).
Table 2: Estimated model for Steak: predicting influence of attribute choice

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>-0.090</td>
<td>-0.036</td>
<td>-0.080</td>
<td>0.050</td>
<td>0.048</td>
</tr>
<tr>
<td>Color</td>
<td>0.107</td>
<td>0.043</td>
<td>0.032</td>
<td>0.055</td>
<td></td>
</tr>
<tr>
<td>Grade1</td>
<td>0.168</td>
<td>0.180</td>
<td>0.308</td>
<td>0.257</td>
<td></td>
</tr>
<tr>
<td>Grade2</td>
<td>-0.056</td>
<td>-0.071</td>
<td>-0.053</td>
<td>-0.050</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td></td>
<td>0.019</td>
<td>0.137</td>
<td>0.127</td>
<td></td>
</tr>
<tr>
<td>Guaranteed Tender</td>
<td></td>
<td>0.167</td>
<td>0.155</td>
<td>0.144</td>
<td></td>
</tr>
<tr>
<td>Grass Fed</td>
<td></td>
<td></td>
<td>0.258</td>
<td>0.262</td>
<td></td>
</tr>
<tr>
<td>Hormone Free</td>
<td></td>
<td></td>
<td>0.215</td>
<td>0.175</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.093</td>
<td>0.026</td>
<td>-0.068</td>
<td>-0.086</td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.084</td>
</tr>
</tbody>
</table>

Log-likelihood       | -752.513| -737.109| -729.810| -703.849| -703.693|
Degrees of freedom   | 1     | 5     | 7     | 9     | 10    |
Chi-square           | 15.404| 7.30  | 25.96 | 0.16  |       |
Chi-square Prob.     | 0.004 | 0.026 | 0.000 | 0.693 |       |
rho-square           | 0.020 | 0.030 | 0.065 | 0.065 |       |

**Estimated Model: Ground Beef**

Similarly, we review the proposed model for ground-beef (Table 3). This model looks at the influence of the entire attribute category to the ground beef product. The influence of each attribute category is similar; however, it seems like a slightly better predictor of choice than the estimated model for steak.

The first model looked at is Model 1. Model 1 looks at the base option without the inclusion of any of the attributes and just price alone. This model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2. Model 2 looks at the addition of search attributes, that is, color, marbling and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.003).
Model 3 looked at the search attributes (including price) and the addition of experience attribute, which is, taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.014).

Model 4 and Model 5 looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.084).

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>-0.131</td>
<td>-0.120</td>
<td>-0.148</td>
<td>0.018</td>
<td>0.016</td>
</tr>
<tr>
<td>Color</td>
<td>0.000</td>
<td>0.005</td>
<td>0.058</td>
<td>0.073</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>0.057</td>
<td>0.187</td>
<td>0.187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbling1</td>
<td>0.078</td>
<td>0.212</td>
<td>0.152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbling2</td>
<td>0.091</td>
<td>0.142</td>
<td>0.149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass fed</td>
<td></td>
<td>0.350</td>
<td>0.353</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone free</td>
<td></td>
<td>0.308</td>
<td>0.263</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.083</td>
<td>0.059</td>
<td>-0.088</td>
<td>-0.122</td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td></td>
<td></td>
<td></td>
<td>0.090</td>
<td></td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-854.50</td>
<td>-852.28</td>
<td>-842.19</td>
<td>-782.92</td>
<td>-782.67</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Chi-square</td>
<td>2.23</td>
<td>10.09</td>
<td>59.27</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>Chi-square Prob</td>
<td>0.328</td>
<td>0.018</td>
<td>0.000</td>
<td>0.881</td>
<td></td>
</tr>
<tr>
<td>Rho-square</td>
<td>0.003</td>
<td>0.014</td>
<td>0.084</td>
<td>0.084</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated Model: Preferred Condition**

A between-subject model was designed to estimate the choices of the samples participants between the picture + word condition and word only condition. This was done for both steak and ground beef product categories.
Preferred Condition (Steak)

We first reviewed the proposed model for steak between the two conditions (Table 4, p. 58 & Table 5, p. 59). The two tables provide the estimates of the two conditions. Each model includes the codes ‘P’ for picture + word condition and ‘W’ for word only condition.

The first model looked at is Model 1P. Model 1P is the base option for the picture + word condition without the inclusion of any of the attributes and just price alone. This model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2P. Model 2P looks at the picture+ word condition with the addition of search attributes, that is, color, grade and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.017).

Model 3P looked at the search attributes (including price) and the addition of experience attributes, which are, guaranteed tenderness and taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.025).

Model 4P and Model 5P looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.058).
The first model looked at is Model 1W. Model 1W is the base option for the picture + word condition without the inclusion of any of the attributes and just price alone. This model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2W. Model 2W looks at the picture+ word condition with the addition of search attributes, that is, color, grade and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.027).

Model 3W looked at the search attributes (including price) and the addition of experience attributes, which are, guaranteed tenderness and taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.041).
Model 4W and Model 5W looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.078).

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M1W</th>
<th>M2W</th>
<th>M3W</th>
<th>M4W</th>
<th>M5W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>-0.059</td>
<td>0.004</td>
<td>-0.046</td>
<td>0.096</td>
<td>0.095</td>
</tr>
<tr>
<td>Color</td>
<td>0.138</td>
<td>0.052</td>
<td>0.038</td>
<td>0.053</td>
<td></td>
</tr>
<tr>
<td>Grade1</td>
<td>0.125</td>
<td>0.155</td>
<td>0.287</td>
<td>0.252</td>
<td></td>
</tr>
<tr>
<td>Grade2</td>
<td>-0.011</td>
<td>-0.038</td>
<td>-0.011</td>
<td>-0.008</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>0.069</td>
<td>0.196</td>
<td>0.189</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed Tender</td>
<td>0.192</td>
<td>0.182</td>
<td>0.175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass Fed</td>
<td>0.270</td>
<td>0.272</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone Free</td>
<td>0.227</td>
<td>0.201</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.122</td>
<td>0.029</td>
<td>-0.069</td>
<td>-0.082</td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td>0.058</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Chi-square</td>
<td>10.12</td>
<td>5.06</td>
<td>13.80</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>Chi-square Prob</td>
<td>0.038485</td>
<td>0.080</td>
<td>0.001</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td>Rho-square</td>
<td>0.027</td>
<td>0.041</td>
<td>0.078</td>
<td>0.078</td>
<td></td>
</tr>
</tbody>
</table>

**Preferred Condition (Ground Beef)**

The next between subject models reviewed are the proposed model for ground beef between the two conditions (Table 6, p. 60 & Table 7, p. 62). The two tables provide the estimates of the two conditions. Each model includes the codes ‘P’ for picture + word condition and ‘W’ for word only condition.

The first model looked at is Model 1P. Model 1P is the base option for the word only condition without the inclusion of any of the attributes and just price alone. This
model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2P. Model 2P looks at the word only condition with the addition of search attributes, that is, color, marbling and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.005).

Model 3P looked at the search attributes (including price) and the addition of experience attribute, which is taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.013).

Model 4P and Model 5P looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.079) and (0.081) respectively.

Table 6: Estimated model for Ground Beef – Pictures + Words (P)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M1P</th>
<th>M2P</th>
<th>M3P</th>
<th>M4P</th>
<th>M5P</th>
</tr>
</thead>
<tbody>
<tr>
<td>options</td>
<td>-0.152</td>
<td>-0.132</td>
<td>-0.161</td>
<td>0.001</td>
<td>-0.003</td>
</tr>
<tr>
<td>color</td>
<td>0.070</td>
<td>0.075</td>
<td>0.158</td>
<td>0.186</td>
<td></td>
</tr>
<tr>
<td>taste</td>
<td></td>
<td>0.026</td>
<td>0.149</td>
<td>0.150</td>
<td></td>
</tr>
<tr>
<td>Marbling1</td>
<td></td>
<td>0.040</td>
<td>0.144</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td>Marbling2</td>
<td></td>
<td>0.097</td>
<td>0.135</td>
<td>0.147</td>
<td></td>
</tr>
<tr>
<td>Grass Fed</td>
<td></td>
<td></td>
<td>0.360</td>
<td>0.366</td>
<td></td>
</tr>
<tr>
<td>Hormone Free</td>
<td></td>
<td></td>
<td>0.259</td>
<td>0.172</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.071</td>
<td>0.069</td>
<td>-0.049</td>
<td>-0.115</td>
<td></td>
</tr>
<tr>
<td>Premium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.176</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-433.57</td>
<td>-431.19</td>
<td>-428.05</td>
<td>-399.121</td>
<td>-398.63</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Chi-square</td>
<td>2.38</td>
<td>3.14</td>
<td>28.93</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>Chi-square Prob</td>
<td>0.305</td>
<td>0.370</td>
<td>0.000</td>
<td>0.783</td>
<td></td>
</tr>
<tr>
<td>Rho-square</td>
<td>0.005</td>
<td>0.013</td>
<td>0.079</td>
<td>0.081</td>
<td></td>
</tr>
</tbody>
</table>
The first model looked at is Model 1W. Model 1W is the base option for the word only condition without the inclusion of any of the attributes and just price alone. This model indicates it would not be a good predictor of the choices sampled than having no model at all.

The second model looked at is Model 2W. Model 2W looks at the word only condition with the addition of search attributes, that is, color, marbling and price. The inclusion of these attributes predicts the choices of the sampled participants. This model indicates that it would only be slightly better to predict the choices of the samples participants compared to no model at all, at (0.004).

Model 3W looked at the search attributes (including price) and the addition of experience attribute, which is taste. The estimates of this model predicts that with the inclusion of experience attributes, the model would better predict the choices of the sampled decision makers than no model at all at (0.022).

Model 4W and Model 5W looked at the inclusion of credence based attributes, which are, grass-fed and hormone-free along with search and experience attributes. These models include all the attributes from the Discrete Choice questions. Both models indicate that it would significantly better predict the choices of the sampled participants than no model at all at (0.096).
Table 7: Estimated model for Ground Beef – Words (W)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M1W</th>
<th>M2W</th>
<th>M3W</th>
<th>M4W</th>
<th>M5W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>-0.108</td>
<td>-0.108</td>
<td>-0.135</td>
<td>0.036</td>
<td>0.036</td>
</tr>
<tr>
<td>Color</td>
<td>-0.072</td>
<td>-0.067</td>
<td>-0.046</td>
<td>-0.049</td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>0.090</td>
<td>0.227</td>
<td>0.227</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbling1</td>
<td>0.116</td>
<td>0.282</td>
<td>0.291</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marbling2</td>
<td>0.086</td>
<td>0.150</td>
<td>0.149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass fed</td>
<td></td>
<td>0.345</td>
<td>0.345</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone free</td>
<td></td>
<td>0.360</td>
<td>0.366</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>0.095</td>
<td>0.050</td>
<td>-0.124</td>
<td>-0.120</td>
<td>-0.012</td>
</tr>
<tr>
<td>Premium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-420.64</td>
<td>-418.96</td>
<td>-411.26</td>
<td>-380.304</td>
<td>-380.30</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Chi-square</td>
<td>1.68</td>
<td>7.70</td>
<td>30.96</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Chi-square Prob</td>
<td>0.432</td>
<td>0.053</td>
<td>0.000</td>
<td>0.999</td>
<td></td>
</tr>
<tr>
<td>Rho-square</td>
<td>0.004</td>
<td>0.022</td>
<td>0.096</td>
<td>0.096</td>
<td></td>
</tr>
</tbody>
</table>

5.6 Hypotheses Test

The hypotheses will be analyzed from three view points. The first perspective will look at the hypotheses from an overall model perspective. This perspective will provide information on the statistically significant predictor of the choices the sampled participants made. The second view point will provide input on the percentage choice share of the sampled participants based on the addition of attributes. Finally, the third view point will be based on the willingness to pay for the addition of attributes by the sampled participants. The results from both the steak and ground beef products were used. These models study the impact of various attributes on food choices. They assist in determining the hypotheses findings which include the addition of various food attributes influence consumer choice, price sensitivity analysis and the participant’s preferred condition.
Hypothesis 1: Attribute Influence (Supported)

\( H_{1a} \): Search attributes will have lower influence on choice than experience attributes

\( H_{1b} \): Credence attributes will have a higher influence on choice than experience attributes

Looking at hypothesis 1 from an overall model fit perspective for both steak and ground beef we can see that the signaling of certain attributes predict the choices of the sampled participants, as seen in Table 2 (pg 55) and Table 3 (pg 56). This is supported when looking at attributes from a statistically significant viewpoint for hypothesis 1 the addition of each attribute estimates to predict the choices of the sampled participants. The inclusion of search attributes was a slightly better predictor for both the steak and ground beef models compared to no model at all. Adding experience attributes was a comparatively better predictor of choice at \( p < 0.05 \) for both the steak and ground beef options. Credence attributes had a statistically significant predictor of choice resulting with a log-likelihood (LL) of -703.849 and chi-square (\( \chi^2 \)) at 0 (steak) and log-likelihood (LL) of -782.92 and chi-square (\( \chi^2 \)) at 0 (ground beef). Thus stating that credence based attributes are a significant influence of the choice by the sampled decision makers at \( p < 0.5 \). These findings are supported when looking at Hypothesis 1 from a percentage of choice share option viewpoint and the willingness-to-pay viewpoint. This has been explained below with a graph for each attribute category.

The base choice share for the product does not include credence or experience attributes. Among the search attributes, it includes the lowest level for each attribute, i.e., color (red), marbling (medium) and price $5. Similar to the ground beef choice share, the
base choice share for the steak does not include credence or experience attributes. Among the search attributes, it includes the lowest level for each attribute, i.e., color (red), grade (A), price $6.50. The following demonstrates the changes in consumer choice share by adding each attribute option at a time in comparison to the base choice for ground beef (46.26%) and steak (46%).

**Figure 3: Addition of credence attributes: Grass-fed and Hormone-free**

<table>
<thead>
<tr>
<th>Choice Share</th>
<th>Base</th>
<th>Grass Fed</th>
<th>Hormone Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Beef</td>
<td>46.26%</td>
<td>63.55%</td>
<td>58.98%</td>
</tr>
<tr>
<td>Steak</td>
<td>46.20%</td>
<td>59.27%</td>
<td>54.72%</td>
</tr>
</tbody>
</table>

**NOTE:** Error bars represent standard errors of the mean

In the above graph we see the difference between the base product and the inclusion of credence attributes to steak and ground beef. It is observed that there is an increase in choice share by adding credence attributes to a product in comparison to the base product that does not include the premium attributes. The ground beef’s choice share increases from 46.26% (base product) to 63.55% with the inclusion of credence attribute, grass fed. We notice that there is a difference in the shares even between two different credence attributes, grass-fed and hormone-free. Adding the hormone-free attributes alone changes the choice share for the premium ground-beef to 59.27%. This implies that the addition of credence attribute on ground beef has an effect on the participant’s choice. Similarly, it is observed that the inclusion of the grass-fed attribute in the steak option has
increased the choice share of participants to 58.98% and to 54.72% with the hormone-free option. Participants who are influenced by credence based attributes exhibit difference in choice share, which is around 17%-13% approximately for grass-fed and 13%-9% for hormone-free. This implies that participants who give importance to credence based food attributes, in this case grass-fed and hormone-free, make choices differently compared to participants who do not.

Figure 4: Addition of experience attribute: Quality Taste and Guaranteed Tenderness

<table>
<thead>
<tr>
<th></th>
<th>Base</th>
<th>Quality Taste</th>
<th>Guaranteed Tender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Beef</td>
<td>46.26%</td>
<td>55.56%</td>
<td></td>
</tr>
<tr>
<td>Steak</td>
<td>46.20%</td>
<td>52.33%</td>
<td>53.17%</td>
</tr>
</tbody>
</table>

NOTE: Error bars represent standard errors of the mean

In the graph above, we see the difference between participant’s choices by including an experience attributes such as, ‘Quality Taste’ and ‘Guaranteed Tenderness’. This category of attribute is one which consumers can only assess after purchase and use of the product. It is implied that the addition of quality taste increases the choice share for both ground beef and steak products. Specifically, adding quality taste increased the choice share of participants for the ground beef from 46% to 56% approximately which is a difference of 10%. The steak increased from 46% to 52%, giving an approximate difference of 6%. Similarly, ‘guaranteed-tender’ attribute only used for steak, had an
increase in choice share of 53%. It is implied that the inclusion of the experience attributes does increase the choice share; however, the differences are uniform for both the options provided.

Lastly, we look at the difference between the participants choices based on the addition of search attributes to ground-beef and steak.

**Figure 5: Addition of search attribute: Color, Marbling (ground-beef) and Grade (steak)**

![Bar Graph](image)

*NOTE: Error bars represent standard errors of the mean*

The bar graph above, displays the choice share options for color, marbling (ground beef) and grade (steak) as a search attributes. It is observed that switching the color for the premium product from ‘red’ to ‘bright red’ increases the choice share of ground beef to 49.93% and decreases the participant’s choice for steak to 43.28%. The inclusion of the color search attribute was not significant. It only increased the participant’s choice share for the ground beef by 4% approximately and decreased the participant’s choice share for steak by 3% approximately. Thus, the addition of this option does not play a significant role and there is clearly no significant difference in the choice share option of participants. This implies that participants do not give much importance to a search attribute like color.
Marbling (for ground beef) and Grade (for steak) has three levels. The base participant choice share was derived from a ‘medium’ marbling level for ground beef and grade A for steak. Substituting the marbling level to ‘extra-lean’ increased the participant’s choice share for ground beef from 46.26% to 57.51%. This gives a difference of 11% for the ground beef. Altering the grade level to AAA is a comparatively similar difference. The steak’s choice share of the participant increases to 57.53%, giving a 12% difference approximately. This implies that participants give importance to marbling and grade, however, the higher the level of grade the bigger the choice decision.

In the graphs above, we see that search attributes have a lower choice share by the sampled participants compared to the choice of experience and credence attribute options. However, to gain better understanding of the influence of attribute options and to determine the significant impact on the sampled participants, we will now see what they were willing-to-pay (WTP) with the inclusion of each attribute category. As seen in Table 8 and 9 (pg 68), when we add credence attributes the WTP is the highest by the sampled participants, followed by experience and search attributes for both steak and ground beef.

Therefore, after analyzing this hypothesis from an overall model viewpoint, it is determined that the presence of food attributes; specifically credence attributes have a significant affect on the sampled participants choices. To gain a better understanding of the influence of attributes and to determine its significant impact on the participants’ influence of choice, we will now see the price sensitivity analysis of the decision makers with the inclusion of each attribute category.
### Table 8: Willingness-to-pay Steak

<table>
<thead>
<tr>
<th>Willingness to pay - Steak</th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Guaranteed Tender</th>
<th>Color</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
<td></td>
<td>AAA</td>
</tr>
<tr>
<td></td>
<td>$3.06</td>
<td>$2.04</td>
<td>$1.48</td>
<td>$1.68</td>
<td>-0.64</td>
<td>$3.00</td>
</tr>
<tr>
<td></td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td>Not Mentioned</td>
<td>Bright Red</td>
<td>AA</td>
</tr>
<tr>
<td></td>
<td>-$3.06</td>
<td>-$2.04</td>
<td>-$1.48</td>
<td>-$1.68</td>
<td>$0.64</td>
<td>-$0.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

### Table 9: Willingness-to-pay Ground beef

<table>
<thead>
<tr>
<th>Willingness to pay - Ground Beef</th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Color</th>
<th>Marbling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
<td>Extra Mean</td>
</tr>
<tr>
<td></td>
<td>$2.90</td>
<td>$2.16</td>
<td>$1.53</td>
<td>Red</td>
<td>$1.25</td>
</tr>
<tr>
<td></td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td>Bright red</td>
<td>$1.22</td>
</tr>
<tr>
<td></td>
<td>-$2.90</td>
<td>-$2.16</td>
<td>-$1.53</td>
<td>-$0.60</td>
<td>-2.47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis 2: Price Sensitivity Analysis (Supported)

\[H_2: \text{Inclusion of signaling attributes results in a lack of price sensitivity}\]

Hypothesis 2 stipulates that consumers are not price sensitive. Looking at Hypothesis 2 from an overall model fit perspective we can see that the inclusion of attributes reduces the price elasticity. In tables 2 (pg 52) and 3 (pg 53), the addition of search attributes for both steak and ground beef was a slightly better predictor of choice compared to no model at all at a price elasticity of 0.093 and 0.083 respectively. Experience attributes were comparatively higher resulting in a LL of -729.81 and \(\chi^2\) probability of 0.026 for steak and -842.19 (LL), 0.018 (\(\chi^2\) probability) for ground beef. Credence based attributes further bring down price elasticity to -0.068 (steak) and -0.088 (ground beef). This viewpoint is again supported with the price elasticity being < 1 at the inclusion of every attribute based on the level of choice predicted by the sampled participants. These findings are supported when looking at Hypothesis 2 from a percentage of choice share option view point and the willingness-to-pay view point. This has been explained with graphs (Figure 6 & 7).
Figure 6: Price sensitivity graphs for Ground-beef

Figure 7: Price sensitivity graphs for Steak
In Figures 5 and 6 (p. 70), the attribute of price had 5 levels, which varied between ground beef ($5.00, $5.50, $6.00, $6.50, $7.00) and steak ($6.50, $7.00, $7.50, $8.00, $8.50), respectively. The hypothetical dotted line represents ‘price-sensitive’ individuals and the solid lines represent ‘non-price sensitive’ sampled participants. It is expected that an increase in price gives a steeper drop in choice share (as represented by the ‘price-sensitive’ line). However, as expected in this study, we see that the increase in price gives a comparatively lower drop in choice share resulting in a flatter demand curve. This implies that the respondents were less sensitive to price.

After analyzing this hypothesis, from the perspective of an overall model viewpoint, the price sensitivity analysis from a specific attribute category does have a significant effect with the addition of attributes. As a result, Hypothesis 2 is supported.

**Hypothesis 3: Preferred Condition (Not Supported)**

Lastly, a comparison of choice shares was conducted for the choices made for the products presented as pictures + words versus those presented as word options alone. This is also a between subject choice estimation.

**H3**: *Picture of the product and the word description will have a higher probability of choice compared to the word description condition alone*

Looking at Hypothesis 3 from an overall model perspective we can see that there is a variation the predictor of choice between the two conditions. With the inclusion of all attributes, Table 4 (p. 58) for Steak (picture + word condition) results with a LL of -356.748, the $\chi^2$ with 10 degrees of freedom = 0.13 and Table 5 (p. 59) for Steak (word alone condition) results with a LL of -344.338, the $\chi^2$ with 10 degrees of freedom = 0.04. This suggests that the choice option survey with pictures + words and the one with words
only did not change the participant's product choice significantly. The findings from the
ground beef estimate model were similar. Table 6 (p. 60) (picture + word condition)
results with LL of -398.63, the $\chi^2$ with 10 degrees of freedom = 0.49 and Table 7 (p. 62)
(word only condition) results with LL of -380.30, the $\chi^2$ with 10 degrees of freedom =
0.00. This suggests that the word condition was a statistically significant predictor of
choice from the sampled participants compared to the picture condition. This resulted is
further supported by the percentage choice share of the participants below.

Figure 8: Picture + Words vs. Words (Ground Beef)

<table>
<thead>
<tr>
<th>Signaled Attributes</th>
<th>Choice Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>47.31%</td>
</tr>
<tr>
<td>Credence</td>
<td>78.82%</td>
</tr>
<tr>
<td>Experience</td>
<td>56.59%</td>
</tr>
<tr>
<td>Search</td>
<td>62.84%</td>
</tr>
</tbody>
</table>

NOTE: Error bars represent standard errors of the mean
Figures 8 and 9 above demonstrate the choice share of participants in the picture + word and word only conditions. The price has been kept constant at $5.00 (ground beef) and $6.50 (steak). The choice share of participants for the picture + word condition compared to the word only condition has been at a lower percentage consistently. This implies that the two separate conditions did not play a significant role in the participant’s choices. Similar results were found with the addition of each attribute category. The above graphs give an overall impression that the two conditions did not differ much in response to the participant choice share. Thus, picture versus word condition does not play a significant role in participant choice. Surprisingly, the participants responses between the two conditions did not differ much in their choices as the levels of attributes were altered. However, we do note an increase and decrease variation between the two products within the same conditions. For instance, with the inclusion of credence attributes, if the ground beef product choice share increased by approximately 20% for both conditions, the choice share of steak decreased by approximately 10% for both
conditions. As a result, the two separate conditions play no major role in the participant’s choice. Thus, Hypothesis 3 is not supported.

**Hypothesis Test Reliability**

To further validate the results of this study we review the standard errors, to get a more statistical perspective on the results above. Tables 10 & 11 below presents the standard errors for all the attribute choices, this shows the actual variance among the observations. The complete distribution is represented as (M5) for both steak and ground beef options. ‘M5W’ & ‘M5P’ is the distribution between the two conditions (picture + word and word only condition).

<table>
<thead>
<tr>
<th>Attributes</th>
<th>M5W</th>
<th>M5P</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>0.036</td>
<td>-0.003</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Color</td>
<td>-0.049</td>
<td>0.186</td>
<td>0.073</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.08)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Taste</td>
<td>0.227</td>
<td>0.15</td>
<td>0.187</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Marbling1</td>
<td>0.291</td>
<td>0.03</td>
<td>0.152</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.15)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Marbling2</td>
<td>0.149</td>
<td>0.147</td>
<td>0.149</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.09)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Grass fed</td>
<td>0.345</td>
<td>0.366</td>
<td>0.353</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Hormone free</td>
<td>0.366</td>
<td>0.172</td>
<td>0.263</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.13)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Price</td>
<td>-0.12</td>
<td>-0.115</td>
<td>-0.122</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.11)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Premium</td>
<td>-0.012</td>
<td>0.176</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.18)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-380.3</td>
<td>-398.63</td>
<td>-782.67</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTE: Numbers in parenthesis are standard errors of estimates
<table>
<thead>
<tr>
<th>Attributes</th>
<th>M5W</th>
<th>M5P</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Options</td>
<td>0.095</td>
<td>0.005</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Color</td>
<td>0.053</td>
<td>0.054</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.13)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Grade1</td>
<td>0.252</td>
<td>0.265</td>
<td>0.257</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.20)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Grade2</td>
<td>-0.008</td>
<td>-0.087</td>
<td>-0.05</td>
</tr>
<tr>
<td></td>
<td>(0.10)</td>
<td>(0.10)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>Taste</td>
<td>0.189</td>
<td>0.069</td>
<td>0.127</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Guaranteed Tender</td>
<td>0.175</td>
<td>0.116</td>
<td>0.144</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Grass Fed</td>
<td>0.272</td>
<td>0.254</td>
<td>0.262</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.06)</td>
<td>(0.04)</td>
</tr>
<tr>
<td>Hormone Free</td>
<td>0.201</td>
<td>0.156</td>
<td>0.175</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.17)</td>
<td>(0.12)</td>
</tr>
<tr>
<td>Price</td>
<td>-0.082</td>
<td>-0.089</td>
<td>-0.086</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(0.12)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Premium</td>
<td>0.058</td>
<td>0.107</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(0.21)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>-344.338</td>
<td>-356.748</td>
<td>-703.693</td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTE: Numbers in parenthesis are standard errors of estimates

Reviewing the complete attribute options (M5) from Tables 10 and 11 above, show that search attributes has a lower variance compared experience and credence attributes. This validates that Hypothesis 1 is supported statistically. When comparing the standard errors between the two conditions there is not much variance. This is valid for both the steak and ground beef proportions. As a result, the two separate conditions play no major role in the participant’s choice. Thus, Hypothesis 3 is not supported.
Chapter 6: Conclusions

6.1: Summary of Results

A consumer making various food choices and the influence of various attributes is relevant in their purchase decision. The purpose of this thesis was to study the influence of food attributes on consumer choices. In addition, this study was also determining if exposing consumers to various conditions will alter their choices. In order to achieve this, individuals were asked about various food attributes and were asked to rate their importance. They were then provided with 12 choice sets of ground beef options and steak options each. Results indicate that signaling various food attributes did influence their choice options, in this study, credence attributes had the highest choice share. This was followed by search and experience attributes. Price on the other hand, did not have an effect on consumer choice. The participants seemed less price sensitive to the various levels of attributes provided in the choice options.

In this research, preferred condition does not have an effect on consumer choices either. One set of participants were exposed to a survey with pictures + words and another set of participants had only word options. There was not much of a differentiation between the choice shares of the two conditions. The WTP within the two product options were similar in nature, where individuals with a higher WTP were those participants under the word condition compared to individuals with the picture +word condition.

6.2 Theoretical Contributions

Previous studies in Signaling theory have looked into the quality and uncertainty in the labor and automobile market (Akerlof, 1970). Research has also been conducted
on products focusing on intrinsic or extrinsic attributes (Kirmani & Rao, 2002), however, majority of the research treated all signals similarly with single signals. This study is an extension of literature to Signaling Theory by studying multiple levels of signals. There has also been limited research specifically those related to food attributes within this theory. Thus, this is an extension to Signaling Theory to multiple signals and food signals.

Similarly, with beef literature, previous studies have looked at consumers purchase decisions based on various intrinsic attributes such as marbling level, fat content, grass-fed versus grain-fed beef (Ward et al, 2008; Loreiro & Umberger, 2007; Umberger et al, 2009; Peterson & Burbidge, 2012) and the health benefits of grass-fed beef in comparison to grain-fed beef (McCluskey et al, 2005). Research on extrinsic attributes included country of origin (McCluskey et al, 2005; Tonsor et al, 2005; Loureiro & Umberger, 2007; Xue et al, 2010) and branding/packaging (Froehlich 2009). Previous research also suggests that when shopping in store consumers rely on extrinsic attributes to determine the quality of the product (Bredahl 2004). The studies also focused on either one specific attribute or a combination of two. This research is extending attribute type, which is, credence, experience and search attribute types and the willingness to pay for each. Willingness to pay for each category type also matters as there is a variation between the WTP for each category. Our results showed credence attributes having the highest influence, followed by experience and search being the lowest.

6.3 Managerial Contributions

Packaged food has evolved over the years, especially here in North America, with the introduction of various regulations by the Food and Drug Administration (FDA) in
the United States and Canadian Food Inspection Agency (CFIA) in Canada. Companies and producers have been putting out signals through advertising or labels on food packaging. Many consumers are keen on making informed choices and decisions about the food they purchase and consume. A number of these consumers review information provided on the packages when deciding to shop for themselves or their family members (Health Canada, 2008). They seek for information that is meaningful and credible about the food they purchase (CFIA, 2010), information that gives a form of reassurance to the consumers regarding the quality of the food being purchased.

This study will aid public policy makers, the retail industry and marketers in creating and promoting products useful to consumers and also assist buyers in making confident purchase decisions. Beef is a growing industry and this study would be a valuable marketing tool for the industry. Particularly, the study reveals that consumers are less price sensitive when it pertains to food signaling related to credence based attributes.

6.4 Limitations

This research has various limitations that may restrict the opportunity to generalize the results, beginning with the fact that participants were provided with hypothetical choices and not given an actual product. At the same time, many participants were not exposed to the various attributes used in the survey. One participant’s feedback stated, “it was difficult to determine some and had to guess at some attributes as I do not know the difference in value of having hormone free meat vs. grass feed beef”

The sample size can be considered a limitation; the number of participants received for the study was less than the number expected. This may have resulted in not
obtaining the required results as hypothesized previously. Thus, the results of this study cannot be associated to consumers in general.

Another major limitation was the use of various levels of attributes and prices. This may have been complicated to the participants when asked to choose between the options provided. Thus, the multiple level signals may have affected the participants choice decisions.

6.5 Assumptions

This research was based on various assumptions which may limit the study from being applied to consumers in general. A major assumption was that the participants would respond to the given options in an honest manner. It was certain a few participants were there mostly to obtain the $5 mall gift card and as they completed the study in less than 10 minutes. Another assumption was that the participants have been exposed to and have had an understanding of the entire attribute options provided. This was clear in a few feedback and questions asked by the participants while doing or after having completed the survey.

6.6 Future Research

As stated in the limitations the sample size for this study was limited. Future research can further expand and increase the sample size and selection which may assist in meeting all the hypotheses and this would help in applying the results to the general population.

The study used hypothetical product options with random pictures of beef. Future research could use actual products or even replicate actual retail beef labels. This may
provide a whole different response to the picture condition versus the word condition. Future research could also include other food options, apart from beef, this could be conducted on other meat, vegetable or fruit options. Providing attributes on canned food would be an interesting option for future research.
References:


Food and Drink Federation. GDA labeling. 15 August 2012. Web March 15, 2013


Iowa Beef Council 2013. What is this steak? Top Sirloin Steak Image http://www.iabeef.org/CMImages/IowaBC/TopSirloinSteak01.jpg


APPENDICES

APPENDIX A: Attribute List

<table>
<thead>
<tr>
<th>Search</th>
<th>Experience</th>
<th>Credence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Taste</td>
<td>Antibiotic Free</td>
</tr>
<tr>
<td>Ounce/weight</td>
<td>Omega 3 level</td>
<td>Hormone/GMO Free</td>
</tr>
<tr>
<td>Appropriate size of cut</td>
<td>Tenderness</td>
<td>Level and Length of Aging</td>
</tr>
<tr>
<td>Presence/ extent of marbling</td>
<td>Juiciness</td>
<td>Grass Fed</td>
</tr>
<tr>
<td>Colour</td>
<td></td>
<td>Grain Fed</td>
</tr>
<tr>
<td>Grade (i.e. A, AA, AAA)</td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traceability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Country-of-Origin</td>
</tr>
</tbody>
</table>

APPENDIX B: Generating BIBD

Generating the BIBD where,

r is the replication of the number

k is the variety of options in each block

λ is the number of times each attribute appears in the block

t/a is the total number of attributes and choice options

\[ r \cdot (k-1) = \lambda \cdot (a-1) \]

B = 25 (blocks) T = 18 (attributes) k = 5 (treatments)
R=6.94 (approx), Lamda l = 1.63 (approx), Seed=104

The SAS System: Balanced Incomplete Blocks Design

<table>
<thead>
<tr>
<th></th>
<th>x1</th>
<th>x2</th>
<th>x3</th>
<th>x4</th>
<th>x5</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>9</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>17</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>18</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>10</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Pretest SAS output
### APPENDIX C: Best-Worst Survey Results

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Most Count</th>
<th>Least Count</th>
<th>Most - Least</th>
<th>Prob(Most)</th>
<th>Prob(Least)</th>
<th>Prob(Most)/Prob(Least)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hormone/GMO Free</td>
<td>42</td>
<td>6</td>
<td>36</td>
<td>0.600</td>
<td>0.086</td>
<td>7.00</td>
</tr>
<tr>
<td>Antibiotic Free</td>
<td>37</td>
<td>3</td>
<td>34</td>
<td>0.529</td>
<td>0.043</td>
<td>12.33</td>
</tr>
<tr>
<td>Taste</td>
<td>21</td>
<td>3</td>
<td>18</td>
<td>0.350</td>
<td>0.050</td>
<td>7.00</td>
</tr>
<tr>
<td>Grade (i.e. A, AA, AAA)</td>
<td>18</td>
<td>4</td>
<td>14</td>
<td>0.257</td>
<td>0.057</td>
<td>4.50</td>
</tr>
<tr>
<td>Price</td>
<td>16</td>
<td>2</td>
<td>14</td>
<td>0.229</td>
<td>0.029</td>
<td>8.00</td>
</tr>
<tr>
<td>Tenderness</td>
<td>14</td>
<td>2</td>
<td>12</td>
<td>0.200</td>
<td>0.029</td>
<td>7.00</td>
</tr>
<tr>
<td>Grass Fed</td>
<td>14</td>
<td>6</td>
<td>8</td>
<td>0.200</td>
<td>0.086</td>
<td>2.33</td>
</tr>
<tr>
<td>Presence/ extent of marbling</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>0.186</td>
<td>0.100</td>
<td>1.86</td>
</tr>
<tr>
<td>Colour</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>0.100</td>
<td>0.100</td>
<td>1.00</td>
</tr>
<tr>
<td>Country-of-Origin</td>
<td>11</td>
<td>13</td>
<td>-2</td>
<td>0.157</td>
<td>0.186</td>
<td>0.85</td>
</tr>
<tr>
<td>Local</td>
<td>4</td>
<td>7</td>
<td>-3</td>
<td>0.057</td>
<td>0.100</td>
<td>0.57</td>
</tr>
<tr>
<td>Juiciness</td>
<td>6</td>
<td>12</td>
<td>-6</td>
<td>0.075</td>
<td>0.150</td>
<td>0.50</td>
</tr>
<tr>
<td>Level &amp; Length of Aging</td>
<td>4</td>
<td>17</td>
<td>-13</td>
<td>0.067</td>
<td>0.283</td>
<td>0.24</td>
</tr>
<tr>
<td>Grain Fed</td>
<td>4</td>
<td>18</td>
<td>-14</td>
<td>0.057</td>
<td>0.257</td>
<td>0.22</td>
</tr>
<tr>
<td>Traceability</td>
<td>3</td>
<td>17</td>
<td>-14</td>
<td>0.043</td>
<td>0.243</td>
<td>0.18</td>
</tr>
<tr>
<td>Ounce/Weight</td>
<td>3</td>
<td>20</td>
<td>-17</td>
<td>0.043</td>
<td>0.286</td>
<td>0.15</td>
</tr>
<tr>
<td>Appropriate size of cut</td>
<td>3</td>
<td>23</td>
<td>-20</td>
<td>0.043</td>
<td>0.329</td>
<td>0.13</td>
</tr>
<tr>
<td>Omega 3 Level</td>
<td>3</td>
<td>32</td>
<td>-29</td>
<td>0.043</td>
<td>0.457</td>
<td>0.09</td>
</tr>
</tbody>
</table>
APPENDIX D: Survey Option Example (Picture + Word condition)

In your opinion, which ground beef option guide are you more likely to purchase?

Serving Size: 450 grams = 1 pound

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grass Fed Beef</strong></td>
<td><strong>Hormone Free Beef</strong></td>
</tr>
<tr>
<td><strong>Quality Taste</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Bright Red Color</strong></td>
<td><strong>-</strong></td>
</tr>
<tr>
<td><strong>Lean (17% fat)</strong></td>
<td><strong>Red Color</strong></td>
</tr>
<tr>
<td>$7.00</td>
<td><strong>Medium (23% fat)</strong></td>
</tr>
<tr>
<td></td>
<td>$6.00</td>
</tr>
</tbody>
</table>

(Example of the first choice set for ground beef- picture condition)
APPENDIX E: Survey Option Example (Word condition)

In your opinion, which ground beef option guide are you more likely to purchase?

Serving Size: 450 grams = 1 pound

<table>
<thead>
<tr>
<th>Option A</th>
<th>Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass Fed Beef</td>
<td>Hormone Free Beef</td>
</tr>
<tr>
<td>Quality Taste</td>
<td>-</td>
</tr>
<tr>
<td>Bright Red Color</td>
<td>Red Color</td>
</tr>
<tr>
<td>Lean (17% fat)</td>
<td>Medium (23% fat)</td>
</tr>
<tr>
<td>$7.00</td>
<td>$6.00</td>
</tr>
</tbody>
</table>

(Example of the first choice set for ground beef- word only condition)
How important is the presence/extent of marbling on the meat to you?

<table>
<thead>
<tr>
<th>Importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely important</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Glossary: Marbling
The fat marbling or streaks in the meat. This affects the eating quality of pieces on the meat.

How important is price when you purchase meat?

<table>
<thead>
<tr>
<th>Importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely important</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Glossary: Price
Value of the meat itself on its own without consideration of any other factors.

How important is the taste of the meat you eat?

<table>
<thead>
<tr>
<th>Importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely important</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Glossary: Taste
Taste is how you perceive the quality of the meat.

How important is the tenderness of the meat you eat?

<table>
<thead>
<tr>
<th>Importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely important</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Glossary: Tenderness
Tenderness is how the meat feels when chewing it.

How important is it for you to be able to trace the origin of the meat?

<table>
<thead>
<tr>
<th>Importance</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somewhat important</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extremely important</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Glossary: Traceability
Certifies the meat's origin.

In the next set of questions you will be provided various beef product options. Please select the product you would be more likely to purchase for a regular weekday meal.

Click here to continue
Have you purchased Ground Beef in the past 6 months?

Yes  No

You are about to purchase a package of ground beef. You are offered two options. Both options are about same weight, about one pound or 450 grams.

You are asked to select one option that best meets your needs.

Click here to continue

In your opinion, which ground beef option guide are you more likely to purchase?

Serving Size: 450 grams = 1 pound

Option A
- Good Fat Content
- High Quality
- Bright Red Color
- Lean (15% fat)
- Rich

Option B
- Good Fat Content
- High Quality
- Bright Red Color
- Lean (15% fat)
- Rich

(Please click one option)

In your opinion, which ground beef option guide are you more likely to purchase?

Serving Size: 450 grams = 1 pound

Option A
- Good Fat Content
- High Quality
- Bright Red Color
- Lean (15% fat)

Option B
- Good Fat Content
- High Quality
- Bright Red Color
- Lean (15% fat)

(Please click one option)
In your opinion, which ground beef option guide are you more likely to purchase?

Serving Size: 450 grams = 1 pound

Option A
- Ground Beef
- Healthy Taste
  - 99.1% Fat
  - 8.4g

Option B
- Ground Beef
- Normal Taste
  - 79.7% Fat
  - 8.4g

(Please click one option)

Have you purchased Beef Steak in the past 6 months?

Yes

No

You are about to purchase a package of beef steak. You are offered two options. Both options are about same weight, about half pound or 225 grams. You are asked to select one option that best meets your needs.

Click here to continue

In your opinion, which beef steak option guide are you more likely to purchase?

Serving Size: 225 grams = ½ (0.5) pound

Option A
- Ground Beef
- Healthy Taste
  - 99.1% Fat
  - 8.4g

Option B
- Ground Beef
- Normal Taste
  - 79.7% Fat
  - 8.4g

(Please click one option)

In your opinion, which beef steak option guide are you more likely to purchase?

Serving Size: 225 grams = ½ (0.5) pound

Option A
- Ground Beef
- Healthy Taste
  - 99.1% Fat
  - 8.4g

Option B
- Ground Beef
- Normal Taste
  - 79.7% Fat
  - 8.4g

(Please click one option)
In your opinion, which beef steak option guide are you more likely to purchase?

**Serving Size: 225 grams = 1/4 (0.5) pound**

![Option A]

- Grass Fed Beef
- Gut Troubled
- Red Color
- Canadian AAA
- $5.00

![Option B]

- Grass Fed Beef
- Gut Troubled
- Red Color
- Canadian AAA
- $5.00

(Please click one option)

---

In your opinion, which beef steak option guide are you more likely to purchase?

**Serving Size: 225 grams = 1/4 (0.5) pound**

![Option A]

- Grass Fed Beef
- Gut Troubled
- Bright Red Color
- Canadian AAA
- $5.00

![Option B]

- Grass Fed Beef
- Gut Troubled
- Red Color
- Canadian AAA
- $5.00

(Please click one option)

---

In your opinion, which beef steak option guide are you more likely to purchase?

**Serving Size: 225 grams = 1/4 (0.5) pound**

![Option A]

- Grass Fed Beef
- Gut Troubled
- Quality Tissue
- Bright Red Color
- Canadian AAA
- $5.00

![Option B]

- Grass Fed Beef
- Gut Troubled
- Quality Tissue
- Red Color
- Canadian AAA
- $5.00

(Please click one option)

---

In your opinion, which beef steak option guide are you more likely to purchase?

**Serving Size: 225 grams = 1/4 (0.5) pound**

![Option A]

- Grass Fed Beef
- Gut Troubled
- Bright Red Color
- Canadian AAA
- $5.00

![Option B]

- Grass Fed Beef
- Gut Troubled
- Red Color
- Canadian AAA
- $5.00

(Please click one option)
Before you submit your survey, if you have any opinions regarding this survey, please type in the box below. This will help us to improve our future surveys.

Thank You for Your Time and Patience!
Please sign the incentive sheet and receive your gift card.

Click Here to Finish Your Survey
Hello, I am Neesha (student) from the University of Guelph; I’m interested in knowing your views about beef options. This survey takes about 15 minutes to complete. All information is strictly confidential. You are required to sign the consent form, approved by the Research Ethics Boards at the University of Guelph. For your participation, you will be given a $5 gift card upon completion of the survey.

Would you be willing to participate in this study?
   Yes   No

First, I would ask you a few questions to see if you fall in our target group.

Q1. Are you older than 18 years of age?
   Yes   No

Q2. Do you consume? (mark all that apply)
   Beef   Chicken   Fish   Pork   None

Q3. Have you purchased beef in the past six months?
   Yes   No
APPENDIX H: Consent Form

UNIVERSITY OF GUELPH

CONSENT TO PARTICIPATE IN RESEARCH

Title: Application of Signaling Theory to Food Attributes and its Influence on Consumer Choice

You are asked to participate in a research study conducted by You are asked to participate in a research study conducted by Dr. Vinay Kanetkar, Dr. Joachim E. Barth and graduate researcher, Neesha Mathew, from the Department of Marketing and Consumer Studies at the University of Guelph. The results of this study will contribute to the completion of a Master's thesis

If you have any questions or concerns about the research, please feel free to contact:
Graduate Researcher: Neesha Mathew at nmathew@uoguelph.ca.
Faculty advisors: Dr. Vinay Kanetkar at vkanetka@uoguelph.ca – 519-824-4120 ext 52221, Dr. Joachim E. Barth at ibarth@uoguelph.ca - ext. 54867

PURPOSE OF THE STUDY

The purpose of the study is to understand the addition of food attributes on packaged products and its influence on consumer choice

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

1. Sign and date at the bottom of this consent form after you have read it completely
2. You will be asked a few questions pertaining to your perception of attributes with respect to consuming products
3. Then you will be asked to indicate your preference for one of the products presented
4. You will then start a discrete choice task where you will again indicate your preference for one of the product items presented with additional attribute information
5. Lastly, a debriefing form will explain to you the purpose of the study and our hypotheses
POTENTIAL RISKS AND DISCOMFORTS

There are no foreseeable risks, discomfort or inconvenience to your participation in this research

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

Participant benefits: Insight into the procedure and methods of consumer research to test hypotheses

Society: Aid policy makers, marketers, retailers in understanding the potential impact that food attributes on a product might have on consumer choices

PAYMENT FOR PARTICIPATION

There will be a $5 gift card for participating in this study.

CONFIDENTIALITY

Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study. All data collected will be stored on an encrypted laptop following the University of Guelph’s Encryption Standards. Disposal of data will occur 6 months after the study has been completed.

When reporting the results of the study, your identity will be kept confidential and results will be aggregated.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw before or after you submit your survey. If you choose to withdraw part way through the survey, you must request the withdrawal of the data. You may also request your data to be deleted after submission of the survey. You may also refuse to answer any questions you don’t want to answer and still remain in the study. Partially filled out responses may be used. The investigator may withdraw you from this research if circumstances arise that warrant doing so.

RIGHTS OF RESEARCH PARTICIPANTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, contact:

Director, Research Ethics                  Telephone: (519) 824-4120, ext. 56606
SIGNATURE OF RESEARCH PARTICIPANT

I have read the information provided for the study “Application of Signaling Theory to Food Attributes and its Influence on Consumer Choice” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

____________________________________
Name of Participant (please print)

____________________________________
Signature of Participant

SIGNATURE OF WITNESS

____________________________________
Name of Witness (please print)

____________________________________
Signature of Witness

103
Survey on Food Attributes

Receive a free $5 mall gift card for your participation

Takes approximately 10-15 minutes
APPENDIX J: De-Brief Form

De-briefing form

Title: Application of Signaling Theory to Food Attributes and its Influence on Consumer Choice

Dear Participant,

Thank you for participating in this study. Your time and effort are much appreciated.

The purpose of the study was to understand the effect of attributes such as price, grade, marbling (search), tenderness, taste (experience) hormone-free and grass-fed (credence) on a label. Specifically, if this information influences consumer purchase behavior.

What we did in the study?

This study will provide you with a combination of search, experience and credence attributes as mentioned above and then explore the extent to which you are willing to pay a premium for the given attributes. We wanted to know if adding attribute signals on retail product labels would influence your choice of purchase.

If you have any concerns about your participation after the purpose of the study has been revealed, please discuss this with me. I will be glad to provide any information to help answer questions you may have about this study. You may contact:
Graduate Researcher: Neesha Mathew at nmathew@uoguelph.ca.
Faculty advisors: Dr. Vinay Kanetkar at vkanetka@uoguelph.ca – 519-824-4120 ext. 52221;
Dr. Joachim E. Barth at jbarth@uoguelph.ca - 519-824-4120 ext. 54867

If you have questions about your rights as a research participant, you may contact the University of Guelph Research Ethics Board at:

Research Ethics Coordinator
University of Guelph
437 University Centre
Guelph, ON N1G 2W1

Telephone: (519) 824-4120, ext. 56606
E-mail: sauld@uoguelph.ca
Fax: (519) 821-5236

Please again accept my appreciation of your participation in this study.
SECTION G – SIGNATURES

Responsible Faculty Assurance:

I, [PLEASE PRINT] have the ultimate responsibility for the conduct of the study described in this application including my responsibilities as an advisor to any students involved in this project. I have read and am responsible for the content of this application. If any changes are made in the above arrangements of procedures, or adverse events are observed, I will bring these to the attention of the Research Ethics Coordinator.

Signature

Date
APPENDIX L: Willingness-to-pay (Preferred Condition – Steak)

### Willingness to pay – Steak (Picture + Words)

<table>
<thead>
<tr>
<th></th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Guaranteed Tender</th>
<th>Color</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
</tr>
<tr>
<td></td>
<td>$2.84</td>
<td>-$2.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone Free</td>
<td>Hormone Free</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1.74</td>
<td>-$1.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>Quality Taste</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$0.77</td>
<td>-$0.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed Tender</td>
<td>Guaranteed Tender</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$1.30</td>
<td>-$1.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Red</td>
<td>Bright Red</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-$0.60</td>
<td>$0.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>AAA</td>
<td>AA</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.96</td>
<td>-$0.97</td>
<td>-$1.99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Willingness to pay – Steak (Words Alone)

<table>
<thead>
<tr>
<th></th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Guaranteed Tender</th>
<th>Color</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
</tr>
<tr>
<td></td>
<td>$3.33</td>
<td>-$3.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hormone Free</td>
<td>Hormone Free</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.45</td>
<td>-$2.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td>Quality Taste</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.31</td>
<td>-$2.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed Tender</td>
<td>Guaranteed Tender</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2.13</td>
<td>-$2.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Red</td>
<td>Bright Red</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-$0.65</td>
<td>$0.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>AAA</td>
<td>AA</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$3.08</td>
<td>-$0.10</td>
<td>-$2.98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX M: Willingness-to-pay (Preferred Condition – Ground Beef)

<table>
<thead>
<tr>
<th></th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Color</th>
<th>Marbling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Quality Taste</td>
<td>Red</td>
<td>Extra Lean</td>
</tr>
<tr>
<td>Willingness to pay</td>
<td>$3.18</td>
<td>$1.49</td>
<td>$1.30 $1.30</td>
<td>-$1.62 $1.62</td>
<td>$0.26 $1.27</td>
</tr>
<tr>
<td></td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Bright red</td>
<td>Lean</td>
</tr>
<tr>
<td></td>
<td>-$3.18</td>
<td>-$1.49</td>
<td>-$1.30</td>
<td>$1.62</td>
<td>-$1.53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Grass Fed</th>
<th>Hormone Free</th>
<th>Taste</th>
<th>Color</th>
<th>Marbling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Quality Taste</td>
<td>Red</td>
<td>Extra Lean</td>
</tr>
<tr>
<td>Willingness to pay</td>
<td>$2.88</td>
<td>$3.06</td>
<td>$1.90 $1.90</td>
<td>$0.41</td>
<td>$2.43</td>
</tr>
<tr>
<td></td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
<td>Bright red</td>
<td>Lean</td>
</tr>
<tr>
<td></td>
<td>-$2.88</td>
<td>-$3.06</td>
<td>-$1.90</td>
<td>-$0.41</td>
<td>-$3.67</td>
</tr>
</tbody>
</table>