CONSUMER ACCEPTANCE OF OMEGA-3 ENHANCED BEEF IN SURVEYS AND RETAIL TRIALS

by

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Abstract

This study examines consumer acceptance of omega-3 enhanced beef using data from a choice experiment and a retail trial. The retail trial was conducted in collaboration with La Vaca Meat Company, Littleton, CO which offered omega-3 enhanced beef products for sale both online and in-store. Prices were adjusted periodically, and online customers were surveyed to gather information about their purchase decisions. The choice experiment was included in an online survey conducted with a nationally representative sample of consumers. One version of the survey focused on ground beef and another focused on steak. Within each version separate treatments examined the impact of providing information about how levels of the most beneficial omega-3s could be enhanced in beef. The choice experiment evaluated how variation in meat attributes such as omega-3 content, safety, and tenderness influenced purchase decisions. Data from the choice experiment were analyzed using multinomial logit models. Results indicate that overall acceptance and willingness to pay for omega-3 enhanced beef was below that of grass-fed beef. Additional information about omega-3s increased willingness-to-pay for enhanced omega ground beef, but had no impact on willingness-to-pay for enhanced omega steak. The analysis showed significant heterogeneity in preferences, and, in particular, females had significantly higher willingness-to-pay for grass-fed ground beef than males. Average willingness-to-pay for grass-fed steak was estimated at $3.69/lb above conventionally raised product, compared to an estimated premium of $1.86/lb for enhanced omega steak. For ground beef the average premium for grass-fed product was estimated to be $1.27/lb compared to $0.79/lb for the enhanced omega product.

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Chapter 1 - Introduction

Consumers have become increasingly aware of and interested in their food over the last decade, which has led to changes throughout the food chain (IFIC, 2007; Bemporad & Baranowski, 2007; The Nielsen Company, 2015). The beef industry has made it a priority to better serve its consumers by making improvements in each segment of the industry and continuing to seek opportunities to better meet consumer demands (NCBA, 2015a). In particular, there are opportunities for the beef industry to be a relevant player in "health and nutrition" food sector (Young, 2007; NCBA, 2015b). Alternative livestock diets provide opportunities for nutrient enhancement of beef, which can help meet the increasing demand for healthy foods. While the beef industry keeps pushing towards improvements throughout the supply chain, it must get beef to the table via production techniques that appeal to the consumer and are also efficient and profitable for the industry. This thesis explores the feasibility of producing omega-3 enhanced beef products by measuring consumer acceptance and willingness-to-pay (WTP) for those products.

1.1 Objective

The objective of this study is to investigate consumer acceptance and willingness-to-pay for omega-3 enhanced beef. Consumer acceptance is examined in both a retail trial in which omega-3 enhanced beef steaks and ground beef were sold online and in a small retail outlet, and in a nation-wide survey that included a choice experiment.

1.2 Motivation

This research is motivated by the increasing awareness of omega-3 fatty acids and their health benefits, as well as the beef industry's desire to better meet consumer demands. There is potential for the cattle feeding industry to increase omega-3 levels in beef if there is sufficient demand for the product at a price that makes it feasible for the industry. Consumer acceptance and willingness to pay for enhanced

omega-3 beef must be understood in order to assess the potential profitability of adopting higher cost feeding regimes that can increase omega-3 levels in beef.

1.3 Organization of Thesis

This thesis is presented in five chapters, the first of which is the present introduction. Chapter 2 contains a review of the literature on consumer acceptance of grass-fed beef, a product that contains higher levels of omega-3 fatty acids and is frequently marketed to consumers on that basis. Chapter 3 provides details about the design of the retail trial and choice experiment used to collect data, and about the multinomial logit model used to analyze data from the choice experiment. Chapter 4 presents the results from each portion of the analysis, while Chapter 5 provides a summary of the findings, and the conclusions drawn from the analysis. Limitations of the study are also described and some suggestions for future research provided.

Chapter 2 - Literature Review

A substantial scientific literature deals with the structure and characteristics of omega-3 fatty acids, and the sources of omega-3 fatty acids in foods (Academies, 2005; Bellows, Bunning, & MacDonald, 2010; IFIC, 2009; Martinez, 2013; University of Maryland Medical Center, 2013; Tur, Bibiloni, Sureda, & Pons, 2012). There also are several studies that review the nutritional and health impacts of omega-3 fatty acids (Vinot, et al., 2011; Tocher, 2015; Moyad, 2005; Harris, Miller, Tighe, Davidson, & Schaefer, 2008; DeFilippis & Sperling, 2006; Lavie, Milani, Mehra, & Ventura, 2009; He, 2009), but most of those studies evaluate fish consumption as the source of omega-3s. We are not aware of any studies that specifically evaluate the nutritional impacts of beef products as a source of omega-3 fatty acids.

On the animal production side there is some literature on feeding flax seed to cattle to increase omega-3 levels, but very few studies on feeding algae as a means of omega-3 enhancement. Several studies have examined consumer preferences for beef attributes including grass-fed, but, to our knowledge, only one study with Canadian consumers (Emunu, McCann-Hiltz, & Hu, 2012) investigates willingness-to-pay (WTP) for omega-3 enhanced beef.

2.1 Omega-3 Fatty Acids: Awareness and Background

Public awareness of health issues is increasing and, according to the nationally representative International Food Information Council (IFIC) 2011 Functional Foods/Foods for Health Consumer Trending Survey, 73% of American consumers believe that food and nutrition play “a great role” in maintaining or improving overall health (IFIC, 2011). In particular, issues related to heart health are of considerable concern with 46% of American consumers identifying cardiovascular disease (which includes heart disease, heart attack, high blood pressure, high cholesterol, and stroke) as their top overall health concern (IFIC, 2011). As this topic continues to be in the media and a priority for consumers, food companies are offering more products with health and nutrition-related (HNR) claims (Martinez, 2013).

These claims were made on 43% of new foods and beverages in 2010, and included claims of low in fat, high in fiber, or formulated with some other positive nutrition or health attribute (Martinez, 2013). One segment of health foods seeing an increase in new product offerings is functional foods. According to IFIC, functional foods are defined as "foods and food components that may provide benefits beyond basic nutrition" (IFIC, 2011, p. 9). Functional food are believed to improve health and well-being, as well as reduce the risk of certain diseases (IFIC, 2011). While estimates of growth in this market segment vary due to the lack of complete agreement on what foods are considered functional foods, there has been increased demand for functional foods, especially by health-conscious baby boomers (Functional Foods, 1998).

An example of a functional food category is foods that contain antioxidants and omega-3 fatty acids. These foods have potential to improve overall health and are promoted for their role in improving cardiovascular health. According to the U.S. Department of Agriculture Economic Research Service (USDA ERS), from 2001 to 2010, products with omega-3 related claims showed the 10th largest percentage-point increase among HNR claims (Martinez, 2013). In the 2013 IFIC Functional Foods Consumer Survey, when respondents were asked how much omega-3 fatty acids they get, 21% said "enough to get a health benefit beyond my minimum needs," while 29% indicate they are getting "just enough omega-3 fatty acids to meet their needs" (IFIC, 2013). This leaves the other 50% of respondents to get "some, but not enough to meet needs," "none," or are "not sure" how much they get (IFIC, 2013).

Meanwhile, there is research that suggests that consumers may not choose omega-3 enhanced beef to fulfill their need for more omega-3 fatty acids (IFIC, 2013). In fact, 68% of respondents in the 2013 IFIC survey either strongly like or somewhat like the idea of getting health promoting nutrients and food components from vitamins or supplements (IFIC, 2013). An additional finding from the 2013 IFIC survey is that 52% of consumers chose breakfast time as their first choice for when they are more likely to include "foods that have nutrients or other food components that promote good health." Lunch was chosen first 7% of the time, dinner was chosen first only 8% of the time, and the remainder chose snack

times. Furthermore, respondents were most likely to think that infants and toddlers benefit more from functional foods than other age groups (IFIC, 2013). Additionally, price was the reason that was selected most frequently as to why consumers do not consume more health-promoting foods (IFIC, 2013).

What are omega-3 fatty acids?

Omega-3 polyunsaturated fatty acids are highly unsaturated long chain fatty acids, which include alpha-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoicacid (DHA). The most common type of omega-3 fatty acids is ALA, which comes from plants. A lack of ALA is shown to cause adverse clinical symptoms, including neurological abnormalities and poor growth (Academies, Dietary fats: Total fat and fatty acids, 2005). ALA also serves as a precursor for the synthesis of EPA and DHA (Academies, Dietary fats: Total fat and fatty acids, 2005). To form EPA and DHA, ALA is desaturated (addition of a double bond) and elongated (addition of two carbon atoms) by desaturase and elongase enzymes to form EPA, which is then desaturated further to form DHA (Academies, Dietary fats: Total fat and fatty acids, 2005). DHA and EPA are found in some foods. While DHA and EPA have the strongest health benefits and are critical during times of rapid growth and development, they are very low in the American diet (Bellows, Bunning, & MacDonald, 2010). Because the rate of conversion of ALA to EPA and DHA is low, consuming more EPA and DHA has the potential to considerably improve health (Bellows, Bunning, & MacDonald, 2010).

Benefits of Omega-3 Fatty Acids

In the 1970s, studies of Greenland Inuit populations began to observe lower levels of coronary heart disease compared to those found in other populations. The finding was attributed to higher levels of fish and marine animal consumption (IFIC, 2009). Since then, evaluation of other populations with high fish consumption have shown similarly low rates of coronary heart disease and, therefore, raised interest and awareness of the benefits of a diet rich in omega-3 fatty acids (IFIC, 2009).

Omega-3 fatty acids have anti-inflammatory and anti-clotting effects that are credited with reducing the risk of heart disease, slowing artery wall thickening, and lowering the incidence of irregular heartbeats (IFIC, 2009). There is also research to suggest they provide other health benefits (Bellows, Bunning, & MacDonald, 2010; University of Maryland Medical Center, 2013). Consuming omega-3 fatty acids can improve overall health by delaying the onset of many age-related conditions including high cholesterol and blood pressure. Omega-3 consumption may also delay the onset of diseases such as some forms of cancer and arthritis (IFIC, 2009; Academies, Dietary fats: Total fat and fatty acids, 2005; Martinez, 2013; University of Maryland Medical Center, 2013; Bellows, Bunning, & MacDonald, 2010). In addition to preventing these chronic diseases, omega-3 fatty acids are important for normal growth and development, as well as for cognitive and behavioral brain function, and have been shown to lower the incidence of depression (IFIC, 2009; Academies, Dietary fats: Total fat and fatty acids, 2005; University of Maryland Medical Center, 2013). Emerging research also shows that an increased level of omega-3 fatty acid consumption has the potential to reduce the risk of bone loss and the risk of neurological disorders such as Alzheimer's disease (IFIC, 2009). Additionally, EPA has important effects on fatty acid metabolism and DHA is enriched with components that improve vision, the nervous system, and brain functions for adults, and especially pregnant females, fetuses, and infants (Academies, Dietary fats: Total fat and fatty acids, 2005; Bellows, Bunning, & MacDonald, 2010). DHA may reduce the risk for premature birth. DHA also occurs naturally in human milk so infants acquire DHA from their mothers, which is critical in the first six weeks of life (Bellows, Bunning, & MacDonald, 2010). In 2001, the FDA approved DHA supplementation in infant formula to support optimal brain and eye development (Bellows, Bunning, & MacDonald, 2010).

For healthy individuals without heart disease, consuming EPA and DHA together may reduce the risk of death from cardiovascular incidents (Bellows, Bunning, & MacDonald, 2010). EPA and DHA may also reduce the risk of non-fatal strokes and heart attacks, as well as death from cardiovascular disease for individuals with existing coronary heart disease or high risk for cardiovascular incidents (Bellows,

Bunning, & MacDonald, 2010). Omega-3 fatty acids are shown to calm the heart's rhythm and counteract potentially fatal, inconsistent rhythms (Bellows, Bunning, & MacDonald, 2010). In individuals who have diabetes or other conditions that increase the risk of developing cardiovascular disease, omega-3 fatty acid consumption helps lower levels of triglycerides and cholesterol in the blood (IFIC, 2009; Bellows, Bunning, & MacDonald, 2010). According to Colorado State University research, very high triglycerides may be decreased by 20 to 50% with a dose of 2 to 4 grams of EPA and DHA per day given as capsules (Bellows, Bunning, & MacDonald, 2010).

Recommended Omega-3 Intake Level

Although the U.S. government does not currently have a recommended daily intake level of omega-3s, health organizations suggest an EPA and DHA intake of at least 250 to 500mg per day for healthy individuals (Oregon et al, 2011). To reach the recommended level of 250 to 500mg per day, the 2010 Dietary Guidelines for Americans, and the American Heart Association and World Health Organization advise consuming seafood twice per week (Oregon et al, 2011). The American Heart Association suggests consuming one portion of oily fish and one portion of lean fish per week to obtain an average of 430mg/day of DHA and EPA (Tur, Bibiloni, Sureda, & Pons, 2012). For people with coronary heart disease, the American Heart Association recommends 1,000 mg of EPA and DHA per day (Oregon et al, 2011).

Sources of Omega-3 Fatty Acids

Only a small portion of ALA, found in plant cells, is converted into DHA and EPA, which are found only in animal tissues (Academies, 2005). Common sources of omega-3 fatty acids are shown in Table 2.1, which was adapted from the International Food Information Council and the study by Tur, Bibiloni, Sureda, and Pons (2012).

Table 2.1 Sources of Omega-3 Fatty Acids

Name	Abbr.	Common Food Sources
alpha-linolenic acid	ALA	Walnuts, flaxseed, soybeans, canola and their oils
eicosapentaenoic acid	EPA	Flaxseed, cold-water fatty fish* and fish oils, krill oil
docosahexaenoic acid	DHA	Cold-water fatty fish* and fish oils, algal oils, krill oil

***Examples of fatty fish include herring, salmon, mackerel, and tuna**

While fish is the most common and readily available source of EPA and DHA, many consumers do not consume fish for various reasons. These reasons could include lack of availability due to geographic location, safety concerns, or ethical reasons. Concerns about potential health risks in fish arise from the existence of environmental contaminants and pollutants such as methylmercury (MeHg) (Tur, Bibiloni, Sureda, & Pons, 2012). MeHg can be discharged into lakes and oceans via rainwater and then into an organic form, which is absorbed and transported by fish (Tur, Bibiloni, Sureda, & Pons, 2012). The level of MeHg in fish depends upon environmental contamination in the area, as well as the type of fish. Fish that eat other fish for food (shark, tuna, swordfish, and orange roughy) have higher levels of MeHg, while non-predatory fish with shorter lives (sardines, salmon, flounder, canned light tuna, and shrimp) have lower levels. Adverse health effects from MeHg are well documented (Tur, Bibiloni, Sureda, & Pons, 2012).

For individuals who do not consume fish but are concerned about their omega-3 intake, particularly DHA, algal oils are useful. Algal oils are well tolerated and rarely cause gastrointestinal discomfort, which can be important for individuals on a high-dose regimen (Tur, Bibiloni, Sureda, & Pons, 2012). Other non-fish omega-3 sources include plant sources such as flaxseed and flaxseed oil, walnuts and walnut oil, and canola oil, which provide ALA. A recently identified source of DHA and EPA is krill oil, which comes from a marine crustacean. Though krill oil is not a traditional food, it is a significant source of high-quality protein and is low in fat (Tur, Bibiloni, Sureda, & Pons, 2012).

In addition to dietary supplements, there also are increasingly more products fortified with omega-3 fatty acids, including dairy products, eggs, cereals, spreads, and beverages (IFIC, 2009). Though omega-3 meat sources other than fish are limited, some companies are developing these options by supplementing feed rations of beef, hogs, and chickens with grains rich in ALA, including soybeans, flaxseed, and canola (Emunu, McCann-Hiltz, & Hu, 2012). These meat options provide omega-3 fatty acids in the form of ALA, but do not provide a significant amount of DHA and EPA, which are the most valuable omega-3 fatty acids. If livestock diets were supplemented with fish products instead of seed products, levels of EPA and DHA may increase. However, in some cases these fish products can negatively impact the sensory attributes of the meat.

2.2 Beef with Higher Omega-3 Fatty Acid Levels

As a result of the growing demand for omega-3 enriched foods, scientists and beef producers have been researching ways to enrich beef's nutrient composition with beneficial fatty acids. Research at Kansas State University showed that feeding flax seed to cattle increased the omega-3 content in meat tissue. However, the fatty acids gained were primarily ALA (LaBrune, Reinhardt, Dikeman, & Drouillard, 2008). The omega-3 fatty acids found in seafood are derived from phytoplankton, the small aquatic plant cells that are a source of food for many aquatic organisms (Oregon et al, 2011). Thus, additional studies at Kansas State University are being conducted to investigate the effects of including algae supplements in rations for beef cattle.

According to K-State beef cattle nutritionist Professor Jim Drouillard, the most recent studies show that by adding natural algae to the diet, levels of EPA and DHA omega-3 fatty acids in the lean and fat tissue of the meat are increased substantially (Personal communication, 2015).

Table 2.2 compares omega-3 fatty acid levels and composition for conventional beef, omega-3 enhanced beef from recent K-State feeding trials, and salmon, which is one of the highest sources of

omega-3 fatty acids. The third column in table 2.2 indicates the proportion of the more beneficial DHA and EPA fatty acids, with the remainder being ALA.

Table 2.2 Omega-3 Fatty Acid Levels of conventional beef, enhanced beef, and salmon

Nutritional Information

Product	Omega-3 fatty acids/mg /5 oz. serving	Omega-3 fatty acid composition
Ground beef*	20-30	
La Vaca Omega-3 ground beef*	200 or more	50% DHA and EPA
Strip steak*	20-30	
La Vaca Omega-3 strip steak* (High choice - Prime)	190 – 400 or more in lean tissue (for 0.7-1.1 lb. steaks)	67% DHA and EPA
Salmon#	2000 or more	95% DHA and EPA

EPA = eicosapentaenoic acid, DHA = docosahexaenoic acid

***Beef nutritional information determined by the Kansas State University Animal Sciences and Industry Muscle Biology Laboratory**

#Salmon nutritional information determined by Oregon State University research

2.3

Consumer Preferences and WTP for Omega-3 Enhanced Meat

A number of studies have shown that consumers have an increased awareness of grass-fed beef and are willing to pay premiums for grass-fed beef compared to conventionally raised beef (Gwin, Durham, Miller, & Colonna, 2012; Evans, D'Souza, Collins, Brown, & Sperow, 2011; Xue, Mainville, You, & Nayga Jr. , 2010).

A 2010 study by Xue, Mainville, You, and Nayga Jr. uses non-hypothetical in-store experiments in three different cities to evaluate consumer preferences between grass-fed beef and conventional beef, and consumer willingness to pay for grass-fed beef. One of the key factors evaluated in the study was the impact of the level of consumer knowledge about grass-fed beef. Xue et al. (2010) found that higher levels of knowledge about nutrient functions were associated with increased willingness to pay for grass-fed beef. The study also found that consumers who prepare and eat beef at home more frequently were willing to pay more for grass-fed beef. The results suggested that it may be beneficial to provide health

and nutrition information with educational materials at the point of sale in the store or via advertising (Xue, Mainville, You, & Nayga Jr., 2010).

Evans et al. (2011) study used in-store taste tests and experimental auctions to evaluate willingness-to-pay for grass-fed beef and found that the average bid to upgrade to a grass-fed steak was $2.28. In that study, 53% of participants would pay a $1.00/lb premium for grass-fed steak, 40% would pay $2.00/lb, and at $4.00/lb at least 20% of the sample would purchase the grass-fed product. Gwin et al. (2012) used choice-based conjoint analysis, incorporating a taste test, to evaluate willingness-to-pay for grass –fed beef. Results indicated that a baseline, uniformed consumer would pay $0.90-$0.94/lb premium for grass-fed ground beef compared to conventional ground beef.

While it is clear that consumers are willing to pay a premium for grass-fed beef, it is possible that consumers view the grass-fed attribute as a cue attribute. Cue attributes are used as a proxy for overall food quality and as indicators of the presence of other attributes (Loureiro & Umberger, 2003; Gao, Schroeder, & Yu, 2010; Gao & Schroeder, 2009; Gao & Schroeder, 2009). In the case of grass-fed beef, consumers likely use it as a signal for the presence of other attributes including animal welfare and environmental impacts, as well as health properties (Gwin, Durham, Miller, & Colonna, 2012).

Information held by the consumer or provided to them during the experiment is another factor that influences consumer willingness-to-pay. While several studies have shown that providing information affects the WTP for grass-fed beef (Lusk & Parker, 2009; McCluskey, Wahl, Li, & Wandschneider, 2005; Thilmany, Umberger, & Ziehl, 2006; Umberger, Boxall, & Lacy, 2009; Xue, Mainville, You, & Nayga Jr. , 2010), Gwin et al. (2012) found that prior knowledge is more influential than providing information during a test. This finding, in addition to the increase in general knowledge and awareness of grass-fed beef supports that WTP premiums for grass-fed beef are likely to be high.

Emunu, McCann-Hiltz, and Hu (2012) evaluated Canadian consumer WTP for omega-3 meat using a double-bounded choice valuation approach in a nationwide survey. WTP. Results indicated that smaller households, households with higher incomes, and households that had previously purchased an

omega-3 product were willing to pay a premium for omega-3 beef, pork, and chicken (Emunu, McCann-Hiltz, & Hu, 2012). Mean WTP was calculated for each of the three meats, with results showing highest WTP for beef. For households that previously purchased omega-3 meat, results predicted a $1.41/kg ($0.64/lb) premium for sirloin steak (beef), compared to a $0.71/kg ($0.32/lb) premium for households that had not previously purchased omega-3 meat. For all three types of meat, age and education level did not have a statistically significant impact on WTP. The findings from this study suggest the existence of a potentially profitable market for the meat sector in supplying omega-3 enhanced products.

Chapter 3 - Methodology

3.1 Cattle Feeding Trials

Feeding trials at the Kansas State University animal research facilities took place between January and May 2014. Cattle in the trial were fed 50g or 100g of algae per day, in addition to a conventional feed ration that included corn, alfalfa, proteins, and vitamins.

After the animals were harvested, the meat tissue was analyzed at the Kansas State University Animal Sciences and Industry Muscle Biology laboratory where the exact levels of fatty acids were collected. The composition of omega-3 fatty acids was evaluated to determine the exact levels for each steak and package of ground beef. As was shown in Table 2.2, there are varying levels of omega-3 fatty acids per steak, because it is dependent upon each animal's intake of feed and how it is absorbed in the body. It also varies due to the range of steak sizes, with larger steaks having higher omega-3 levels. Additionally, the estimated levels of omega-3's in each strip steak is only for the lean tissue, therefore higher levels may actually be consumed if consumers eat any of the fat on the steaks when cooked. Omega-3 levels in ground beef can be measured more easily because the meat is a mixture of lean and fat. For the ground beef products from this trial there was at least 200 milligrams of omega-3 per 5-ounce serving (typical size of ground beef patty sold).

3.2 Selling Omega-3 Enhanced Beef

The La Vaca Meat Company of Littleton, Colorado, agreed to offer the algae-fed, omega-3 enhanced ground beef and strip steaks to its customers via online sales and their small boutique meat store. The omega-3 beef products were sold frozen and packaged using La Vaca Meat Company's regular packaging with the addition of a small, 1½-inch "Omega-3" sticker. The retail trial used 300 16-ounce packages of ground beef and 300 strip steaks sold in two separate size categories: 11-ounce and 16-ounce. Prices were adjusted during the time the products were offered. This pricing plan is discussed in more detail later in this section. All point-of-sale data were recorded by La Vaca staff and shared with the

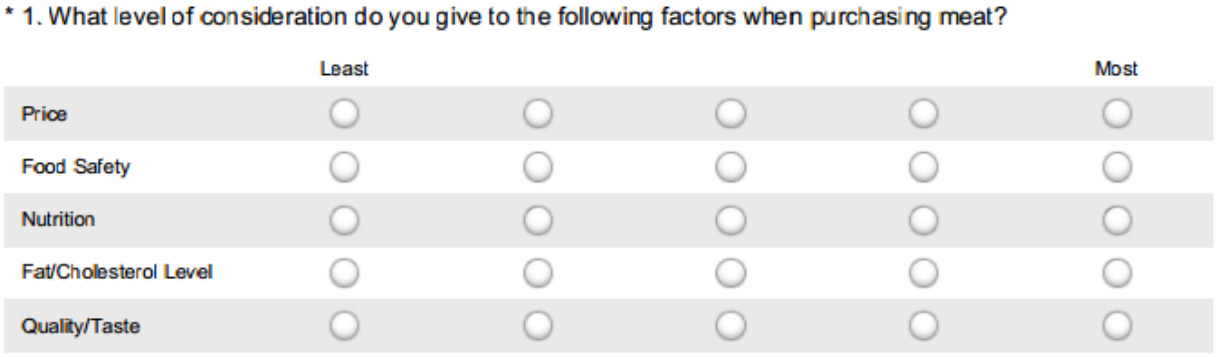
researchers throughout the duration of the study. When customers made a purchase via the La Vaca Meat Co. website, they were prompted to take a short survey.

3.2.1 La Vaca In-Store and Online Survey: Sample and Data Collection

The goal of the La Vaca customer survey was to elicit reasons why the consumer did or did not purchase omega-3 enhanced ground beef or strip steak. . Respondents were asked whether they did or did not purchase ground beef and if they did, they were asked whether they purchased omega-3 enhanced ground beef. They then were directed to select reasons why they did or did not purchase the enhanced omega product. Included among the options for not purchasing was that the respondent was not aware that the omega-3 product was available. The same process existed for those purchasing steak. The flow of questions used is included in Appendix A with the rest of the survey.

In addition to questions about their purchase decision, consumers were asked to provide demographic information and indicate how much consideration, from least to most, they gave to price, food safety, nutrition, fat/cholesterol level, and quality/taste when purchasing meat.

Figure 3.1 La Vaca Customer Survey – Level of Concern



After completing the survey, consumers were eligible to enter a voluntary drawing for 2 free steaks from La Vaca Meat Co.

Price Plan

While the enhanced omega3 product was being sold via the online and physical La Vaca stores, prices were periodically adjusted in an effort to predict market share at different price premium levels. On May 23, 2014, at the beginning of the trial, omega-3 product was priced at a 15% premium to the per-pound prices of the equivalent non-omega product in the respective categories of ground beef and strip steaks (80/20 Chuck Steakburger and Top Tier Choice N.Y. Strip steaks). After 75 days, prices were adjusted to a 30% premium. After an additional 51 days, prices were adjusted back to a 15% premium, and then, after another 49 days, they were changed to a 0% premium for 53 days. Table 3.1 indicates the exact dates for the price adjustments, number of days at each premium level, and the prices for the omega enhanced products adjusted to incorporate the premiums specified for each period.

Table 3.1 Price Adjustment Time Periods

Dates	# of Days	Price Premium	Enhanced Omega Ground Beef Price	Enhanced Omega Steak Price
May 23, 2014-August 5, 2014	75	15%	$6.41/lb	$24.53/lb
August 6, 2014-Sept. 25, 2014	51	30%	$7.24/lb	$27.73/lb
Sept. 26, 2014-Nov. 13, 2014	49	15%	$6.41/lb	$24.53/lb
Nov. 14, 2014-Jan. 5, 2015	53	0%	$5.57/lb	$21.33/lb

Collection of Data

Throughout the adjustment of prices, all sales information was recorded. Additionally, the survey responses from online customers were collected through SurveyMonkey.com. Once all data was collected from the online and physical store customers, they were organized and analyzed to determine how much product was sold over the different time periods compared with the corresponding traditional product offerings by La Vaca. The survey data collected from the online customers was very limited (n=115 from May 23, 2014 to July 27, 2015) and fewer than 10% of the observations were from respondents who purchased an omega-enhanced product. Results, though limited, are discussed in Chapter 4.

3.3 National Survey Sample and Data Collection

To target a nationally representative sample of beef consumers, two surveys were created – one addressing steak attributes ("National Omega-3 Survey – Steak") and one addressing ground beef attributes ("National Omega-3 Survey – Ground Beef"). The surveys were administered to a Survey Monkey Audience panel of adults (18 years and over) who had purchased a beef product within the previous 30 days.

Both surveys included questions to assess the following: 1) frequency of consumption for various meat products, 2) expenditure on food consumed at home, 3) experience with grass-fed beef and impressions of grass-fed beef compared to conventional beef, 4) exercise frequency, medical issues, 5) dietary changes and supplements, 6) concern for various food related issues, and 7) level of knowledge about omega-3 fatty acids. Respondents were directed to either a high information or low information treatment before completing the choice experiment section of the survey. The high information treatment provided the respondent more information about the different types of omega-3 fatty acid, the fact that EPA and DHA types had more health benefits, and the fact that cattle diets supplemented with algae resulted in beef products with higher levels of EPA and DHA than beef from either grass-fed or conventionally raised cattle.

The high-information treatment read as follows:

> "Omega-3 fatty acids are highly unsaturated long chain fatty acids. Nutritional and health studies suggest that omega-3 fatty acids can be beneficial to health. They may help reduce cholesterol and blood pressure, and may reduce the chance of heart disease and cancer.
>
> There are three types of omega-3 fatty acids: alpha-linolenic acid (ALA), eicosapentaenoic (EPA), and docosahexaenoic (DHA). The most common is ALA, which comes from plant sources such as walnuts, flaxseed, canola and soybeans. DHA and EPA, which are only found in animal tissues, have the greatest health benefits. The American Heart Association recommends DHA/EPA intakes of 250 to 500 mg per day.
>
> Fish such as salmon, herring and tuna are among the best sources of DHA/EPA with salmon providing up to 400 mg/ounce. Beef from cattle fed with supplements derived from algae has recently been found to provide up to 100 mg/ounce of omega-3 fatty acids with more DHA/EPA than grass-fed or conventionally raised beef."

The low-information treatment read as follows:

> "Omega-3 fatty acids are highly unsaturated long chain fatty acids. Nutritional and health studies suggest that omega-3 fatty acids can be beneficial to health. They may help reduce cholesterol and blood pressure, and may reduce the chance of heart disease and cancer."

The goal was for the information treatments to be applied equally to half of the respondents in each survey. The actual breakdown was close to 50/50 with 53.7% of the ground beef survey respondents and 51.4% of the steak survey respondents participating in the high-information treatment.

Following the choice experiment questions respondents were asked to indicate their level of confidence in the choices they had just made and their level of confidence in potential health benefits of omega-3 fatty acids. The final questions in the survey elicited demographic information including household size, presence of children in the household, and the respondent's level of education. Other demographic information including age, gender, income, and region of the U.S. were provided by Survey Monkey.

Choice experiments (CE) offer a real-life buying situation with the flexibility to measure multiple attributes and their influence on a consumer's willingness to pay (Lusk, Roosen, & Fox, 2003). The most common use of CE in valuation experiments includes a design with a limited number of attributes (Pozo, Tonsor, & Schroeder, 2012). However, researchers have found that consumers develop inferences about the attributes beyond the information they are given (Kardes, Posavac, & Cronley, 2004) and about other attributes (Huber & McCann, 1982). From this, Pozo, Tonsor, & Schroeder (2012) concluded that CE respondents made choices by mixing visible attributes and inferred attributes, and this correlation between attributes influences the impact on marginal values. Therefore, carefully choosing which attributes are included in a CE design is critical to getting robust WTP results. The typical approach to utilizing CEs is to only provide the respondents with one CE design. While some researchers have done studies where they used two different designs to get WTP estimates (Gao & Schroeder, 2009; Tonsor, 2011), there is no conclusive evidence that says what the correct number of CE designs or number of attributes should be (Pozo, Tonsor, & Schroeder, 2012).

A 2012 study by Pozo, Tonsor, and Schroeder evaluated the impact of the choice experiment (CE) design when including or excluding different attributes. Using Multinomial Logit (MNL) and Random Parameters Logit (RPL) they found that the combinations of attributes used, as well as consumer inferences about the attributes influenced estimated WTP and consumer welfare (Pozo, Tonsor, & Schroeder, 2012). The implications from this study are that researchers could be getting WTP estimates that are not robust to different specifications when they limit their studies by only using certain attributes in their CE design. Due to these findings, careful consideration was given when choosing the attributes for both choice experiments. While it is difficult to create the scenario of an exact label, based on current market offerings it was determined that the attributes chosen were relevant and important to consumers when they are choosing ground beef and steak products at the retail counter.

Steak Survey Choice Experiment Design

The choice experiment design for the steak survey included the attributes price, tenderness, omega-3 level, and locally raised at various levels as shown in Table 3.2. The baseline price was selected to correspond to that of a current offering of strip steak at Sam's Club in Topeka, Kansas, which was collaborating with the researchers on an additional retail trial for omega-enhanced products. The higher prices were selected to represent premiums of approximately 20% and 40%.

Table 3.2 Steak Survey Choice Experiment Attributes and Levels

D-efficiency: 93.8			
Price	1	2	3
	10.99	13.19	15.39
Tenderness	1	2	
	Guaranteed Tender	No Label	
Omega 3	1	2	3
	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving
Locally raised	1	2	
	Yes	No	

This combination of attributes and their levels led to 4 different blocks with 9 questions in each block. Statistical Analysis Software (SAS) was used to generate a design as shown in Appendix B with a D-efficiency score of 93.8, which is close to the efficiency of a balanced orthogonal design of 100. Each respondent saw 9 questions from one block. Each question included 3 steak alternatives and another option to not choose any of the alternatives. This design was used to create the 36 questions – each with 3 combinations of the various attributes and their different levels – used in the steak survey. Figure 3.2 is an example of one of the 9 questions shown to respondents in the steak survey.

Figure 3.2 Steak Survey Block 3 Question Set 2

	Option A	Option B	Option C	None
Price	$13.19/lb	$10.99/lb	$13.19/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	

	Option A	Option B	Option C	None
Please select one	○	○	○	○

Respondents were directed to different blocks as part of the survey logic executed through Survey Monkey. The distribution of respondents to the 4 blocks in the steak survey is described in Table 3.3.

Table 3.3 Steak Survey Distribution among CE Blocks

Blocks	Block 1	Block 2	Block 3	Block 4	Min	Max	Response Count
Steak Survey	59	35	44	45	35	59	183
Percentage	***32.24%***	***19.13%***	***24.04%***	***24.59%***		***Average: 25%***	

Both survey designs also accounted for potential interaction effects between the grass-fed beef omega-3 level and the locally raised attribute. The surveys in their entirety can be found in Appendix C. While the choice experiment was hypothetical and no real money or product was being exchanged, the survey's instructions did include a brief "cheap talk" script that provided information to the survey

respondents about the concept before they began the choice experiment. This is done to reduce hypothetical bias and produce more reliable willingness-to-pay estimates (Tonsor & Shupp, 2011).

Ground Beef Choice Experiment Design

The choice experiment for the ground beef survey included the following attributes: price, a food safety treatment, omega-3 level, locally raised, and lean-to-fat ratio. Attribute levels are shown in Table 3.4. The baseline price of $3.79/lb was similar to the price of ground beef offered for sale at Sam's Club in Topeka, Kansas. As in the steak survey, the higher prices were selected to represent premiums of approximately 20% and 40%.

Table 3.4 Ground Beef Survey Choice Experiment Attributes and Levels

D-efficiency: 95.91			
Price	1	2	3
	3.79	4.59	5.29
Food Safety	1	2	3
	Regular inspection	Inspection plus steam pasteurization	Inspection plus irradiation
Omega 3	1	2	3
	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving
Lean-to-fat ratio	1	2	
	90/10	80/20	
Locally raised	1	2	
	Yes	No	

This combination of attributes and their levels led to a design with 8 different blocks with 9 questions in each block. Statistical Analysis Software (SAS) was used to generate a design as shown in Appendix B with a D-efficiency score of 95.91. Each respondent saw 9 questions from one block, and each question included 3 ground beef alternatives and an option to not choose any of the alternatives. This design was used to create the 72 questions – each with 3 combinations of the various attributes and their different levels – used in the ground beef survey. Figure 3.3 is an example of a question from the ground beef survey.

Figure 3.3 Ground Beef Survey Block 1 Question Set 1

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	80/20	90/10	

	Option A	Option B	Option C	None
Please select one	○	○	○	○

The distribution of respondents to the 8 blocks in the ground beef survey is described in Table 3.5. Each person only saw one block of 9 questions.

Table 3.5 Ground Beef Survey Distribution among Choice Experiment Blocks

Blocks	**Block 1**	**Block 2**	**Block 3**	**Block 4**	**Block 5**	**Block 6**	**Block 7**	**Block 8**	**Min**	**Max**	**Response Count**
	45	47	38	59	45	53	43	44	38	59	374
Percentage	***12.03%***	***12.57%***	***10.16%***	***15.78%***	***12.03%***	***14.17%***	***11.50%***	***11.76%***		**Average: 12.5%**	

Survey Execution

The surveys were administered online using Survey Monkey's opt-in audience recruiting system to gather an adult population (18 years +) that included only respondents who had purchased beef in the 30 days before the survey was sent out. Using this service, a specific number of completed responses was selected and paid for. Incomplete surveys were discarded. . Questions for the surveys were developed and then added to the online platform and a Survey Monkey account representative was available to assist with survey design and execution. Once all the questions and logic were applied, the cost per response was $5.50. The project budget allowed for 528 total responses, with 352 allocated to the ground beef survey and 176 to the steak survey since there were twice as many CE blocks in the ground beef survey.

Prior to administering the survey, a pre-test was conducted with a group of graduate students and faculty. Feedback from the pretest was taken into consideration for final edits before the surveys was administered.

Once the surveys were ready to go out, an email was sent to the Survey Monkey representative giving them the approval to begin data collection. Within 18 hours, there were already more than enough

surveys completed and Survey Monkey allowed the extra responses to be kept without having to pay extra for them. In total, 557 complete responses were collected - 374 to the ground beef survey and 183 to the steak survey.

Survey Data Collection

The data collected from the online surveys was exported via Excel files (in numeric form) to begin cleaning and organizing for further analysis.

3.4 Models

3.4.1 Choice Experiment

With stated preference methods such as choice experiments, consumers are assumed to make choices that maximize their utility. When presented with a choice, it is assumed that respondents choose the alternative with the combination of attributes providing them with the most utility. In a conditional multinomial logit model, random utility theory is assumes that the utility for individual *i* from an alternative j is $U_{ij} = V_{ij} + \varepsilon_{ij}$. In this equation, V_{ij} is the systematic portion of utility, which includes the influence of attributes and their levels and ε_{ij} is a random, unobservable term with an IID extreme value distribution (Train, 2003).

This conditional multinomial logit model (MNL) assumes parameters are homogenous across all respondents, which may be an overly restrictive assumption. However it is a good starting point for empirical analysis (Hensher & Greene, 2003). To overcome the limitation of homogenous preferences, a mixed logit model – like a random parameters logit (RPL) model – can be used. This type of model allows for evaluation of heterogeneity within the population (McFadden & Train, 2000).

In either the MNL or RPL models, willingness-to-pay estimates can be computed from (individual-specific in RPL) attribute parameters and the (typically fixed) price parameter as the negative ratio between the attribute and price parameters: $WTP_{ki} = -\frac{\beta_{ki}}{\beta_1}$ where β_1 represents the price parameter.

3.4.2 Multinomial Logit

The coefficients found using the simple multinomial logit (MNL) model are helpful in identifying preferences broadly, by their sign and magnitude in relation to the rest of the attribute coefficients. However, they do not provide any indication of relative heterogeneity in preferences. In order to evaluate heterogeneity, a random parameters model was estimated.

Chapter 4 - Results

The results from the retail trial discussed in Chapter 3 were limited and difficult to interpret. Therefore, this results section is primarily comprised of the econometric results gleaned from multinomial logit and random parameters logit models.

4.1 Retail Sales Trial Results

Throughout the process of the La Vaca retail sales trial, efforts were made to maintain contact with the store and get regular updates of the sales. While all sales receipts were collected from the online and in-store sales, analysis of these sales proved to be a challenge. There were several difficulties related to lack of control with the experiment and the limited sales that made analysis difficult.

Initial expectations were that omega-3 enhanced beef products would sell well with La Vaca given the nature of their store (small, local, boutique meat store). It was expected that sales would increase when prices decreased. However, the data actually showed that enhanced omega sales were actually the lowest during the period of the lowest prices – a 0% premium. The result is difficult to explain but it did occur during the holiday season in which La Vaca's primary sales were Prime Rib, steak bundles, and filets. Out of the four time periods, the time period in which both omega-3 products (steak and ground beef) had their highest share of sales within their category (e.g. all ground beef and all steak-excluding bundles), was during Period 3 (September 26, 2014-November 13, 2014), when there was a 15% premium: omega-3 ground beef at $6.41/lb and omega-3 strip steak at $24.53/lb. During this time period, omega-3 ground beef accounted for 23.7% of the sales volume. In the same time period, the omega-3 strip steaks accounted for 5.69% of sales volume. Table 4.1 summarizes the sales data.

Table 4.1 Omega-3 vs. Total Sales Volumes

Volume (lbs)	May 23-Aug. 5 (15% premium)	Aug. 6-Sept. 25 (30% premium)	Sept. 26-Nov. 13 (15% premium)	Nov. 14-Jan. 5, 2015 (0% premium)
Omega-3 Ground Beef	11.22%	21.48%	23.70%	16.78%

La Vaca 80/20 Ground Beef	42.03%	41.60%	38.63%	58.16%
Other La Vaca Ground Beef	46.75%	36.91%	37.68%	25.05%
	100%	100%	100%	100%
Omega-3 Strip Steak	2.72%	5.33%	5.69%	1.62%
La Vaca Choice Strip Steak	5.17%	11.30%	9.29%	7.20%
Other La Vaca Steak	92.11%	83.37%	85.02%	91.18%
	100%	100%	100%	100%

Ultimately, the inconsistency in sales volumes and data management influenced this retail trial and led to results that contradict our initial expectation that sales would increase with lower prices. More data and discussion about the retail trial can be found in Appendix D.

Retail Trial Online Survey Results

From May 23, 2014 to July 27, 2015 a total of 115 online La Vaca customers completed the online survey. Of the 115 respondents, 18 did not purchase ground beef or steak (made purchase of other item (s)) so these responses were discarded, leaving 97 responses for analysis. 37 of the 97 respondents purchased ground beef while 89 purchased steak, which means 29 purchased both ground beef and steak. Of the 37 respondents who purchased ground beef, 8 purchased omega-3 enhanced ground beef, which represents 21.6% of those purchasing ground beef. However, 10 of the 37 respondents reported that they did not see the omega product available so when these customers are disregarded, 8 of 27 (29.6%) who purchased ground beef and knew omega product was available, purchased the omega enhanced ground beef. Of the 89 respondents who purchased steak, 34 reported not seeing omega product available, which leaves 55 customers who did purchase steak and saw that omega product was available. Of these 55, 7 customers purchased omega enhanced steak, which represents a share of 12.7%.

Of the 8 customers who purchased omega ground beef, 7 cited “believe there are health benefits” as a reason for purchasing the omega-3 enhanced ground beef. Meanwhile, only 2 of the 7 customers who

purchased omega-3 enhanced steak cited this same reason. The most frequently cited reason for not purchasing omega-3 ground beef or steak was "not interested/unsure about health benefits."

The composition of the sample included 52% male, an average age of 50 (ranges from 22 to 86), 56 of 115 are college graduates, 55/115 have a household size of 2 (including themselves), 10% of respondents have kids under 6 years old, while 30% have kids between 6 to 18. Most respondents (59 of 115) consume ground beef or steak 1 to 3 times per week. Additionally, of the purchase considerations surveyed, price had the lowest mean level of consideration, which is not surprising considering the type of customer that La Vaca targets (i.e. higher income consumers looking for specialty beef products).

Logit Model Analysis

The decision to purchase either omega ground beef or omega steak given that the individual did purchase a ground beef or steak product was analyzed using a logit model. The dependent variable takes a value of 1 if the individual purchased the omega product, zero otherwise, and thus the predicted value from the model is the probability of making the purchase. Unlike ordinary least square (OLS) analysis, in which the predicted value may be either negative or greater than 1, the logit model constrains predictions to the 0 to 1 interval. Probability of purchase was modeled as a function of the price premium, gender, age, education, income, and frequency of beef consumption. Results for the logit models for omega ground beef and omega steak are provided in Tables 4.2 and 4.3.

Table 4.2 Binary Logit Estimates for La Vaca Omega-3 Ground Beef, N=29

Variable	**Coefficient** (St. Err)
Constant	-4.389
	(8.902) [a]
Male	-5.074* [b]
	(2.642)
Age	-0.170*
	(0.089)
Beef Consumption Frequency	-2.407
	(1.556)
Education	-5.015*
	(2.898)

Income	7.730*
	(4.118)
Price Premium (%)	8.984
	(7.140)
McFadden Pseudo R-Squared	0.512

[a] Values in parentheses are standard errors.

[b] One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

Table 4.3 Binary Logit Estimates for La Vaca Omega-3 Steak, N=67

Variable	**Coefficient** (St. Err)
Constant	1.413
	(7.02) [a]
Male	-0.470
	(1.389)
Age	0.044
	(0.055)
Beef Consumption Frequency	-1.502
	(0.966)
Education	-0.75
	(0.778)
Income	1.113
	(1.013)
Price Premium	-4.241
	(5.636)
McFadden Pseudo R-Squared	0.1618

[a] Values in parentheses are standard errors.

Given the low number of observations (N=29 in the ground beef model, N=67 in the steak model) it is not surprising that we find few significant regression coefficients. In both models, higher income is associated with a higher probability of purchase, although the effect is significant only in the ground beef model. The prevailing price premium for omega product would be expected to have a negative effect on the probability of purchase. The coefficient on premium is negative but insignificant in the steak model, but positive, albeit again insignificant, for ground beef. Both models predict that males are less likely to buy omega product than females, but the effect is significant only for ground beef.

4.2 Nation-Wide Survey Results

Summary Statistics and Demographics

The following descriptions are for the complete data set, n=374 for ground beef and n=183 for steak survey respondents. Some observations will be deleted in later analysis for various reasons that are discussed later. Summary statistics for the sample of all responses are reported in Table 4.8, with additional summary statistics for other variables in Tables 4.9-4.18. Additional detail regarding the summary statistics for other variables is in Appendix E.

Both samples included more women than men: 55.6% for ground beef survey respondents and 58.5% for steak respondents, which is a slightly higher proportion of women to men than in the U.S. population as shown in Table 4.4.

Table 4.4 Comparison of U.S. Population and Survey Sample – Gender

Gender	U.S. Population[a]	GB Survey Sample	Steak Survey Sample
0=Female	50.8%	55.6%	58.5%
1=Male	49.2%	44.4%	41.5%

[a] Data from U.S. Census Bureau (U.S. Census Bureau, 2013)

On a scale of 1 (some high school) to 5 (post college graduate), the average education was 3.8 for the ground beef survey sample and 3.65 for the steak survey. 65.5% and 60.1% indicate they are college graduates or post college graduates in the ground beef and steak survey samples, respectively. Table 4.5 shows this is above the average education level of the U.S. population.

Table 4.5 Comparison of U.S. Population and Survey Sample – Education

Education	U.S. Population[ab]	GB Survey Sample	Steak Survey Sample
1=Some high school	7.99%	1.3%	1.6%
2=High school graduate	29.63%	9.9%	14.2%
3=Some college	28.78%	23.3%	24.0%
4=College graduate	18.88%	38.2%	37.7%
5=Post college graduate	10.38%	27.3%	22.4%

[a] Data from U.S. Census Bureau (U.S. Census Bureau, 2014)
[b] Does not add up to 100%, because a small % of the population have less than a high school education.

Household size was measured by the number of adults, children under 6, and children between 6 and 18. The majority of respondents for both surveys indicated 2 adults and 0 children per household. Based on open-ended questions where respondents could enter exact numbers, the averages for "adults" were 2.2 and 2.31 for ground beef and steak survey respondents, for "children under 6" they were 0.18 and 0.23, and 0.39 and 0.38 for "children between 6 and 18." 32.9% of the U.S. population has a household with one or more people under 18 years old (U.S. Census Bureau, 2014).

The age of respondents was dispersed between 18 and 60+ in both groups. On a scale of 1 (<18) to 5 (60+), the averages were 3.7 and 3.74 for ground beef and steak survey respondents, respectively. When mean age was calculated using the midpoints for each age category, the mean was 50.1 and 50.44 for ground beef and steak, respectively. As Table 4.6 shows, the median age of all U.S. population is 37.5 years old (U.S. Census Bureau, 2013).

Table 4.6 Comparison of U.S. Population and Survey Sample – Age

Age	U.S. Population[a]	U.S. Population[b]	GB Survey Sample	Steak Survey Sample
1=<18	23.3%	0%	0%	0%
2=18-29	16.8%	21.9%	17.91%	12.02%
3=30-44	19.5%	25.42%	22.46%	28.96%
4=45-59	20.5%	26.73%	31.82%	32.24%
5=60+	19.9%	25.95%	27.81%	26.78%
Average Age	37.5		50.1 (18.28)	50.44 (17.28)

[a] Data from U.S. Census Bureau (U.S. Census Bureau, 2013)
[b] Excluding <18 population

Initially, respondents indicated their household income based on a scale of 1 ($0-$9,999) to 11 (prefer not to answer) with 19.5% and 25.14% of respondents selecting "Prefer not to answer," as shown in Table 4.8. The average income levels without the "11s" were 4.53 for ground beef survey respondents and 4.34 for steak survey respondents. Using the midpoints for each category, the average income for the steak respondents was $73,722.63 and $79,501.66 for ground beef respondents. Where respondents selected "Prefer not to answer" an income level was predicted using a regression equation, which is discussed more in the Data Transformations section of Appendix F. After the regression equation was used to predict values, the new average income levels were $75,325.38 for the steak survey sample and

$80,376.33 for the ground beef survey sample. The median household income for the U.S. population is $52,250 in 2013 inflated dollars (U.S. Census Bureau, 2013).

Table 4.7 Summary Statistics for Income Variable

Income				
	Ground Beef		**Steak**	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
$0-$9999	5.88%	22	3.28%	6
$10,000-$24,999	7.75%	29	7.65%	14
$25,000-$49,999	14.44%	54	18.58%	34
$50,000-$74,999	16.04%	60	15.85%	29
$75,000-$99,999	13.10%	49	12.02%	22
$100,000-$124,999	9.63%	36	8.74%	16
$125,000-$149,999	5.61%	21	2.19%	4
$150,000-$174,999	2.67%	10	2.19%	4
$175,000-$199,999	1.34%	5	1.64%	3
$200,000+	4.01%	15	2.73%	5
Prefer Not to Answer	19.52%	73	25.14%	46
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**11**		***11***
Mean		**5.80**		***6.02***
Std. Dev.		**3.25**		***3.38***

Without "Prefer Not to Answer"

Answered question		**301**		***137***
Skipped question		**73**		***46***
Min	***$5000***	**1**	***$5000***	***1***
Max	***$250,000***	**10**	***$250,000***	***10***
Mean	***$79,501.66***[a]	**4.53**	***$73,722.63***[a]	***4.34***
Std. Dev.		**2.23**		***2.05***

*Tables with more detail about each question are included in Appendix E

[a] Average income using category midpoint values

The region which respondents came from are designated based on the US Census regions, which are listed in Appendix E.

Data in Table 4.8 has been discussed above.

Table 4.8 Demographics Summary Statistics and Variable Definitions

		Mean		Proportions	
Variable	Definition	Ground Beef	Steak	Ground Beef	Steak
Gender	1=male; 0=female	0.44	0.42	44.4%	41.5%
male		(0.497)*	(0.494)		
Education	Level of education	3.8	3.65		
edu	1=Some high school	(0.99)	(1.03)	1.3%	1.6%
	2=High school graduate			9.9%	14.2%
	3=Some college			23.3%	24.0%
	4=College graduate			38.2%	37.7%
	5=Post college graduate			27.3%	22.4%
Adults	Number of adults in household	2.2	2.31		
adults		(0.94)	(1.63)		
Children Under 6	Number of children under 6 in	0.18	0.23		
childu6	household	(0.63)	(0.70)		
Children 6 to 18	Number of children between 6 and 18	0.39	0.38		
child618	in household	(0.87)	(0.91)		
Age	Age group of respondent	3.7	3.74		
age	1=<18	(1.06)	(0.98)	0%	0%
	2=18-29			17.91%	12.02%
	3=30-44	50.1	50.44	22.46%	28.96%
	4=45-59	(18.28)	(17.28)	31.82%	32.24%
	5=60+			27.81%	26.78%
Income	Income range of respondent	Without "11s"[1]			
income	1=$0-$9999			5.88%	3.28%
	2=$10,000-$24,999	4.53	4.34	7.75%	7.65%
	3=$25,000-$49,999	(2.23)	(2.05)	14.44%	18.58%
	4=$50,000-$74,999			16.04%	15.85%
	5=$75,000-$99,999	$79,501	$73,722	13.10%	12.02%
	6=$100,000-$124,999	(58,284)	(53,434)	9.63%	8.74%
	7=$125,000-$149,999			5.61%	2.19%
	8=$150,000-$174,999			2.67%	2.19%
	9=$175,000-$199,999			1.34%	1.64%
	10=$200,000+			4.01%	2.73%
	11= Prefer Not to Answer			19.52%	25.14%
Number of observations				374	183

*Standard deviations are in parentheses

[1] This is shown in Table 4.7

Respondents were asked about their frequency of consumption for ground beef, steak, chicken, pork, and fish on a scale of 0 (never) to 4 (at least once a week). As Table 4.9 shows, on average, the level of consumption for each category, respectively, was 3.09, 2.33, 3.56, 2.5, and 2.47 for ground beef survey respondents and 2.98, 2.32, 3.63, 2.64, 2.38 for steak survey respondents. For both survey groups, chicken was the most frequently consumed product, followed by ground beef. On a scale of 1 (less than $60 per week) to 5 (more than $150 per week) the average household food expenditure for ground beef survey respondents was 2.76 and 2.72 for steak survey respondents (between $61-$90 and $91-$120 per week). When asked where they most frequently purchase meat consumed at home, 75.9% and 77.6% of ground beef and steak survey respondents respectively, said supermarket/grocery store.

Table 4.9 Summary Statistics on Meat Consumption and Purchase Questions

		Mean		Proportions	
Variable	Definition	Ground Beef	Steak	Ground Beef	Steak
Consumption Frequency	How frequent a household consumes these products 0=Never 1=Less than once a month 2=About once a month 3=2-3 times a month 4=At least once a week				
consgb	Ground beef consumption	3.09 (1.02)	2.98 (1.19)		
consteak	Steak consumption	2.33 (1.11)	2.32 (1.22)		
conschck	Chicken consumption	3.56 (0.86)	3.63 (0.81)		
conspork	Pork consumption	2.50 (1.25)	2.64 (1.25)		
consfish	Fish consumption	2.47 (1.32)	2.38 (1.31)		
Food Expenditure **spend**	How much a household spends on food consumed at home per week	2.76 (1.15)	2.72 (1.19)		
	1=Less than $60 per week			12.0%	15.3%
	2=$61-$90 per week			34.8%	33.3%
	3=$91-$120 per week			28.3%	24.6%
	4=$121-$150 per week			15%	17.5%
	5=More than $150 per week			9.9%	9.3%
Meat Purchase Location	Where respondent most frequently purchases meat consumed at home				

Variable	Definition	Mean		Proportions	
		Ground Beef	Steak	Ground Beef	Steak
	1=Supermarket/Grocery Store			75.9%	77.6%
	2=Bulk Store (e.g. Sam's, Costco)			11.8%	13.1%
	3=Health/Natural Foods Store			6.1%	3.3%
	4=Farmers Market/Local Cooperative			2.9%	4.9%
	5=Directly from Producer			1.6%	0.5%
	6=Internet or Direct Mail Order			1.6%	0.5%

Respondents were asked about their experience with grass-fed beef and in both surveys, more than 50% of respondents claimed that they have consumed grass-fed beef, but do not regularly consume it. The average responses, on a scale of 1 (never heard of it) to 4 (consume it regularly), were 2.74 for both surveys. Additionally, respondents were asked about impressions they had regarding grass-fed beef compared to conventional beef. The options were negative, neutral, positive, and no expectation for their impression of grass-fed beef's impact on human health, environment, animal welfare, and taste compared to conventional beef. The responses for both ground beef and steak survey respondents were overwhelmingly positive with over 50% of respondents indicating positive impressions for all impacts. More details regarding the percentages responding "positive" for each individual impact can be found in Table 4.10. The correlations for these impressions were all positive ranging from 0.5 for impact on animal welfare and taste and 0.74 for impact on animal welfare and the environment for ground beef survey respondents. For steak survey respondents the correlations range from 0.6 for impact on animal welfare and taste and 0.77 for impact on human health and environment.

Table 4.10 Summary Statistics on Grass-Fed Beef Questions

Variable	Definition	Mean		Proportions	
		Ground Beef	Steak	Ground Beef	Steak
Grass-Fed Beef Experience	Respondents' experience with grass-fed beef	2.74 (0.76)	2.74 (0.76)		
expgrass	1=I have never heard of it. 2=I have heard of it, but never consumed it. 3=I have consumed it, but do not regularly consume it. 4=I consume it regularly.				
Grass-Fed Beef Impressions	Respondents' impression of grass-fed beef compared to conventional beef 1=Negative 2=Neutral 3=Positive 4=No Expectation	Without "4s"[1]		Percentage Indicating Positive Impression	
	Impact on				
grashlth	human health	2.62 (0.56)	2.69 (0.56)	58.02%	66.67%
grassenv	the environment	2.60 (0.56)	2.59 (0.62)	55.08%	56.83%
graswelf	animal welfare	2.65 (0.54)	2.66 (0.60)	60.43%	65.03%
grastast	taste	2.55 (0.60)	2.56 (0.64)	54.01%	58.47%

[1] Since the number 4 is associated with "No Expectation," including it in a mean calculation is inaccurate. To get a better measure of the impressions, only the 1s, 2s, and 3s were analyzed.

Table 4.11 indicates the concern level of respondents regarding a series of food issues. On a scale of 1 (not at all concerned) to 5 (very concerned) average responses ranged from 3.19 to 4.03 for all issues. The lowest average for both groups was concern about the use of irradiation to control foodborne pathogens (3.19 and 3.28), while the highest average for both groups was concern about the use of chemicals/pesticides in food production (3.89 and 4.03). The correlations for these concern levels were all positive. In the ground beef survey, those correlations ranged from 0.54 for concern between foodborne pathogens and labeling of genetically modified food ingredients, to 0.865 between concern about chemicals/pesticides in food production and use of antibiotics in food animal production. For steak survey

respondents, the correlations range from 0.545 (between concern about Genetic Modification of food crops (GMOs) and welfare of animals used for food production) to 0.81 (between concern about chemicals/pesticides in food production and use of antibiotics in food animal production).

Table 4.11 Summary Statistics on Concern of Food Issues

		Mean		Proportions	
Variable	Definition	Ground Beef	Steak	Ground Beef	Steak
Food Issue Concerns	How concerned respondents are about the issues 1=Not at all concerned 3=Somewhat concerned 5=Very concerned				
conhorm	Use of synthetic growth hormones in food	3.68 (1.39)	3.72 (1.40)		
conpath	Foodborne pathogens that can cause illness	3.77 (1.30)	3.76 (1.23)		
conirrad	Use of irradiation to control foodborne pathogens	3.19 (1.45)	3.28 (1.39)		
congm	Genetic Modification of food crops (GMOs)	3.33 (1.50)	3.43 (1.43)		
conclone	Use of cloning in food animal production	3.36 (1.46)	3.58 (1.41)		
conwelf	Welfare of animals used for food production	3.76 (1.30)	3.78 (1.30)		
conchem	Use of chemicals/pesticides in food production	3.89 (1.32)	4.03 (1.21)		
conlblgm	Labeling of genetically modified food ingredients	3.49 (1.47)	3.66 (1.40)		
conantib	Use of antibiotics in food animal production	3.84 (1.35)	3.87 (1.27)		

To better understand the respondents' knowledge of omega-3 fatty acids, a series of statements were provided to which respondents were asked to indicate their level of agreement ranging from 1 (strongly disagree) to 5 (strongly agree). Table 4.12 shows that for both survey groups, the highest level of agreement (4.0 and 4.05) was with the statement, "Salmon is a good source of omega-3 fatty acids."

The second most agreed on statement, "Omega-3 fatty acids can help reduce the risk of heart attacks," had averages of 3.78 and 3.75 for ground beef and steak survey respondents respectively. The last two statements had much lower levels of agreement, which was expected. For "Beef is a good source of omega-3 fatty acids" the averages were 2.78 and 2.71, followed by "Wheat-based foods are a good source of omega-3 fatty acids" with averages of 2.78 and 2.69. The agreement levels that respondents indicated (between disagree and neutral) for the statements about beef and wheat shows that consumers are not sure whether beef or wheat are good sources of omega-3 fatty acids.

Table 4.12 Summary Statistics on Knowledge, Confidence and Information

		Mean		Proportions	
Variable	Definition	Ground Beef	Steak	Ground Beef	Steak
Omega-3 Agreements	Level of agreement with the statements 1=Strongly disagree 2=Disagree 3=Neutral 4=Agree 5=Strongly Agree				
agrheart	Omega-3 fatty acids can help reduce	3.78	3.75		
	the risk of heart attacks.	(0.92)	(0.87)		
agrsalm	Salmon is a good source of omega-3	4.00	4.05		
	fatty acids.	(0.94)	(0.85)		
agrwheat	Wheat based foods are a good source	2.78	2.69		
	of omega-3 fatty acids.	(0.84)	(0.87)		
agrbeef	Beef is a good source of omega-3	2.78	2.71		
	fatty acids.	(0.90)	(0.90)		

Table 4.13 shows summary statistics for exercise, health and diet questions. When asked about exercise frequency, the averages were 2.17 and 2.02 on a scale of 1 to 3 with both groups of survey respondents split almost evenly between "less than once a week" (25.4 and 33.3%), "1-2 times a week" (31.8 and 31.7%), and "3 or more times a week" (42.8 and 35%).

When asked about medical diagnosis, most respondents said they had not been diagnosed with any of the options offered (diabetes, heart disease, high blood pressure, high cholesterol, and obesity). Of the medical options offered, high blood pressure and high cholesterol were the most frequently selected, with about one third each for both samples.

Respondents were asked to indicate whether they had made any changes to their diet over the past year. The most frequent responses were more vegetables (42 and 38%) and less sugar (37 and 35%) followed by more fiber (30.5 and 29.5%) and reduced calories (30.5 and 25.1%). A quarter of respondents indicated no major changes over the past year and the amount of respondents indicating that they added more omega-3 fats to their diet was 13.6 and 15.8%. When asked what type of dietary supplements respondents take, the majority indicated vitamins (59% for both samples), followed by "none" (32.4 and 31.1%), then minerals (22.7 and 26.2%).

Table 4.13 Summary Statistics on Exercise, Health and Diet Questions

		Mean		Proportions	
Variable	Definition	Ground Beef	Steak	Ground Beef	Steak
Exercise Frequency **excfreq**	How frequent a respondent undertakes moderate or vigorous physical activities 1=Less than once a week 2=1-2 times a week 3=3 or more times a week	2.17 (0.81)	2.02 (0.83)		

Variable	Definition	Mean		Proportions	
		Ground Beef	Steak	Ground Beef	Steak
Medical Diagnosis	Whether respondents have ever been diagnosed by a medical professional with these conditions			Percentage Indicating "Yes"	
	Diabetes			15.0%	12.6%
	Heart Disease			5.6%	4.4%
	High Blood Pressure			28.9%	32.8%
	High Cholesterol			27.5%	29.5%
	Obesity			18.7%	23.0%
	None			47.1%	44.8%
Dietary Changes	Whether respondents have made any changes to their diet over the past year				
	More fiber			30.5%	29.5%
	More whole grains			26.5%	23.5%
	More protein			22.5%	20.8%
	More vegetables			42.0%	37.7%
	More calcium			9.6%	6.6%
	More omega-3 fats			13.6%	15.8%
	More probiotics			14.2%	12.0%
	More potassium			7.5%	7.7%
	Reduced calories			30.5%	25.1%
	Reduced carbohydrates			28.3%	20.8%
	Less sodium			24.9%	26.2%
	Less sugar			36.6%	35.0%
	Less meat			17.1%	14.8%
	Less gluten			9.6%	10.9%
	Reduced saturated fats			19.0%	19.1%
	Reduced cholesterol			14.4%	15.3%
	No major changes			27.5%	26.8%
	Other			4.0%	3.8%
Dietary Supplements	Dietary supplements that respondents take				
	Vitamins			58.8%	59.0%
	Minerals			22.7%	26.2%
	Fatty Acids			6.4%	7.1%
	Amino Acids			4.5%	6.0%
	Protein			10.7%	11.5%
	Botanicals			3.2%	4.4%
	Other Dietary Supplements			17.9%	19.7%
	None			32.4%	31.1%

Observations Excluded

A total of 41 of the 374 completed ground beef surveys (11%) were eliminated from the analysis. Those eliminated included 4 respondents indicating in the comment section that they were unable to view the choice experiment questions on their device, and 12 respondents who indicated in the survey that they did not consume ground beef. Other respondents were eliminated based on the time taken to complete the

survey. Median response time for the ground beef survey was 9 minutes. Of 45 subjects who completed the survey in less than 5 minutes, 15 had no variability in their responses to the choice experiment questions – i.e., they chose the same alternative in all 9 questions. The combination of completion time and pattern of responses suggest that those respondents paid little or no attention to the response task and for that reason those observations were excluded. An additional 10 observations were excluded from respondents who completed the survey in less than 3 minutes. Those exclusions leave a sample of 333 respondents for analysis in the ground beef survey. Remaining in that sample are 19 subjects whose responses to the choice experiment questions did not vary. Examination of comments submitted by respondents indicated some who consistently chose the "None" option because the product price was always too high.

In the steak survey, 9 respondents who indicated that they did not consume steak were excluded, as were an additional 7 subjects completing the survey in less than 5 minutes and with no variability in their responses to the choice experiment questions. Five more subjects who completed the survey in less than 3 minutes were also excluded. Median response time in the steak survey was approximately 9½ minutes with 84 of 183 completing in less than 9 minutes, and 111 completing in less than 10 minutes. In total, 21 of the 183 respondents to the steal survey (11.5%) were excluded from further analysis. Remaining in the sample are 20 subjects exhibiting no variation in responses to the choice experiment questions.

Summary Statistics of Choice Experiment Responses

Tables 4.14 and 4.16 provide data on the effect of information, price, consumption of steak frequency, locally raised, and tenderness on the frequency with which steak products at different omega levels were selected. Tables 4.15 and 4.17 provide similar data for the ground beef choice experiment, examining in turn the effects of omega-3 information and price (Table 4.15), ground beef consumption frequency, lean-to-fat ratio, food safety intervention, and locally raised (Table 4.17) on the frequency of

selection. The reported frequencies are calculated using the reduced sample as discussed in the "Observations Excluded" section.

The data reported in Table 4.14 suggests that the additional information about omega-3s provided to half of the survey respondents, had little or no impact on the frequency with which steaks with varying levels of Omega-3 were chosen. The frequency with which the conventional steak was chosen rose from 15.87% to 16.11% while that for grass-fed and enhanced both increased: from 35.61% to 39.7% for grass-fed, and from 21.02% to 22.01% for enhanced. The pattern of change is in line with what would be expected since the additional information informs the respondent about recommended intake levels and the higher levels of beneficial omega-3s in animals fed with supplements derived from algae.

Table 4.14 Steak: Effect of Information and Price on Choice Frequency

		Percent Choosing	
Omega Level	**Price**	**Low Info**	**High Info**
NONE		27.56%	22.22%
Conventional (Omega16)		15.87%	16.11%
	10.99	23.05%	23.55%
	13.19	18.59%	18.59%
	15.39	5.60%	5.79%
Grass-Fed (Omega40)		35.61%	39.70%
	10.99	57.20%	60.54%
	13.19	31.67%	32.37%
	15.39	17.32%	25.39%
Enhanced (Omega400)		21.02%	22.01%

10.99	34.56%	36.53%
13.19	20.40%	22.00%
15.39	9.28%	10.11%

In the ground beef data (Table 4.15), again the differences in selection frequency between the two information treatments are quite small, with a reduction in the frequency of selection for the conventional product (from 21.26% to 18.14%) and a slight increase for the grass-fed product (from 34.87% to 35.29%) and for the enhanced product (from 25.71% to 26.83%).

Table 4.15 Ground Beef: Effect of Information and Price on Choice Frequency

		Percent Choosing	
Omega Level	**Price**	**Low Info**	**High Info**
NONE		18.12%	19.32%
Conventional (Omega16)		21.26%	18.14%
	3.79	27.09%	24.49%
	4.59	23.59%	16.30%
	5.29	12.50%	13.32%
Grass-Fed (Omega40)		34.87%	35.29%
	3.79	46.00%	42.68%
	4.59	35.28%	33.57%
	5.29	22.60%	29.19%
Enhanced (Omega400)		25.71%	26.83%
	3.79	40.35%	40.80%
	4.59	20.27%	20.85%
	5.29	16.91%	18.68%

In Tables 4.14 and 4.15, price appears to have an important influence on the frequency with which an alternative is chosen. In almost all cases, frequency of selection declines when price increases. Thus, for example, in Table 4.14 we observe that frequency of selection for the conventional steak, with low information treatment, declines from 23.05% to 5.60% as price increases from $10.99/lb to $15.39/lb. This pattern is seen throughout the analysis of other attributes. It is shown in Table 4.15 that the frequency of selection for conventional ground beef, with low information treatment, declines from 27.09% to 12.50% as price increases from $3.79/lb to $5.29/lb.

For both steak and ground beef, the response frequency data suggests a preference for the grass-fed product (Omega40) over the other two options (Conventional - Omega16 and Enhanced - Omega400). In the steak survey, with the low information treatment, the overall frequency of selection for the grass-fed product was 35.61% compared to 21.02% for enhanced and 15.87% for conventional. Similarly, in the ground beef survey, with the low information treatment, overall frequency of selection for grass-fed was 34.87% compared to 25.71% for enhanced and 21.26% for conventional. Thus, for both products, a slight preference for the enhanced omega-3 level product (Omega400) over the conventional product (Omega16) is observed. This pattern is seen in the high information treatment as well.

Table 4.16 illustrates the influence of steak consumption frequency, whether or not the product is derived from a locally raised (within 50 miles) animal, and whether or not the steak was guaranteed tender. Respondents who were in the low steak consumption category (consume steak once per month or less) chose the "none" option more frequently at 29.72% vs. 19.44% for those in the high steak consumption category (consume steak at least once per week). Those in the high steak consumption category chose conventional (18.62% vs. 14.30%) and enhanced omega-3 steak (27.46% vs. 18.98%) more frequently than those in the low steak consumption category. Conversely, the grass-fed option was chosen more frequently by those with low steak consumption (36.94%) compared to those with high steak consumption (34.48%). Also in Table 4.16 there is a definite preference for the locally raised steak option. Frequency of selection for conventional product increases from 9.99% to 21.55% if the product is local. The effect is more pronounced for grass-fed product (increasing from 28.53% to 47.14%), and less pronounced for enhanced product (from 18.3% to 24.46%). For each of the three omega-3 levels (conventional, grass-fed, enhanced), the frequency of selection increases if the product is local with the percentage increases ranging from roughly 6% to 18% within each of the three categories. Table 4.16 also shows that the frequency of steak product selection increases if the product is guaranteed to be tender. The impact of the tenderness guarantee is greatest for conventional product (an increase from 9.08% to 25.04%). For grass-fed beef, frequency of selection increases by 9.2% (from 32.6% to 41.8%) with the

tenderness guarantee. Interestingly, for grass-fed product the effect of the tenderness guarantee is weaker than the corresponding effect of the product being locally raised (which increased frequency of selection by 18.61% (from 28.53% to 47.14%). This pattern suggests that for consumers of grass-fed beef, the value of a locally raised designation would exceed the value of a tenderness guarantee.

Table 4.16 Steak: Effect of Steak Consumption Frequency, Local and Tenderness on Choice Frequency

	Percent Choosing					
Omega Level	**Low Consumption**	**High Consumption**	**Not Local**	**Local**	**Not Tender**	**Tender**
NONE	29.72%	19.44%	24.76%	24.76%	24.76%	24.76%
Conventional (Omega16)	14.30%	18.62%	9.99%	21.55%	9.08%	25.04%
Grass-Fed (Omega40)	36.94%	34.48%	28.53%	47.14%	32.60%	41.80%
Enhanced (Omega400)	18.98%	27.46%	18.30%	24.46%	15.75%	26.83%

In the regression analysis that follows later, willingness-to-pay values are estimated for attributes such as locally raised and guaranteed tender using ratios of coefficient estimates for these attributes and the coefficient for the price attribute. The selection frequency data can provide some insight into how that analysis will work.

Table 4.17illustrates the influence of ground beef consumption frequency, 80/20 vs. 90/10 lean-to-fat ratios, food safety interventions, and whether or not the product is derived from a locally raised (within 50 miles) animal. Respondents who were in the low ground beef consumption category (consume ground beef once per month or less) chose the “none” option more frequently at 25.63% vs. 14.59% for those in the high ground beef consumption category (consume ground beef at least once per week). Those in the high ground beef consumption category chose each omega-3 level option more frequently than those in the low ground beef consumption category. As Table 4.17 shows, the frequency of consuming conventional product increased from 15.13% to 21.47%, grass-fed increased from 33.22% to 35.31% and enhanced omega-3 steak increased from 25.74% to 28.54% when respondents were in the high ground beef consumption category vs. low ground beef consumption. Table 4.17 also shows that in a comparison of 80/20 vs. 90/10 lean-to-fat ratios for ground beef, respondents prefer the leaner (90/10) option. For

example, when the 90/10 grass-fed beef option is offered, it is chosen 41.14% of the time compared to the 80/20 grass-fed beef option, which is chosen 29.42% of the time when it is offered. When evaluating preferences for food safety methods in Table 4.17, the most frequently chosen alternative is "steam" (i.e. USDA inspection plus steam pasteurization) for both the conventional and grass-fed ground beef products (23.3% and 45.52%, respectively). Interestingly, for the enhanced omega ground beef product, regular inspection was chosen more frequently (28.76% vs. 25.79% for steam and 24.65% for irradiation). Surprisingly, irradiation is chosen least frequently for conventional and enhanced ground beef products, but not for grass-fed ground beef products, where regular inspection is chosen least frequently. Table 4.17 also shows the preference for the locally raised attribute. While there is a preference for the locally raised product for each of the three omega-3 levels, it is not as strong for ground beef as it is for steak. For example, the conventional ground beef product that is locally raised is chosen 22.7% of the time it is offered, compared to 16% of the time for the not local conventional ground beef option.

Table 4.17 Ground Beef: Effect of Ground Beef Consumption Frequency, Lean-to-Fat Ratio, Food Safety Interventions, and Local on Choice Frequency

	Percent Choosing								
Omega Level	**Low Consumption**	**High Consumption**	**Fat 80/20**	**Fat 90/10**	**Reg. Inspect**	**Steam**	**Irrad**	**Not Local**	**Local**
NONE	25.63%	14.59%	18.75%	18.75%	18.75%	18.75%	18.75%	21.8%	21.8%
Conventional (Omega16)	15.13%	21.47%	18.08%	21.33%	20.35%	23.30%	14.62%	16.0%	22.7%
Grass-Fed (Omega40)	33.22%	35.31%	29.42%	41.14%	30.84%	42.52%	32.44%	29.1%	37.2%
Enhanced (Omega400)	25.74%	28.54%	23.39%	29.29%	28.76%	25.79%	24.65%	23.0%	27.7%

Following the choice experiment section, a question was asked to measure the respondents' confidence in their choices. As shown in Table 4.18, respondents in the ground beef survey had an average of 3.37 on a scale of 1 (not at all confident) to 5 (very confident), and the average was 3.62 for steak survey respondents, so both groups were more than somewhat confident in their choices. The difference between the two groups makes sense because there was one more attribute with three levels in the ground beef choice experiment than the steak choice experiment, which would make it more difficult

for those respondents to make choices. Another question was asked to measure how much respondents believed there were health benefits from omega-3 fatty acids. On the same confidence scale as was just mentioned, the averages were 3.58 and 3.63, which means the respondents were more than somewhat confident that there are health benefits from omega-3 fatty acids.

Table 4.18 Summary Statistics on Confidence Level Questions

Variable	Definition	Mean	
		Ground Beef	Steak
Confidence	**Level of confidence respondents have**		
	1=Not at all confident		
	3=Somewhat confident		
choconf	**5=Very confident**	**3.37**	**3.62**
	Confidence in selections just made	**(1.03)**	**(1.00)**
o3bnconf		**3.58**	**3.63**
	Confidence that there are health benefits from omega-3 fatty acids	**(1.02)**	**(1.06)**

4.3 Choice Experiment Model Results

To begin the empirical analysis of the choice experiment data, exploratory models were run with the full sample for each survey. These include simple multinomial logit models (MNL) and MNL models segmented by various attributes. Based on the findings of the exploratory models, more refined models were run. These more precise random parameters logit models exclude observations as discussed in the "Observations Excluded" section of Chapter 4.2.

Preliminary Models

Results from a simple multinomial logit model that assumes parameter homogeneity are presented in Table 4.19. As expected, the coefficient for price was negative and statistically significant for each survey. Tenderness, local, grass-fed and enhanced, which are coded as dummy variables, all increase utility.

Steak Survey Multinomial Logit Model Results (Full Sample)

Table 4.19 reports the estimates of a conditional multinomial logit model for the steak survey, segmented by information treatment.

Table 4.19 Conditional Logit Estimates for Steak – Segmented by Information Treatment

		Full Sample	**Low Info**	**High Info**
Attribute/Variable	**Level**	N = 1647[a]	N=801	N=846
Alternative specific constant - Neither option	ASC None	-2.766***[b] (0.278)[c]	-2.652*** (0.4)	-2.916*** (0.389)
Steak Price/lb	Price	-0.321*** (0.021)	-0.321*** (0.03)	-0.324*** (0.029)
Omega	Grass-fed (Omega40)	1.047*** (0.090)	0.897*** (0.129)	1.188*** (0.127)
	Enhanced (Omega400)	0.385*** (0.099)	0.305** (0.141)	0.462*** (0.138)
Steak Guaranteed Tender	Yes	0.591*** (0.076)	0.696*** (0.11)	0.492*** (0.105)
Animal Locally Raised	Yes	0.637*** (0.071)	0.687*** (0.104)	0.593*** (0.099)
Log likelihood		-1986.97	-965.77	-1016.77

[a]183 respondents each answering 9 questions. For LowInfo, 89 respondents. For HighInfo, 94 respondents.
[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.
[c]Values in parentheses are standard errors.

Focusing first on the model results for the full sample we see that, as expected, the coefficient for price was negative and statistically significant, indicating that higher prices are associated lower utility. The estimated coefficients on the dummy variables representing grass-fed (Omega40), enhanced omega (Omega400), tenderness and local are all positive and significant, indicating that each of those attributes are associated with increased utility. Models were then estimated using the subsamples defined by our information treatment (Low Info or High Info) to investigate the impact of providing additional information about omega-3s in the high-information treatment. Comparing the estimated results from the two subsample models suggests that the effects were in the expected direction – with the estimated

coefficients for both grass-fed (Omega40) and enhanced omega (Omega400) being somewhat larger in the high-information subsample.

As noted above, the multinomial logit model assumes preference homogeneity – i.e., it assumes that the same estimated coefficient for an attribute level applies to all individuals in the sample. To illustrate potential heterogeneity in the sample, Table 4.20 reports the estimates of a conditional multinomial logit model segmented by gender.

Table 4.20 Conditional Logit Estimates for Steak – Segmented by Gender

		Full Sample	**Male**	**Female**
Attribute/Variable	**Level**	N = 1647[a]	N=684	N=963
Alternative specific constant - Neither option	ASC None	-2.766***[b]	-3.424***	-2.329***
		(0.278)[c]	(0.433)	(0.367)
Steak Price/lb	Price	-0.321***	-0.366***	-0.291***
		(0.021)	(0.033)	(0.028)
Omega	Grass-fed	1.047***	1.023***	1.066***
	(Omega40)	(0.090)	(0.142)	(0.117)
	Enhanced	0.385***	0.699***	0.139
	(Omega400)	(0.099)	(0.151)	(0.132)
Steak Guaranteed Tender	Yes	0.591***	0.769***	0.468***
		(0.076)	(0.119)	(0.100)
Animal Locally Raised	Yes	0.637***	0.523***	0.735***
		(0.071)	(0.109)	(0.096)
Log likelihood		-1986.97	-809.39	-1161.26

[a]183 respondents each answering 9 questions. For Male, 76 respondents. For Female, 107 respondents.
[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.
[c]Values in parentheses are standard errors.

The estimated coefficients in the gender-segmented models point to some differences between male and female preferences. In particular, while the estimated coefficients on grass fed are virtually identical, the estimated coefficients on enhanced omega are very different, being substantially larger for males than for females. In fact, for females, the estimated coefficient on enhanced omega is insignificant.

Males appear to be slightly more sensitive to price than females, and while males have a stronger preference than females for tenderness, females have a stronger preference for the locally raised attribute.

Table 4.21 reports the estimates of a conditional multinomial logit model for the steak survey, segmented by income. To get the segmented income, we found the median was 5 and separated those with income less than 5 as "low-income" and those greater than 5 as "high-income" so 22 respondents answering "5" are excluded in this analysis to have a distinctly segmented subsample.

Table 4.21 Conditional Logit Estimates for Steak – Segmented by Income

Attribute/Variable	**Level**	**Full Sample**	**High-income**	**Low-income**
		N = 1647[a]	N=441	N=1008
Alternative specific constant - Neither option	ASC None	-2.766***[b]	-3.026***	-2.650***
		(0.278)[c]	(0.525)	(0.361)
Steak Price/lb	Price	-0.321***	-0.314***	-0.322***
		(0.021)	(0.040)	(0.027)
Omega	Grass-fed	1.047***	1.126***	1.009***
	(Omega40)	(0.090)	(0.172)	(0.117)
	Enhanced	0.385***	0.304	0.377***
	(Omega400)	(0.099)	(0.188)	(0.128)
Steak Guaranteed Tender	Yes	0.591***	0.548***	0.561***
		(0.076)	(0.145)	(0.098)
Animal Locally Raised	Yes	0.637***	0.764***	0.595***
		(0.071)	(0.135)	(0.093)
Log likelihood		-1986.97	-525.65	-1217.98

[a]183 respondents each answering 9 questions. For income, median=5 so those answering "5" are excluded (22) and for High-income, 49 respondents; for Low-income, 112 respondents

[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

[c]Values in parentheses are standard errors

Again, there is a negative coefficient for price in this model, with those in the low-income category only slightly more sensitive to price than those in the high-income category. Table 4.21 also shows that grass-fed, enhanced omega, tenderness and local all increase utility. However, enhanced omega was not found to be statistically significant for the high-income category. Those in the high-

income category have more of a preference for grass-fed and for local. Those in the low-income category have a slight preference for steak tenderness.

Ground Beef Multinomial Logit Model Results (Full Sample)

Table 4.22 reports the estimates of a conditional multinomial logit model for the ground beef survey, segmented by information treatment.

Table 4.22 Conditional Logit Estimates for Ground Beef – Segmented by Information Treatment

Attribute/Variable	Level	Full Sample N = 3366[a]	Low Info N=1557	High Info N=1809
Alternative specific constant - Neither option	ASC None	-1.890***[b] (0.189)[c]	-2.221*** (0.275)	-1.593*** (0.260)
Ground Beef Price/lb	Price	-0.544*** (0.038)	-0.598*** (0.056)	-0.495*** (0.053)
Omega	Grass-fed (Omega40)	0.744*** (0.058)	0.671*** (0.084)	0.813*** (0.080)
	Enhanced (Omega400)	0.358*** (0.061)	0.228*** (0.088)	0.477*** (0.084)
Ground Beef Lean-to-fat Ratio	90/10	0.338*** (0.049)	0.372*** (0.071)	0.313*** (0.068)
Food Safety Intervention	Regular Inspection plus Steam Pasteurization (Steam)	0.124** (0.057)	0.216*** (0.084)	0.050 (0.077)
	Regular Inspection plus Irradiation (Irrad)	-0.222*** (0.059)	-0.159* (0.085)	-0.277*** (0.082)
Animal Locally Raised	Yes	0.373*** (0.047)	0.412*** (0.069)	0.332*** (0.064)
Log likelihood		-4394.18	-2008.71	-2377.92

[a]374 respondents each answering 9 questions. For LowInfo, 173 respondents. For HighInfo, 201 respondents.
[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.
[c]Values in parentheses are standard errors.

As expected, the coefficient for price was negative and statistically significant, indicating that higher prices are associated with lower utility. We also see that grass-fed, enhanced omega, 90/10 lean-to-fat ratio, steam pasteurization, and local all increase utility, while irradiation decreases utility. With high-information, the preference for grass-fed and enhanced omega does increase, which makes sense, because respondents gain information about the benefits of the higher omega-3 levels. The preference for 90/10

lean-to-fat ratio, steam pasteurization, and local are lower with high information than with low information, which makes sense given that respondents prefer the omega-3 attribute when provided more information.

Table 4.23 reports the estimates of a conditional multinomial logit model for the ground beef survey, segmented by gender.

Table 4.23 Conditional Logit Estimates for Ground Beef – Segmented by Gender

Attribute/Variable	Level	Full Sample N = 3366[a]	Male N=1494	Female N=1872
Alternative specific constant - Neither option	ASC None	-1.890***[b] (0.189)[c]	-2.147*** (0.278)	-1.667*** (0.258)
Ground Beef Price/lb	Price	-0.544*** (0.038)	-0.523*** (0.057)	-0.562*** (0.052)
Omega	Grass-fed (Omega40)	0.744*** (0.058)	0.469*** (0.085)	0.987*** (0.080)
	Enhanced (Omega400)	0.358*** (0.061)	0.272*** (0.088)	0.446*** (0.085)
Ground Beef Lean-to-fat Ratio	90/10	0.338*** (0.049)	0.198*** (0.071)	0.46*** (0.068)
Food Safety Intervention	Regular Inspection plus Steam Pasteurization (Steam)	0.124** (0.057)	-0.061 (0.085)	0.277*** (0.077)
	Regular Inspection plus Irradiation (Irrad)	-0.222*** (0.059)	-0.104 (0.085)	-0.332*** (0.082)
Animal Locally Raised	Yes	0.373*** (0.047)	0.295*** (0.069)	0.434*** (0.064)
Log likelihood		-4394.18	-1990.03	-2377.67

[a]374 respondents each answering 9 questions. For Male, 166 respondents. For Female, 208 respondents.
[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.
[c]Values in parentheses are standard errors.

As we found in the steak results, the estimated coefficients in the gender-segmented models point to some differences between male and female preferences. Females have a preference for grass-fed, enhanced omega, 90/10 lean-to-fat ratio, steam pasteurization, and the locally raised attribute compared to males. Also, females are more sensitive to irradiation than males.

Table 4.24 reports the estimates of a conditional multinomial logit model for the ground beef survey, segmented by income. To get the segmented income, we found the median was 5 and separated those with income less than 5 as "low-income" and those greater than 5 as "high-income" so 49 respondents answering "5" are excluded in this analysis to have a distinctly segmented subsample.

Table 4.24 Conditional Logit Estimates for Ground Beef – Segmented by Income

		Full Sample	**High-income**	**Low-income**
Attribute/Variable	**Level**	N = 3366[a]	N=1035	N=1890
Alternative specific constant - Neither option	ASC None	-1.890***[b] (0.189)[c]	-2.326*** (0.351)	-1.773*** (0.249)
Ground Beef Price/lb	Price	-0.544*** (0.038)	-0.694*** (0.072)	-0.487*** (0.051)
Omega	Grass-fed (Omega40)	0.744*** (0.058)	0.837*** (0.107)	0.691*** (0.077)
	Enhanced (Omega400)	0.358*** (0.061)	0.463*** (0.112)	0.278*** (0.080)
Ground Beef Lean-to-fat Ratio	90/10	0.338*** (0.049)	0.400*** (0.090)	0.284*** (0.065)
Food Safety Intervention	Regular Inspection plus Steam Pasteurization (Steam)	0.124** (0.057)	0.141 (0.106)	0.071 (0.075)
	Regular Inspection plus Irradiation (Irrad)	-0.222*** (0.059)	-0.174 (0.109)	-0.247*** (0.077)
Animal Locally Raised	Yes	0.373*** (0.047)	0.272*** (0.085)	0.420*** (0.062)
Log likelihood		-4394.18	-1331.36	-2479.82

[a]374 respondents each answering 9 questions., For income, median=5 so those answering "5" are excluded (49) and for High-income, 115 respondents; or Low-income, 210 respondents.

[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

[c]Values in parentheses are standard errors.

Again, a negative coefficient for price exists in this model, and interestingly, those in the high-income category are more sensitive to price than those in the low-income category. We also see that grass-fed, enhanced omega, 90/10 lean-to-fat ratio, steam pasteurization, and local all increase utility, however steam pasteurization was not found to be statistically significant for either income category. Irradiation decreases utility, but was not found to be statistically significant for the high-income category. Those in the high-income category have more of a preference for grass-fed, enhanced omega, 90/10 lean-

to-fat ratio. Meanwhile, those in the low-income category are more sensitive to irradiation and also prefer local slightly more than the high-income category.

Random Parameters Logit Models

As noted previously, the simple multinomial logit model embodies some assumptions that may be unrealistic – i.e. preference homogeneity and independence of irrelevant alternatives. However, as Hensher and Greene (2003) state, it is a good starting point for empirical analysis. Random parameters logit (RPL) models eliminate both of the assumptions held in the simple multinomial logit model by allowing for variability in the estimated model coefficients. That, in turn, allows for not only a point estimate of the willingness to pay values for attributes (obtained as the negative of the ratio of an attribute coefficient divided by the coefficient on price), but also for a distribution of those WTP values.

The models reported earlier used dummy coding to represent different attribute levels. However, given the presence of the "none" option in the choice experiment, a more precise way of representing discrete attribute levels is to use effect coding – which effectively eliminates correlation between the "none" option and alternatives for which all attribute levels are are baseline levels. With effect coding, the insignificant coefficient on enhanced omega, in Table 4.25, means that its effect on utility is not significantly different from the mean of all the omega categories (i.e., the mean effect across conventional, grass, and enhanced omega). The implied effect of the omitted conventional category is the negative of the sum of the coefficients for grass and omega400. (With dummy coding, an insignificant coefficient would mean that the effect on utility was not significantly different from that of the omitted baseline (conventional) category).

Given what was found in exploratory models on samples that were split between males-females, and high-low information, the following RPL models estimate effects of: a) gender on the coefficient for grass-fed, and b) high information on the coefficient for omega400.

Ground Beef RPL Model Results

Table 4.25 reports the estimates of a random parameters logit model for the ground beef survey, which uses effects coded variables.

Table 4.25 Random Parameter Logit Estimates for Ground Beef (effects coding)

Attribute	**Variable**	**Full Sample** N=2997[a]	**Coefficient** (St. Err)
Alternative specific constant - Neither option	ASCNone	Fixed Coefficient	-3.673***[b] (0.231)
Price	Ground beef $/lb	Fixed Coefficient	-0.793*** (0.050)
Omega	Grass-fed *(Omega40)*	Mean Coefficient	0.645*** (0.066)
		St. dev. of Coefficient	0.503*** (0.067)
	Male – Grass-fed	Mean effect	-0.168* (0.099)
	Enhanced *(Omega400)*	Mean Coefficient	-0.114 (0.074)

		St. dev. of Coefficient	0.535***
			(0.072)
	HighInfo – Enhanced	Mean effect	0.210**
			(0.098)
Lean-to-fat Ratio	90/10 *(fat9010)*	Mean Coefficient	0.246***
			(0.045)
		St. dev. of Coefficient	0.586***
			(0.048)
Food Safety Intervention	Regular Inspection plus Steam Pasteurization *(Steam)*	Mean Coefficient	0.266***
			(0.057)
		St. dev. of Coefficient	0.715***
			(0.065)
	Regular Inspection plus Steam Irradiation *(Irrad)*	Mean Coefficient	-0.256***
			(0.064)
		St. dev. of Coefficient	0.902***
			(0.073)
Animal Locally Raised	Yes *(yeslocal)*	Mean Coefficient	0.275***
			(0.031)
		St. dev. of Coefficient	0.14*
			(0.072)
Log likelihood			-3593.17

[a]N = 2997 (333 respondents each answering 9 questions).

[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

In Table 4.25, as observed earlier, the estimated coefficient on price is negative and significant as expected. The coefficients on the effect coded variable representing the grass-fed omega category is positive and significant, indicating that utility associated with grass-fed is above the average utility for all omega categories (i.e., that utility for grass-fed is higher than the mean of grass-fed, enhanced omega, and conventional). However, because the model allows the coefficient on grass-fed to be influenced by gender, the estimated value of 0.645 applies only to females. The coefficient on the male-grass-fed variable, which allows for preference heterogeneity between males and females, is negative, indicating that males have lower preference for grass-fed product than females. The implied coefficient estimate for males is 0.645 – 0.168 = 0.477, indicating that grass-fed beef has above average utility for both males and females. The estimated standard deviation for the grass-fed coefficient is also significant, indicating that preferences are heterogeneous.

The coefficient on enhanced omega variable is negative but insignificant, indicating that utility for enhanced omega beef is slightly below the mean of the three categories. Again, because the choice frequency data showed that respondents in the high-information treatment chose enhanced omega product more frequently than those in the low information treatment, the model allows the coefficient on enhanced omega to be influenced by the information treatment. The positive and significant coefficient on the high-information-enhanced variable indicates higher utility for the enhanced omega product in the high-information treatment. When we add the coefficients on enhanced omega (-0.114) and high-information-enhanced omega (0.210) the resulting coefficient is positive – indicating higher than average utility for the enhanced omega product in the high information treatment. As with grass-fed, the estimated standard deviation for the enhanced omega product is significant, indicating that preferences for the enhanced product are also heterogeneous.

With effects coding, the implied coefficient on the omitted omega category (conventionally raised) is equal to the negative of the sum of the coefficients on the included categories. If we take the implied average coefficient for grass-fed for males and females (0.645 – ½ * 0.168 = 0.561) and the implied average coefficient across both information treatments for enhanced omega (-0.114 + ½ * 0.210 = -0.009) we find that the implied coefficient on conventional beef would be – (0.561 – 0.009) = -0.552. Thus, even though the estimated coefficient on the variable representing enhanced omega in the low-information treatment is negative (-0.114), the model still shows that utility associated with the enhanced omega product is higher than that associated with conventional product.

The model estimates also show higher utility associated with the leaner (90/10) ground beef than with the alternative (80/20) product, and higher utility for meat originating from locally raised animals. The effect coded variables on food safety interventions indicate higher than average utility associated with steam pasteurization and lower than average utility associated with irradiation.

Steak RPL Model Results

Table 4.26 reports the estimates of a random parameters logit model for the steak survey, which uses effects coded variables.

Table 4.26 Random Parameter Logit Estimates for Steak (effects coding)

Attribute	Variable	Full Sample N=1458[a]	Coefficient (St. Err)
Alternative specific constant - Neither option	ASCNone	Fixed Coefficient	-5.686***[b] (0.359)
Price	Steak $/lb	Fixed Coefficient	-0.471*** (0.028)
Omega	Grass-fed *(Omega40)*	Mean Coefficient	0.971*** (0.129)
		St. dev. of Coefficient	1.021*** (0.103)
	Male – Grass-fed	Mean effect	-0.172 (0.195)
	Enhanced *(Omega400)*	Mean Coefficient	-0.031 (0.146)
		St. dev. of Coefficient	1.09*** (0.115)
	HighInfo – Enhanced	Mean effect	-0.034 (0.201)
Guaranteed Tender	Yes (*ytender*)	Mean Coefficient	0.387*** (0.060)
		St. dev. of Coefficient	0.45*** (0.081)
Animal Locally Raised	Yes *(yeslocal)*	Mean Coefficient	0.454*** (0.051)
		St. dev. of Coefficient	0.309*** (0.078)
Log likelihood			-1608.07

[a]N = 1458 (162 respondents each answering 9 questions).

[b]One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

As shown in Table 4.26, the estimated coefficient on price is negative and significant as expected. The coefficients on the effect coded variable representing the grass-fed omega category is positive and significant, indicating that utility associated with grass-fed is above the average utility for all omega categories (i.e., that utility for grass-fed is higher than the mean of grass-fed, enhanced omega, and conventional). As discussed in the ground beef results, because the model allows the coefficient on grass-fed to be influenced by gender, the estimated value of 0.971 applies only to females. The coefficient on the male-grass-fed variable, which allows for preference heterogeneity between males and females, is negative, indicating that males have lower preference for grass-fed product than females. The implied coefficient estimate for males is 0.971 – 0.172 = 0.799, indicating that grass-fed beef has above average utility for both males and females. The estimated standard deviation for the grass-fed coefficient is also significant, indicating that preferences are heterogeneous.

As with ground beef, the estimated coefficient on enhanced omega variable is negative but insignificant. Unlike in the ground beef model however, for steak the estimated effect of high-information on the preference for the enhanced omega product is insignificant.

The model estimates also show higher utility associated with the guaranteed tender steak than with the alternative not guaranteed tender product, and higher utility for meat originating from locally raised animals.

Willingness-to-Pay Estimates

The WTP estimates in Tables 4.27 and 4.28 show the mean (for this survey sample) WTP estimate for the corresponding attribute compared to the baseline product, as well as the upper and lower 95% confidence intervals. In the case of steak, the baseline product is a conventionally raised, not guaranteed tender, not locally raised steak. For ground beef, the baseline product is conventionally raised, 80/20 lean-to-fat ratio, regularly inspected, not locally raised ground beef.

Steak Survey

Table 4.27 reports WTP point estimates and confidence intervals for omega-3 enhanced steak.

Table 4.27 Willingness-to-Pay Estimates for Steak

Attribute/Variable	Level	Willingness-to-Pay Estimate[a]	
Omega	Grass-fed (Omega40)	Upper 95% Confidence Interval	$5.23
		Point Estimate	$4.06***[b] (0.597)[c]
		Lower 95% Confidence Interval	$2.89
	Male – Grass-fed	Upper 95% Confidence Interval	$4.76
		Point Estimate	$3.33*** (0.729)
		Lower 95% Confidence Interval	$1.90
	Enhanced (Omega400)	Upper 95% Confidence Interval	$3.18
		Point Estimate	$1.93*** (0.639)
		Lower 95% Confidence Interval	$0.68
	HighInfo – Enhanced	Upper 95% Confidence Interval	$3.04
		Point Estimate	$1.79*** (0.642)
		Lower 95% Confidence Interval	$0.53
Steak Guaranteed Tender	Yes	Upper 95% Confidence Interval	$2.17
		Point Estimate	$1.65*** (0.268)
		Lower 95% Confidence Interval	$1.12
Animal Locally Raised	Yes	Upper 95% Confidence Interval	$2.38
		Point Estimate	$1.93*** (0.229)
		Lower 95% Confidence Interval	$1.48

[a] Willingness-to-pay estimates in dollars per pound.

[b] One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

[c] Values in parentheses are standard errors.

Table 4.27 reports that the mean willingness-to-pay point estimate for this survey sample and confidence intervals for the estimated average value of grass-fed steak with 40 mg/serving of omega-3 fatty acids and enhanced beef with 400 mg/serving of omega-3 fatty acids. The estimated premium that females are WTP for grass-fed steak is $4.06/lb compared to a baseline beef steak product. Males are willing to pay less for this same product ($3.33/lb). The premium for the enhanced beef with 400 mg/serving of omega-3 fatty acids is $1.93/lb with low information compared to the baseline product, but with high-information it is only $1.79/lb. Respondents were willing to pay a premium of $1.65/lb for steak that is guaranteed tender and $1.93/lb for steak that is locally raised. More discussion on the distribution of WTP values follows the ground beef WTP estimates.

Ground Beef Survey

WTP point estimates and confidence intervals are reported in Table 4.28 for omega-3 enhanced ground beef.

Table 4.28 Willingness-to-Pay Estimates for Ground Beef

Attribute/Variable	Level	Willingness-to-Pay Estimate [a]

Omega	Grass-fed *(Omega40)*	Upper 95% Confidence Interval	$1.87
		Point Estimate	$1.48*** [b] (0.199) [c]
		Lower 95% Confidence Interval	$1.09
	Male – Grass-fed	Upper 95% Confidence Interval	$1.48
		Point Estimate	$1.06*** (0.214)
		Lower 95% Confidence Interval	$0.64
	Enhanced *(Omega400)*	Upper 95% Confidence Interval	$0.91
		Point Estimate	$0.53*** (0.194)
		Lower 95% Confidence Interval	$0.15
	HighInfo – Enhanced	Upper 95% Confidence Interval	$1.43
		Point Estimate	$1.06*** (0.189)
		Lower 95% Confidence Interval	$0.68
Lean-to-fat Ratio	90/10 *(fat9010)*	Upper 95% Confidence Interval	$0.85
		Point Estimate	$0.62*** (0.12)
		Lower 95% Confidence Interval	$0.39
Food Safety Intervention	Regular Inspection plus Steam Pasteurization *(Steam)*	Upper 95% Confidence Interval	$0.63
		Point Estimate	$0.35** (0.145)
		Lower 95% Confidence Interval	$0.07
	Regular Inspection plus Irradiation *(Irrad)*	Upper 95% Confidence Interval	-$0.0006
		Point Estimate	-$0.31** (0.157)
		Lower 95% Confidence Interval	-$0.62
Animal Locally Raised	Yes *(yeslocal)*	Upper 95% Confidence Interval	$0.87
		Point Estimate	$0.69*** (0.088)
		Lower 95% Confidence Interval	$0.52

[a] Willingness-to-pay estimates in dollars per pound.

[b] One asterisk indicates statistical significance at the 10% level, two at the 5% level, three at the 1% level.

[c] Values in parentheses are standard errors.

Table 4.28 reports that the mean willingness-to-pay point estimate for this survey sample for grass-fed ground beef with 40 mg/serving of omega-3 fatty acids is $1.48/lb for females and $1.06/lb for males compared to a baseline ground beef product. Similar to the steak WTP estimates, males are willing to pay less for the grass-fed product. The premium for the enhanced ground beef with 400 mg/serving of

omega-3 fatty acids is $0.53/lb with low information compared to the baseline product, but with high-information it is $1.06/lb. Respondents were willing to pay a premium of $0.62/lb for steak that is 90/10 lean-to-fat, $0.35/lb for steam pasteurized ground beef, and $0.69/lb for ground beef that is locally raised. Meanwhile, respondents of this survey had an average WTP discount of $0.31/lb for irradiated ground beef, which is expected given the results from previous analysis.

4.4 Potential Demand

Based on WTP estimates and the standard deviations of the estimates, more specific willingness-to-pay estimates can be calculated for different percentages of the population.

Table 4.29 shows that the mean, for this survey sample, willingness-to-pay for grass-fed steak is $3.33/lb for males and $4.06/lb for females. However, the top 10% of males are willing-to-pay $4.26/lb for grass-fed steak, while the top 10% of females are willing to pay $4.83/lb for the same product. Meanwhile, with low information the mean WTP for enhanced omega steak is $1.93/lb and the top 10% of consumers are willing-to-pay $2.75/lb for the enhanced omega steak. In this survey sample, providing additional information did not result in an increased WTP. Table 4.29 also shows the mean, upper 25% and upper 10% WTP for guaranteed tender steak and locally raised steak.

Table 4.29 WTP Distribution for Steak Attributes

WTP/lb	**Upper 50%**	**Upper 25%**	**Upper 10%**
Grass-Fed Steak			
Male	$3.33	$3.82	$4.26
Female	$4.06	$4.46	$4.83
Enhanced Omega Steak			
Low Info	$1.93	$2.36	$2.75
High Info	$1.79	$2.22	$2.61
Guaranteed Tender Steak			
Full Sample	$1.65	$1.83	$1.99
Locally Raised Steak			

Full Sample	$1.93	$2.08	$2.22

Table 4.30 shows that the mean, for this survey sample, willingness-to-pay for grass-fed ground beef is $1.06/lb for males and $1.48/lb for females. However, the top 10% of males are willing-to-pay $1.33/lb for grass-fed ground beef, while the top 10% of females are willing to pay $1.74/lb for the same product. With high-information the mean WTP for enhanced omega ground beef is $1.06/lb and the top 10% of consumers are willing-to-pay $1.30/lb for the enhanced omega ground beef. In this survey sample, providing additional information does result in an increased WTP. Table 4.30 also shows the mean, upper 25% and upper 10% WTP for 90/10 ground beef, steam pasteurized, irradiated, and locally raised ground beef.

Table 4.30 WTP Distribution for Ground Beef Attributes

	Upper 50%	**Upper 25%**	**Upper 10%**
Grass-Fed Ground Beef			
Male	$1.06	$1.20	$1.33
Female	$1.48	$1.61	$1.74
Enhanced Omega Ground Beef			
Low Info	$0.53	$0.66	$0.78
High Info	$1.06	$1.19	$1.30
90/10 Ground Beef			
Full Sample	$0.62	$0.70	$0.77
Steam Pasteurized Ground Beef			
Full Sample	$0.35	$0.45	$0.54
Irradiated Ground Beef			
Full Sample	-$0.31	-$0.20	-$0.11

Locally Raised Steak				
	Full Sample	$0.69	$0.75	$0.80

Results from the WTP estimates suggest that consumers are willing to pay a premium for enhanced omega-3 beef compared to conventionally raised products, but far less than the premium they are willing-to-pay for grass-fed beef products.

Chapter 5 - Conclusion

The retail beef industry will continue to be shaped by changing consumers demand for meat products. Meanwhile, the beef industry and its stakeholders continue to pursue improvements in cattle production practices, beef processing methods, and marketing strategies. One of the opportunities for the beef industry to have a more positive role in the "health and nutrition" foods sector is through further nutrient enhancement with various feeding methods, which can help to meet the increasing demand for healthy foods. In particular, by feeding cattle an algae supplement, in addition to a conventional feed ration, the level of omega-3 fatty acids can significantly increase. However, the extent to which consumers are willing to accept and pay for the nutrient enhancement can either delay or propel the advancement of this practice.

The research in this thesis measures consumer acceptance and willingness-to-pay (WTP) for enhanced omega-3 steak and ground beef compared to conventionally raised and grass-fed beef. Data from a retail trial and choice experiment provide a better understanding of consumer acceptance and willingness-to-pay for the omega-3 enhanced ground beef and steak products.

The retail trial did not provide significant results, although some interesting findings came from the trial. Sales of the omega-3 enhanced product were inconsistent with initial expectations and no trends were identified. Logit analysis of online survey results show that in both models, higher income is associated with a higher probability of purchase, although the effect is significant only in the ground beef model. The prevailing price premium for the enhanced omega product would be expected to have a negative effect on the probability of purchase. The coefficient on premium is negative but insignificant in the steak model, but positive, albeit again insignificant, for ground beef. Both models predict that males are less likely to buy omega product than females, but the effect is significant only for ground beef.

Analysis of the nation-wide survey sample found that they had a higher income level and education level than the average U.S. population. In the choice frequency analysis, information was found

to have a small effect, options with lower prices were chosen more frequently, and those in the low-beef consumption category chose the "none" option more frequently. Additionally, there was an evident preference for locally raised product, guaranteed tender steak, and 90/10 ground beef. Further analysis of the choice experiment data began with exploratory simple multinomial logit models, which suggested preference heterogeneity. Therefore, further analysis was done on a reduced sample (cleaned data set), where variables were effect coded and random parameters logit models were run.

As expected, for all model results for both surveys the coefficient for price was negative and statistically significant, indicating that higher prices are associated with lower utility.

For the simple multinomial model run with the full sample for the steak survey, grass-fed, enhanced omega-3, tenderness, and local are all positive and significant, indicating that each of these attributes is associated with increased utility. Meanwhile, for the simple multinomial model run with the full sample for the ground beef survey, grass-fed, enhanced omega-3, 90/10 lean-to-fat ratio, steam pasteurization, and local all increase utility, while irradiation decreases utility. In both survey results, preference heterogeneity was shown with samples segmented by income, information treatment, and gender.

After cleaning the data set and reducing the sample size, additional models were run that used effects coded variables. Random parameters logit models were run with the ground beef and steak survey samples, which included the effect of gender on preferences for grass-fed beef and the effect of high-information on preferences for the enhanced omega-3 beef products.

The coefficients on the effect coded variable representing the grass-fed omega category is positive and significant for the ground beef and steak survey samples, indicating that utility associated with grass-fed is above the average utility for all omega categories (i.e., that utility for grass-fed beef is higher than the mean of grass-fed, enhanced omega, and conventional). Although, grass-fed beef has above average utility for both males and females, females have a higher preference for grass-fed beef than males. The

estimated standard deviation for the grass-fed coefficient is also significant, indicating that preferences are heterogeneous.

For the ground beef and steak survey samples, the coefficient on the enhanced omega variable is negative but insignificant, indicating that utility for enhanced omega beef is slightly below the mean of the three categories. The model allows the coefficient on enhanced omega to be influenced by the information treatment, which shows that respondents of the ground beef survey sample have higher than average utility for the enhanced omega product in the high-information treatment. As with grass-fed, the estimated standard deviation for the enhanced omega product is significant, indicating that preferences for the enhanced product are also heterogeneous. However, in the steak survey sample the estimated effect of high-information on the preference for the enhanced omega product is insignificant.

Additionally, for the ground beef model the coefficients indicate higher utility for the enhanced omega-3 product than that associated with conventional product. The model estimates also show higher utility associated with the leaner (90/10) ground beef than with the alternative (80/20) product, and higher utility for meat originating from locally raised animals. The effect coded variables on food safety interventions indicate higher than average utility associated with steam pasteurization and lower than average utility associated with irradiation.

The steak model estimates show higher utility associated with the guaranteed tender steak than with the alternative not guaranteed tender product, and higher utility for meat originating from locally raised animals.

Using the RPL models, estimated mean WTP premiums were calculated for these survey samples. The estimated premium that females are WTP for grass-fed steak is $4.06/lb compared to a baseline beef steak product, while they are willing to pay $1.48/lb for grass-fed ground beef compared to a baseline ground beef product. Males are willing to pay less for this same products as their WTP for grass-fed steak is $3.33/lb and $1.06/lb for grass-fed ground beef.

The information treatment did not increase the WTP for omega-3 enhanced steak, but did for omega-3 enhanced ground beef. With low information the premium for the omega-3 enhanced steak is $1.93/lb and $0.53/lb for omega-3 enhanced ground beef compared to the baseline product, but with high-information it is $1.79/lb for enhanced omega steak and $1.06/lb for enhanced omega ground beef.

Respondents were willing to pay a premium of $1.65/lb for steak that is guaranteed tender and $1.93/lb for steak that is locally raised. Respondents were willing to pay a premium of $0.62/lb for steak that is 90/10 lean-to-fat, $0.35/lb for steam pasteurized ground beef, and $0.69/lb for ground beef that is locally raised. Meanwhile, respondents of this survey had an average WTP discount of $0.31/lb for irradiated ground beef, which is expected given the results from previous analysis.

In the case of grass-fed beef, consumers likely use it as a signal for the presence of other attributes including are animal welfare and environmental impacts, as well as health properties (Gwin, Durham, Miller, & Colonna, 2012). While several studies have shown that providing information affects the WTP for grass-fed beef (Lusk & Parker, 2009; McCluskey, Wahl, Li, & Wandschneider, 2005; Thilmany, Umberger, & Ziehl, 2006; Umberger, Boxall, & Lacy, 2009; Xue, Mainville, You, & Nayga Jr. , 2010), Gwin et al. (2012) found that prior knowledge is more influential than providing information during a test. This finding, in addition to the U.S. population's increase in general knowledge and awareness of grass-fed beef supports that WTP premiums for grass-fed beef are likely to be high. Therefore, it is not surprising to see willingness to pay estimates for grass-fed beef at very high levels in this study, especially when you consider the hypothetical upward bias and the higher income levels of the sample. However, the estimates found in this research are not far from those found in recent studies. The 2011 Evans et al. study found the average bid to upgrade to a grass-fed steak was $2.28, while the range found in our study was $2.89/lb to $5.23/lb. In Gwin et al.'s (2012) research, they discovered that a baseline, uniformed consumer would pay $0.90-$0.94/lb premium for grass-fed ground beef compared to conventional ground beef. This is not far from the range of $1.09/lb to $1.87/lb found in our study.

To further analyze the demand for omega-3 enhanced beef, WTP distributions were calculated. With low information the mean WTP for enhanced omega steak is $1.93/lb, the top 25% of consumers are WTP $2.36/lb, and the top 10% of consumers are willing-to-pay $2.75/lb for the enhanced omega steak. Note that additional information did not increase WTP estimates for omega-3 enhanced steak, but did for omega-3 enhanced ground beef. With high-information the mean WTP for enhanced omega ground beef is $1.06/lb, the top 25% of consumers were WTP $1.19/lb, and the top 10% of consumers are willing-to-pay $1.30/lb for the enhanced omega ground beef.

Though WTP premiums were found for omega-3 enhanced ground beef and steak, the estimates found are not necessarily high enough to justify the implementation of the enhanced omega-3 diet for cattle producers. The reality of a profit depends not only on consumers being willing to pay a premium, but also on the cost of production, including the cost of the algae supplement, supply chain management, and marketing for this novel product.

5.1 Summary and Implications

Ultimately, the overall acceptance and willingness to pay towards an omega-3 enhanced beef product was evaluated. Consumers showed a preference for the enhanced omega-3 beef option over conventionally raised beef, but a much higher preference for grass-fed beef. This research will contribute to the limited availability of published literature on this topic and will provide animal science researchers and members of the cattle industry, as well as the meat marketing industry, a better understanding of the potential opportunity to expand product offerings for consumers.

Summary of Results

The overall acceptance and willingness to pay for an omega-3 enhanced beef product, which has levels of DHA and EPA higher than traditional beef and is an alternative to fish, was less than a grass-fed beef option with 90% less omega-3 fatty acids per serving. Even with a high-information treatment,

consumers more frequently preferred the grass-fed option. As expected, higher prices are associated with lower utility.

The average premium, for this survey sample, for the omega-3 enhanced steak is $1.93/lb compared to the baseline steak product. The top 25% of consumers are WTP $2.36/lb, and the top 10% of consumers are willing-to-pay $2.75/lb for the enhanced omega steak. Meanwhile, the premium for the omega-3 enhanced ground beef is $0.53/lb with low-information and $1.06/lb with high-information. With high-information, the top 25% of consumers were WTP $1.19/lb, and the top 10% of consumers are willing-to-pay $1.30/lb for the enhanced omega ground beef.

Therefore, if it costs less than these willingness-to-pay estimates to produce and market the omega-3 enhanced beef product, then this could be a viable production option for the beef industry. However, further research must be done to come to this conclusion.

5.2 Future and Related Research

This research was part of a pilot study for a larger research project funded through the Federal State Marketing Improvement Program (FSMIP) from the U.S. Department of Agriculture's Agricultural Marketing Service agency. With the second feeding trial mentioned in Chapter 3, more beef has been processed and sold at the Sam's Club in Topeka, Kansas, to better understand the acceptance of omega-3 enhanced beef at the retail meat counter. Although the customer base of Sam's Club is different than that of La Vaca Meat Co.'s customer base, a similar experiment was done. Prices were changed periodically to measure actual willingness-to-pay. The data gathered from the surveys in this research can be used when analyzing the sales data from Sam's Club. Additionally, there is ongoing research on the proper feeding regimen to be used for cattle that will go into the omega-3 enhanced beef supply. Affordability and efficiency are key areas of focus in this research.

In the case of this research, the enhanced omega-3 attribute is limited in the market and using CE designs have the advantage of being able to evaluate consumer preferences for new attributes. As was

found by Pozo, Tonsor, and Schroeder (2012), attributes can be sensitive to one another so it is important to understand the importance of evaluating potential relationships between attributes. Though we did not use multiple designs, our experiment provides some insight into how the labelling of the product could influence the WTP for the product. However, it is limited, because the combination of attributes used in our design are not necessarily the real labeling environment so the WTP garnered from this research is not necessarily the true WTP.

Further research is needed to better understand the cost of production and marginal value to cattle producers who seek to utilize the omega-3 feed additive.

5.3 Limitations

La Vaca Retail Trial

In the initial retail trial where product was sold at La Vaca Meat Co., there were several limitations. Primarily, that we did not have control over the day-to-day management of the experiment. While the employees we worked with were very good to work with, it was difficult to maintain the level of control over several things. One was the marketing communications shared with customers. Some customers may have been persuaded to purchase the omega-3 enhanced product because a sales staff was able to tell them about it, while other customers may not have seen the product at all and no sales staff was available to tell them about it. Another aspect of the marketing communications that was not controlled was the amount of customers who saw information about the enhanced omega beef product via the company's Facebook page. Another limitation was the low level of sales through the store. This created challenges in the pricing structure. Because all of La Vaca's product moves slowly, we needed to keep the prices at a certain level for a more extended period of time than what we would have liked. Having the price periods extended to around 45 days caused each time period to have its own unique characteristics about the time of year (e.g. holidays, weather). Additional discussion on the challenges with this part of the study can be found in Appendix D.

Online Survey Creation

Survey Monkey was used because the researchers had created previous surveys using this platform. However, limitations existed with the platform and the choice experiment survey. In the creation of the online survey it was difficult and time consuming to add the CE questions. Each question had to be added individually as a picture, which was created by copying the table created in Excel onto a PowerPoint slide (at a particular size) then saving each table as an image and uploading it to the survey. Another challenge related to this part of the survey was that the pictures may show up in different sizes based on the type of device the survey was taken on, which created problems for some respondents. For example, one respondent commented in their survey that they could not see any of the options so they chose "None" on all of them. While this person was kind enough to let us know about the problem they encountered, we do not know how many other respondents had this issue.

Another issue regarding the use of Survey Monkey to execute a Choice Experiment was the limitation in the logic we were able to apply. We could not make the 9 questions that a respondent would see for the block they were assigned be on individual pages without creating a separate survey for each block. Consequently, all 9 questions were all on one page within the survey, which could have influenced some respondents' choices.

Yet another issue with using Survey Monkey was the inability to remove the "Back" button on select pages. We did not want respondents to be able to go back and change their answers after they had learned something later in the survey so the "Back" button was removed from all pages, but it would have been helpful to have the "Back" button available during the choice experiment section to refer back to the attribute definitions. One additional issue was the inability to put an accurate progress bar with the survey. Because there were multiple blocks within the survey that would be skipped (since each respondent only saw one block), the progress bar would have shown an inaccurate percentage so it was left off entirely.

Results

Different results would likely have been seen if the 40 mg/serving omega-3 level, which was associated with grass-fed beef had been labeled differently. The name, “grass-fed” likely overshadowed the omega-3 level that was being asked about. However, this is the way product is labeled in the current marketplace.

Chapter 6 - References

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Appendix A - Online LaVaca Survey

Omega-3 Beef Survey

Your participation in this short survey is completely voluntary and you may withdraw at any time. Your responses are confidential and your answers will not be associated with you. As a token of our appreciation, by providing your contact information at the link at the end of the survey, you will be entered in a drawing for 2 free steaks from LaVaca Meat Co.

For the following questions, please select your response.

1. Did you purchase ground beef?

- ○ Yes
- ○ No

2. Did you purchase steak?

- ○ Yes
- ○ No

3. Did you purchase Omega-3 enhanced ground beef?

- ○ Yes
- ○ No

4. Did you purchase Omega-3 enhanced steak?

- ○ Yes
- ○ No

5. Why did you purchase Omega-3 enhanced ground beef? Check all that apply.

- ☐ Believe there are health benefits
- ☐ Good value for the price
- ☐ Want to try something different
- ☐ Purchased both Omega-3 product and regular product

6. Why did you not purchase Omega-3 ground beef? Check all that apply.

- ☐ Did not see it on the shelf
- ☐ Too expensive
- ☐ Not interested/unsure of health benefits

7. Why did you purchase Omega-3 steak? Check all that apply.

- [ ] Believe there are health benefits
- [ ] Good value for the price
- [ ] Want to try something different
- [ ] Purchased both Omega-3 product and regular product

8. Why did you not purchase Omega-3 steak? Check all that apply.

- [ ] Did not see it on the shelf
- [ ] Too expensive
- [ ] Not interested/unsure of health benefits

* 9. What gender are you?

- ( ) Male
- ( ) Female

10. In what year were you born?

* 11. Approximately how often does your household consume ground beef and/or steak?

- ( ) Less than once per week
- ( ) 1 – 3 times per week
- ( ) More than 3 times per week

* 12. To help us identify the representation of various income levels, please indicate your approximate annual household income before taxes.

- ( ) Less than $25,000
- ( ) $25,000 - $50,000
- ( ) $50,000 - $100,000
- ( ) More than $100,000
- ( ) Prefer not to answer

* 13. What is your highest level of education?

- Some high school
- High school graduate
- Some college
- College graduate
- Post college graduate

* 14. Including yourself, how many people live in your household?

- 1 person
- 2 people
- 3 people
- 4 people
- 5 people
- More than 5 people

* 15. Are there any children living in your household?

	Yes	No
Under age 6?		
Between 6 and 18?		

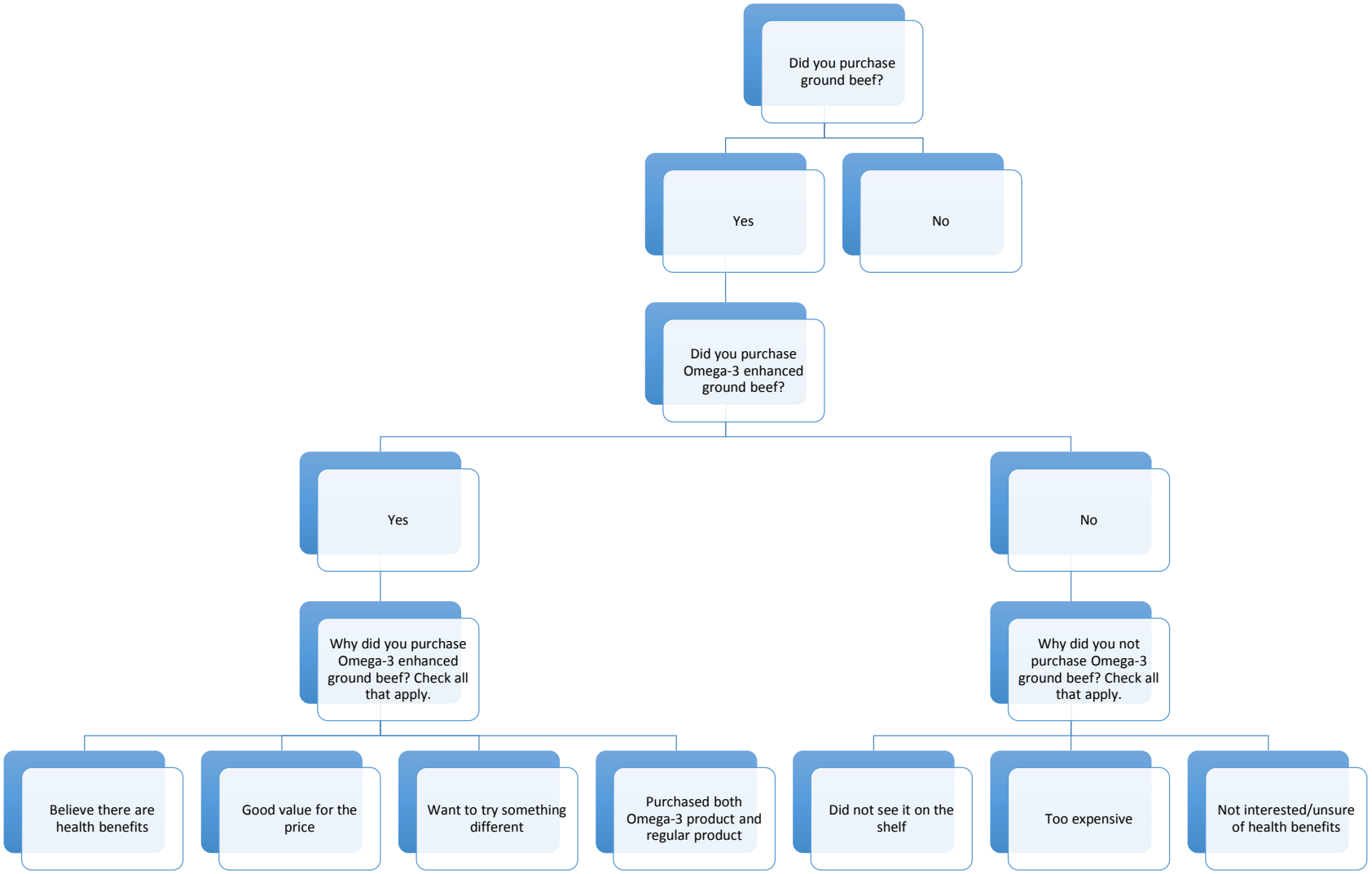
* 16. What level of consideration do you give to the following factors when purchasing meat?

	Least				Most
Price					
Food Safety					
Nutrition					
Fat/Cholesterol Level					
Quality/Taste					

17. Thank you for completing the survey. Your responses are confidential and your answers will not be associated with you.

*Optional: If you would like to enter the drawing for the free steaks, please provide an email address below.

Question Logic for purchase decisions



Appendix B - Survey Designs

Ground Beef Survey Design

	Choice 1					Choice 2					Choice 3				
Block Number	price	food safety	omega3	locally raised	lean to fat	price	food safety	omega3	locally raised	lean to fat	price	food safety	omega3	locally raised	lean to fat
1	3	2	1	1	2	2	2	2	1	2	2	3	1	1	1
1	1	3	3	1	1	3	1	2	2	2	1	3	2	1	2
1	2	2	2	2	2	3	3	1	2	1	2	2	2	2	1
1	2	1	2	1	1	1	3	2	1	1	3	2	2	1	1
1	1	1	2	1	2	2	3	3	2	2	2	3	3	2	1
1	2	2	1	2	2	1	1	2	2	2	3	1	2	2	2
1	3	3	3	2	1	1	3	3	1	1	3	1	1	2	2
1	3	3	2	2	2	1	1	3	1	2	1	2	1	2	2
1	3	3	1	1	2	2	2	1	1	1	1	1	3	1	1
2	3	1	3	1	2	3	2	3	1	2	3	3	3	1	2
2	1	2	3	2	1	2	3	1	2	2	1	2	1	2	2
2	2	2	1	2	2	3	1	1	1	2	3	2	3	2	2
2	3	3	3	1	2	1	1	3	2	1	1	3	3	2	1
2	2	3	1	1	1	2	3	1	2	2	3	1	2	1	1
2	1	2	1	2	2	1	3	2	1	1	1	1	1	1	1
2	3	3	2	1	2	1	2	2	1	2	2	2	2	2	2
2	1	2	2	2	1	3	1	3	1	1	2	3	1	1	2
2	1	1	1	1	1	3	2	2	2	1	3	2	1	2	1
3	2	2	1	2	1	1	3	2	1	1	1	3	3	1	2
3	1	2	1	1	2	3	1	3	2	1	3	2	1	2	1
3	3	3	2	2	1	2	3	2	2	1	2	3	1	2	1
3	1	2	3	2	2	2	2	2	2	1	2	2	3	2	2
3	2	3	2	1	1	3	1	3	1	1	2	1	3	2	2
3	1	1	1	1	2	3	2	3	1	2	1	1	2	1	2
3	3	3	3	1	1	3	3	1	1	2	3	2	1	1	1
3	3	1	2	1	1	1	1	1	1	2	1	1	2	2	1
3	2	1	3	2	2	2	1	1	2	2	3	3	1	1	2
4	3	3	1	2	1	3	2	1	2	1	3	3	2	2	1
4	2	2	3	1	1	2	3	3	1	2	1	2	2	2	1
4	3	1	1	1	2	3	1	2	1	1	1	2	3	2	1
4	3	1	2	1	2	2	2	1	2	1	2	2	1	1	2
4	1	3	2	1	2	1	3	2	2	2	3	3	3	1	2
4	1	2	2	2	2	1	2	1	1	2	2	2	2	1	2
4	2	1	2	2	1	3	3	3	2	2	1	2	3	1	1
4	2	2	3	2	1	1	2	3	2	1	2	1	2	1	1
4	2	1	3	1	2	2	1	2	1	2	2	1	1	2	2
5	2	2	2	1	2	3	1	2	2	2	1	3	1	2	1
5	1	3	1	2	1	3	2	1	2	1	1	1	3	2	2
5	3	1	1	1	1	2	1	2	2	1	2	1	2	2	2
5	1	3	1	1	2	1	3	3	2	2	1	2	2	2	2
5	1	1	1	2	2	2	1	3	1	1	2	2	3	1	1
5	1	1	3	1	1	1	1	1	1	1	3	2	1	1	1
5	3	2	2	2	1	3	2	3	2	2	3	1	1	1	2
5	2	3	3	2	1	3	2	2	1	2	2	3	3	1	1
5	3	2	2	1	2	2	3	1	1	1	3	3	2	1	2
6	1	1	3	2	2	3	3	1	1	1	2	3	2	2	1
6	2	2	1	1	1	1	3	3	1	1	1	3	1	1	2
6	2	3	2	2	2	2	2	1	1	1	1	1	1	2	2
6	1	3	3	2	1	3	1	2	1	2	1	2	2	1	2
6	1	3	2	1	1	2	1	3	2	1	3	2	3	1	2
6	3	2	1	2	1	2	1	3	2	2	2	3	2	1	1
6	1	3	3	1	2	1	1	1	2	2	2	1	1	1	1
6	3	2	3	1	1	1	2	2	2	1	2	2	3	2	1
6	2	1	2	2	2	1	2	2	2	2	3	1	3	1	1
7	3	1	2	2	2	1	1	1	2	1	1	3	2	1	1
7	1	2	2	1	1	2	2	3	1	2	3	1	2	2	1
7	2	3	3	2	2	1	2	3	2	1	3	2	1	1	2
7	3	1	1	2	1	2	3	2	2	2	1	2	1	1	2
7	1	3	2	2	2	2	1	2	1	1	3	3	2	2	1
7	2	3	1	1	1	1	3	1	1	2	2	3	3	2	2
7	1	2	3	1	2	3	3	1	2	1	2	1	3	1	2
7	1	2	2	1	1	1	2	1	2	2	1	3	1	2	1
7	3	1	1	2	2	3	3	3	2	2	2	1	1	2	2
8	1	1	1	2	1	1	2	1	1	1	2	3	1	2	2
8	1	1	2	2	1	2	3	2	1	2	3	1	3	2	2
8	2	1	3	1	1	2	2	3	2	1	1	3	2	2	2
8	3	2	3	2	1	2	1	1	1	2	1	1	3	1	1
8	2	3	2	1	2	3	3	2	2	1	1	1	1	1	1
8	3	2	3	1	2	3	3	2	1	1	3	1	2	1	2
8	2	3	1	2	2	2	2	3	1	2	2	2	2	1	1
8	3	1	3	2	2	1	3	3	1	2	3	3	3	2	1
8	3	2	1	1	1	1	1	1	2	2	2	2	3	1	2

Steak Survey Design

	Choice 1				Choice 2				Choice 3			
Block Number	price	tenderness	omega3	locally raised	price	tenderness	omega3	locally raised	price	tenderness	omega3	locally raised
1	3	2	3	1	1	2	1	1	1	1	2	1
1	3	1	2	1	2	1	3	2	2	2	1	2
1	2	2	3	2	1	2	1	2	1	2	2	1
1	3	2	1	1	2	2	3	1	3	2	3	1
1	2	2	3	1	2	1	2	1	3	2	1	1
1	1	2	1	2	1	1	2	2	2	2	3	2
1	1	2	2	2	3	1	3	2	1	1	3	1
1	2	1	3	2	3	2	2	2	3	1	3	1
1	1	1	1	1	3	2	1	1	3	1	2	2
2	1	2	2	1	1	2	3	1	2	1	1	1
2	2	2	1	2	2	2	1	1	2	1	3	1
2	2	2	1	1	3	1	3	2	3	2	2	1
2	1	2	3	2	2	1	2	1	2	1	3	2
2	3	1	1	2	2	1	1	2	1	1	2	2
2	1	1	3	1	1	1	1	2	3	2	3	1
2	3	2	3	1	1	1	2	2	3	1	1	2
2	1	1	2	1	3	2	2	1	1	2	1	2
2	3	1	2	2	1	2	3	1	1	2	3	2
3	3	2	3	2	1	2	3	2	2	2	2	2
3	2	1	2	1	1	1	1	1	2	2	3	1
3	1	1	3	2	2	1	3	1	3	1	2	1
3	3	2	2	2	3	2	1	2	2	1	1	1
3	1	1	1	1	2	1	2	2	1	2	1	1
3	2	1	2	2	1	1	2	1	3	1	2	2
3	2	2	1	2	3	1	3	1	1	1	1	2
3	3	1	1	2	3	2	2	1	2	2	2	1
3	2	1	3	1	2	2	3	2	1	1	3	2
4	2	2	2	1	2	2	2	2	1	2	2	2
4	1	1	1	2	1	2	3	2	3	1	1	1
4	1	1	3	1	3	1	3	1	2	2	2	2
4	3	1	2	2	2	1	2	2	2	1	2	1
4	3	2	1	1	1	1	2	1	1	1	3	1
4	3	2	2	1	3	1	1	2	3	1	3	2
4	2	1	1	1	1	2	1	2	2	1	1	2
4	3	1	3	2	3	1	1	1	1	2	1	1
4	1	2	2	2	2	2	1	1	3	2	1	2

Appendix C - Survey Instrument

Ground Beef Survey

*Note: In the survey below "National Survey on Beef Preferences" indicates the start of a new page within the survey that respondents went through via SurveyMonkey.com.

National Survey on Beef Preferences

This survey is part of a Kansas State University graduate student's research project to better understand preferences and willingness to pay for different beef products. Your responses are completely anonymous and confidential.

Thank you for participating.

National Survey on Beef Preferences

* 1. Approximately how often does your household consume the following products?

	At least once a week	2-3 times a month	About once a month	Less than once a month	Never
Ground Beef/ Hamburger	○	○	○	○	○
Steak	○	○	○	○	○
Chicken	○	○	○	○	○
Pork	○	○	○	○	○
Fish	○	○	○	○	○

National Survey on Beef Preferences

* 2. Approximately how much does your household spend on food that will be consumed at home during a typical week?

- ○ less than $60 per week
- ○ $61-$90 per week
- ○ $91-$120 per week
- ○ $121-$150 per week
- ○ more than $150 per week

National Survey on Beef Preferences

* 3. Where do you most frequently purchase meat that you consume at home?

- Supermarket/Grocery Store
- Bulk Store (e.g. Sam's, Costco)
- Health/Natural Foods Store
- Farmers Market/Local Cooperative
- Directly from Producer
- Internet or Direct Mail Order

* 4. What is your experience with "grass-fed" beef? (Grass-fed beef must come from cattle that have consumed a diet solely derived from grass for the lifetime of the animal, with the exception of milk consumed prior to weaning.)

- I have never heard of it.
- I have heard of it, but never consumed it.
- I have consumed it, but do not regularly consume it.
- I consume it regularly.

* 5. Compared to conventional beef, what is your expectation or impression regarding grass-fed beef's...

	Negative	Neutral	Positive	No Expectation
impact on human health				
impact on the environment				
impact on animal welfare				
impact on taste				

National Survey on Beef Preferences

* 6. How frequently do you undertake moderate or vigorous physical activities (including any activities that cause an increase in your heart or breathing rate so that you can talk but not sing, such as brisk walking, bicycling, vacuuming or other forms of exercise)?

- Less than once a week
- 1 – 2 times a week
- 3 or more times a week

* 7. Have you ever been diagnosed by a medical professional with any of the following? Check all that apply.

- ☐ Diabetes
- ☐ Heart disease
- ☐ High blood pressure
- ☐ High Cholesterol
- ☐ Obesity
- ☐ None of the above

* 8. Over the past year, have you made any changes to your diet? Check all that apply.

- ☐ More fiber
- ☐ More whole grains
- ☐ More protein More
- ☐ vegetables More
- ☐ calcium
- ☐ More omega-3 fats
- ☐ More probiotics More
- ☐ potassium Reduced
- ☐ calories Reduced
- ☐ carbohydrates Less sodium
- ☐ Less sugar
- ☐ Less meat
- ☐ Less gluten
- ☐ Reduced saturated fats
- ☐ Reduced cholesterol
- ☐ No major changes in the past year

Other (please specify)

* 9. What type of dietary supplements do you take? Check all that apply.

- ☐ Vitamins
- ☐ Minerals
- ☐ Fatty Acids
- ☐ Amino Acids
- ☐ Protein
- ☐ Botanicals
- ☐ Other Dietary Supplements
- ☐ None

National Survey on Beef Preferences

* 10. How concerned are you about the issues listed below?

	Not at all Concerned		Somewhat Concerned		Very Concerned
Use of synthetic growth hormones in food production	○	○	○	○	○
Foodborne pathogens that can cause illness	○	○	○	○	○
Use of irradiation to control foodborne pathogens	○	○	○	○	○
Genetic Modification of food crops (GMOs) Use of	○	○	○	○	○
cloning in food animal production Welfare of	○	○	○	○	○
animals used for food production Use of	○	○	○	○	○
chemicals/pesticides in food production	○	○	○	○	○
Labeling of genetically modified food ingredients	○	○	○	○	○
Use of antibiotics in food animal production	○	○	○	○	○

National Survey on Beef Preferences

* 11. Please indicate whether you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Omega-3 fatty acids can help reduce the risk of heart attacks.	○	○	○	○	○
Salmon is a good source of omega-3 fatty acids.	○	○	○	○	○
Wheat based foods are a good source of omega-3 fatty acids.	○	○	○	○	○
Beef is a good source of omega-3 fatty acids.	○	○	○	○	○

National Survey on Beef Preferences

A 50.0% Omega-3 fatty acids are highly unsaturated long chain fatty acids. Nutritional and health studies suggest that omega-3 fatty acids can be beneficial to health. They may help reduce cholesterol and blood pressure, and may reduce the chance of heart disease and cancer.

There are three types of omega-3 fatty acids: alpha-linolenic acid (ALA), eicosapentaenoic (EPA), and docosahexaenoic (DHA). The most common is ALA, which comes from plant sources such as walnuts, flaxseed, canola and soybeans. DHA and EPA, which are only found in animal tissues, have the greatest health benefits. The American Heart Association recommends DHA/EPA intakes of 250 to 500 mg per day.

Fish such as salmon, herring and tuna are among the best sources of DHA/EPA with salmon providing up to 400 mg/ounce. Beef from cattle fed with supplements derived from algae has recently been found to provide up to 100 mg/ounce of omega-3 fatty acids with more DHA/EPA than grass-fed or conventionally raised beef.

B 50.0% Omega-3 fatty acids are highly unsaturated long chain fatty acids. Nutritional and health studies suggest that omega-3 fatty acids can be beneficial to health. They may help reduce cholesterol and blood pressure, and may reduce the chance of heart disease and cancer.

National Survey on Beef Preferences

Imagine being at the grocery store examining one pound (16 oz.) packages of ground beef patties available for purchase. In the following scenarios you will be asked to choose one package of ground beef patties from among three alternatives or to indicate you would not purchase any of the three available products. Alternatives vary in price and in the following attributes:

Food Safety:

- Level 1: USDA inspection.
- Level 2: USDA inspection plus steam pasteurization – a process that kills over 95% of harmful bacteria such as *E.coli* on the beef carcass during processing.
- Level 3: USDA inspection plus irradiation – a process that kills 100% of harmful bacteria such as *E. coli* in ground beef.

Omega-3 Level: Depending on how animals are fed, ground beef products contain varying levels of omega-3 fatty acids.

- Level 1: Conventional feeding: 16 mg Omega-3 per 4 oz. serving
- Level 2: Grass fed: 40 mg Omega-3 per 4 oz. serving
- Level 3: Enhanced omega diet: 400 mg Omega-3 per 4 oz. serving

Locally Raised: Product is considered local if the animal was raised within 50 miles of where the ground beef product is sold.

Lean to Fat Ratio: Ground beef product is either 80/20 (i.e., 80% lean and 20% fat) or 90/10.

In each scenario that follows, please select the type of ground beef you would prefer to purchase or whether you would not purchase any of the options.

Even though this is a hypothetical exercise, please answer the questions as if you were actually shopping for ground beef and these were the available alternatives. Keep in mind that buying a product means that you would have less money available for other purchases.

National Survey on Beef Preferences

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus irradiation	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	80/20	90/10	

* 12. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	90/10	80/20	80/20	

* 13. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	No	
Lean to Fat	80/20	90/10	90/10	

* 14. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	90/10	90/10	90/10	

* 15. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	80/20	80/20	90/10	

* 16. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	No	
Lean to Fat	80/20	80/20	80/20	

* 17. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	90/10	90/10	80/20	

* 18. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	80/20	80/20	

* 19. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	90/10	90/10	

* 20. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

National Survey on Beef Preferences

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	80/20	80/20	

* 21. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	No	
Lean to Fat	90/10	80/20	80/20	

* 22. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	80/20	80/20	

* 23. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	80/20	90/10	90/10	

* 24. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	90/10	80/20	90/10	

* 25. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	80/20	90/10	90/10	

* 26. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	80/20	80/20	80/20	

* 27. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	90/10	90/10	80/20	

* 28. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	90/10	90/10	90/10	

* 29. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	90/10	90/10	80/20	

* 30. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	80/20	90/10	90/10	

* 31. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	No	
Lean to Fat	90/10	90/10	90/10	

* 32. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	No	
Lean to Fat	80/20	90/10	80/20	

* 33. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	90/10	90/10	80/20	

* 34. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	80/20	80/20	

* 35. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	90/10	80/20	90/10	

* 36. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	90/10	80/20	90/10	

* 37. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	80/20	80/20	80/20	

* 38. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	No	
Lean to Fat	90/10	90/10	90/10	

* 39. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	90/10	80/20	90/10	

* 40. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	80/20	90/10	90/10	

* 41. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	80/20	90/10	80/20	

* 42. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	80/20	80/20	80/20	

* 43. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	80/20	80/20	80/20	

* 44. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	90/10	80/20	90/10	

* 45. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	90/10	90/10	90/10	

* 46. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	80/20	80/20	80/20	

* 47. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	80/20	80/20	90/10	

* 48. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	No	
Lean to Fat	90/10	90/10	80/20	

* 49. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	90/10	90/10	80/20	

* 50. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	80/20	80/20	80/20	

* 51. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	80/20	90/10	90/10	

* 52. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	90/10	90/10	90/10	

* 53. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	90/10	80/20	80/20	

* 54. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	90/10	80/20	90/10	

* 55. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	90/10	80/20	

* 56. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	90/10	90/10	

* 57. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	90/10	90/10	80/20	

* 58. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	90/10	80/20	

* 59. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	90/10	80/20	80/20	

* 60. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	90/10	90/10	80/20	

* 61. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	90/10	80/20	90/10	

* 62. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	80/20	80/20	90/10	

* 63. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	90/10	90/10	90/10	

* 64. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	80/20	80/20	90/10	

* 65. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Regular inspection	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	80/20	90/10	90/10	

* 66. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	90/10	80/20	90/10	

* 67. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	80/20	90/10	80/20	

* 68. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	
Lean to Fat	90/10	80/20	80/20	

* 69. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Regular inspection	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	90/10	90/10	

* 70. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	No	
Lean to Fat	90/10	80/20	80/20	

* 71. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	80/20	90/10	80/20	

* 72. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	90/10	80/20	90/10	

* 73. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Regular inspection	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	No	
Lean to Fat	80/20	80/20	80/20	

* 74. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$3.79/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	90/10	90/10	80/20	

* 75. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$3.79/lb	$4.59/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	90/10	80/20	80/20	

* 76. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus steam pasteurization	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	No	
Lean to Fat	90/10	90/10	80/20	

* 77. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$4.59/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	90/10	80/20	90/10	

* 78. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$5.29/lb	$3.79/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus irradiation	Regular inspection	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	80/20	90/10	90/10	

* 79. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$5.29/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Inspection plus irradiation	Regular inspection	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	Yes	
Lean to Fat	80/20	90/10	80/20	

* 80. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$4.59/lb	$4.59/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus irradiation	Inspection plus steam pasteurization	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	Yes	
Lean to Fat	80/20	80/20	90/10	

* 81. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$5.29/lb	I would not purchase any of these options
Food Safety	Regular inspection	Inspection plus irradiation	Inspection plus irradiation	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	No	
Lean to Fat	80/20	80/20	90/10	

* 82. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$5.29/lb	$3.79/lb	$4.59/lb	I would not purchase any of these options
Food Safety	Inspection plus steam pasteurization	Regular inspection	Inspection plus steam pasteurization	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	Yes	
Lean to Fat	90/10	80/20	80/20	

* 83. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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* 84. How confident are you in the selections you just made?

Not at all Confident		Somewhat Confident		Very Confident
○	○	○	○	○

* 85. How confident are you that there are health benefits from omega-3 fatty acids?

Not at all Confident		Somewhat Confident		Very Confident
○	○	○	○	○

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* 86. What is your highest level of education?

- ○ Some high school
- ○ High school graduate
- ○ Some college
- ○ College graduate
- ○ Post college graduate

* 87. Including yourself, how many adults live in your household?

* 88. How many children under age 6 live in your household?

* 89. How many children between 6 and 18 live in your household?

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Thank you for completing the survey. Your responses are confidential and your answers will not be associated with you.

90. Please provide any comments you have regarding this survey.

The steak survey follows the same style and logic with the same questions being asked before and after the choice experiment section. The only differences between the two surveys are the description of the hypothetical scenario, the attribute definitions section and the blocks of questions used in the choice experiment section, as well as the number of respondents (n=374 for ground beef survey and n=183 for steak survey). Below are the descriptions and blocks used in the steak survey.

Steak Survey – Choice Experiment Section

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Imagine being at the grocery store purchasing a one pound (16 oz.) package of steaks available for purchase. In the following scenarios you will be asked to choose one package of steaks from among three alternatives or to indicate you would not purchase any of the three available products. Alternatives vary in price and in the following attributes:

Tenderness:

- Guaranteed Tender: Beef is aged for a minimum of 14 days to guarantee tenderness.
- No label: No information is provided on the product indicating tenderness level.

Omega-3 Level: Depending on how animals are fed, steak products contain varying levels of omega-3 fatty acids.

- Level 1: Conventional feeding: 16 mg Omega-3 per 4 oz. serving
- Level 2: Grass fed: 40 mg Omega-3 per 4 oz. serving
- Level 3: Enhanced omega diet: 400 mg Omega-3 per 4 oz. serving

Locally raised: Product is considered local if the animal was raised within 50 miles of where the steak product is sold.

In each scenario that follows, please select the type of steak you would prefer to purchase or whether you would not purchase any of the options.

Even though this is a hypothetical exercise, please answer the questions as if you were actually shopping for steak and these were the available alternatives. Keep in mind that buying a product means that you would have less money available for other purchases.

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	Option A	Option B	Option C	None
Price	$15.39/lb	$10.99/lb	$10.99/lb	I would not purchase any of these options
Tenderness	No Label	No Label	Guaranteed Tender	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	Yes	

* 12. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$13.19/lb	$13.19/lb	
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	

* 13. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$10.99/lb	$10.99/lb	
Tenderness	No Label	No Label	No Label	I would not purchase any of these options
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	Yes	

* 14. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$13.19/lb	$15.39/lb	
Tenderness	No Label	No Label	No Label	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	

* 15. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$13.19/lb	$15.39/lb	
Tenderness	No Label	Guaranteed Tender	No Label	I would not purchase any of these options
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	

* 16. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$10.99/lb	$13.19/lb	
Tenderness	No Label	Guaranteed Tender	No Label	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	No	

* 17. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$15.39/lb	$10.99/lb	
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	Yes	

* 18. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$15.39/lb	$15.39/lb	
Tenderness	Guaranteed Tender	No Label	Guaranteed Tender	I would not purchase any of these options
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	No	Yes	

* 19. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$15.39/lb	$15.39/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	Guaranteed Tender	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	

* 20. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$10.99/lb	$10.99/lb	$13.19/lb	I would not purchase any of these options
Tenderness	No Label	No Label	Guaranteed Tender	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	Yes	

* 21. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$13.19/lb	$13.19/lb	I would not purchase any of these options
Tenderness	No Label	No Label	Guaranteed Tender	
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	Yes	

* 22. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$15.39/lb	$15.39/lb	
Tenderness	No Label	Guaranteed Tender	No Label	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	Yes	

* 23. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$13.19/lb	$13.19/lb	
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	No	

* 24. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$13.19/lb	$10.99/lb	
Tenderness	Guaranteed Tender	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	No	

* 25. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$10.99/lb	$15.39/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	Yes	

* 26. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$10.99/lb	$15.39/lb	I would not purchase any of these options
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	
Omega 3	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	

* 27. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$15.39/lb	$10.99/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	No Label	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	Yes	No	

* 28. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$10.99/lb	$10.99/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	No Label	
Omega 3	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	No	Yes	No	

* 29. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

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	Option A	Option B	Option C	None
Price	$15.39/lb	$10.99/lb	$13.19/lb	I would not purchase any of these options
Tenderness	No Label	No Label	No Label	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	No	

* 30. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$10.99/lb	$13.19/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	

* 31. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$13.19/lb	$15.39/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	Guaranteed Tender	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	Yes	

* 32. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$15.39/lb	$13.19/lb	
Tenderness	No Label	No Label	Guaranteed Tender	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	

* 33. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$13.19/lb	$10.99/lb	
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	Yes	

* 34. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$10.99/lb	$15.39/lb	
Tenderness	Guaranteed Tender	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	No	

* 35. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$15.39/lb	$10.99/lb	I would not purchase any of these options
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	

* 36. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$15.39/lb	$13.19/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	No Label	
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	Yes	Yes	

* 37. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$13.19/lb	$10.99/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	Guaranteed Tender	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	No	

* 38. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$13.19/lb	$10.99/lb	I would not purchase any of these options
Tenderness	No Label	No Label	No Label	
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	No	No	

* 39. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$10.99/lb	$15.39/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	No Label	Guaranteed Tender	
Omega 3	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	No	Yes	

* 40. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$15.39/lb	$13.19/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	
Omega 3	Enhanced diet: 400 mg/serving	Enhanced diet: 400 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	Yes	Yes	No	

* 41. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$13.19/lb	$13.19/lb	
Tenderness	Guaranteed Tender	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	Grass-fed: 40 mg/serving	
Locally raised	No	No	Yes	

* 42. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$10.99/lb	$10.99/lb	
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Grass-fed: 40 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	Yes	Yes	

* 43. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$15.39/lb	$15.39/lb	
Tenderness	No Label	Guaranteed Tender	Guaranteed Tender	I would not purchase any of these options
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Enhanced diet: 400 mg/serving	
Locally raised	Yes	No	No	

* 44. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$13.19/lb	$10.99/lb	$13.19/lb	
Tenderness	Guaranteed Tender	No Label	Guaranteed Tender	I would not purchase any of these options
Omega 3	Conventional: 16 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	Yes	No	No	

* 45. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$15.39/lb	$15.39/lb	$10.99/lb	I would not purchase any of these options
Tenderness	Guaranteed Tender	Guaranteed Tender	No Label	
Omega 3	Enhanced diet: 400 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	Yes	

* 46. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

	Option A	Option B	Option C	None
Price	$10.99/lb	$13.19/lb	$15.39/lb	I would not purchase any of these options
Tenderness	No Label	No Label	No Label	
Omega 3	Grass-fed: 40 mg/serving	Conventional: 16 mg/serving	Conventional: 16 mg/serving	
Locally raised	No	Yes	No	

* 47. Which option shown above do you prefer?

	Option A	Option B	Option C	None
Please select one	○	○	○	○

Appendix D - LaVaca Meat Co. Omega-3 Beef Retail Sales Trial

As referred to in Chapter 4, the LaVaca Meat Co. retail trial came with many difficulties, they are outline below:

- Overall, their sales are very inconsistent.
- They changed their prices often and since the premiums were based on their prices, this led to changes in the omega product prices.
- When we asked them to change prices, it could have taken them a few days to get it all switched over in their systems.
- Prices on the LaVaca website are deceiving (always listed as a discount of x% off as part of their marketing), so it was hard to know if items were really on sale or not.
- Coupons and discounts were often applied in store and online.
- All products were not always offered – sometimes products weren't offered during periods of time so the sales over a period could be misleading.
- Not all items sold in the store are sold online and vice versa.
- Had to work with different people for online sales and in store sales.
- There was in store employee transition in the middle of the trial.
- Point of sale data was generated differently for online sales and in store sales

In the following table, which details the amount of pounds and dollars sold in store and online, the following items are included:

- "Omega-3 Ground Beef" = approx. 16 oz. package of 80/20 patties (15 oz. or greater)
- "LaVaca 80/20 Ground Beef" = 16 oz. package of 80/20 Chuck Patties

- "Other LaVaca Ground Beef" includes the following for in store and online:
    - Natural Steakburger - 80/20 Patties - 2 Pack - 10 oz.
    - Prime Steakburger - 80/20 Patties - 3 Pack (17 oz.)
    - Steakburger - 90/10 Sirloin Patties - 3 Pack (16 oz.)

    The following are included only in the online sales of "Other LaVaca Ground Beef":

    - 80/20 Chuck Steakburger - 32 oz.
    - 90/10 Sirloin Steakburger - 32 oz.
- "Omega-3 Strip Steak" is listed as 15 oz. steak online, but could have been 11-17 ounce steaks priced by the pound; sold by weight in store
- "LaVaca Choice Strip Steak" includes Choice Strip in store and the following for online:
    - 11, 13, and 17 oz. Choice NY Strip Steak
- "Other LaVaca Steak" includes the following for in store and online:
    - Top Tier Choice Bone-in K.C. Strip - 14 oz.
    - Top Tier Choice Porterhouse - 20.5 oz.
    - Top Tier Choice Ribeye - 12.5 oz.
    - Top Tier Choice Ribeye - 15 oz.
    - Top Tier Choice T-Bone - 20 oz.
    - Natural Choice Filet Mignon - 8 oz.
    - Natural Choice New York Strip - 14 oz.
    - Natural Choice Ribeye - 16 oz.
    - Natural Choice T-Bone - 19 oz.

- Prime Filet Mignon - 9 oz.
- Prime Ribeye - 12 oz.
- Prime T-Bone - 19 oz.
- Prime New York Strip - 11 oz.
- Prime New York Strip - 13 oz.

The following are included only in the online sales of "Other LaVaca Steak":

- Top Tier Choice Filet Mignon - 11 oz.
- Top Tier Choice Filet Mignon - 8 oz.
- Top Tier Choice Porterhouse - 23 oz.
- Natural Choice Porterhouse - 20 oz.

The following are included only in the in store sales of "Other LaVaca Steak":

- Prime K.C. Strip
- Prime Porterhouse

Sales Summary

May 23, 2014-August 5, 2014	(75 days) In Store	15% premium Online	Totals	Price/lb
Omega-3 Ground Beef				($6.41)[a]
Pounds	45.89	16	61.89	
Dollars	$286.79	$110.32	$397.11	$6.42[b]
LaVaca 80/20 Ground Beef				($5.57)
Pounds	220.79	11	231.79	
Dollars	$1,160.53	$61.27	$1,221.80	$5.27
Other LaVaca Ground Beef				
Pounds	227.16	30.625	257.785	
Dollars	$1,480.22	$236.49	$1,716.71	
All Ground Beef				
Pounds	493.84	57.625	551.465	
Dollars	$2,927.54	$408.08	$3,335.62	
Proportion Omega/Total				
Pounds	9.29%	27.77%	11.22%	
Dollars	9.80%	27.03%	11.91%	
Omega-3 Strip Steak				($24.53)
Pounds	34.48	1.875	36.355	
Dollars	$774.81	$55.14	$829.95	$22.83
LaVaca Choice Strip Steak				($21.33)
Pounds	61.82	7.44	69.26	
Dollars	$1,099.96	$157.29	$1,257.25	$18.15
Other LaVaca Steak				
Pounds	927.28	306.125	1233.405	
Dollars	$19,502.01	$9,190.87	$28,692.88	
All Steak				
Pounds	1023.58	315.44	1339.02	
Dollars	$21,376.78	$9,403.30	$30,780.08	
Proportion Omega/Total				
Pounds	3.37%	0.59%	2.72%	
Dollars	3.62%	0.59%	2.70%[c]	

[a] What the price per pound was initially supposed to be is in parentheses
[b] Average price per pound calculated from actual sales data
[c] Since the omega product is sold at a premium, the percentage of dollars should exceed percentage of sales

August 6, 2014-Sept. 25, 2014	(51 days) In Store	30% premium Online	Totals	Price/lb
Omega-3 Ground Beef				($7.24) [a]
Pounds	31.97	29	60.97	
Dollars	$200.56	$205.34	$405.90	$6.66 [b]
LaVaca 80/20 Ground Beef				($5.57)
Pounds	110.08	8	118.08	
Dollars	$579.57	$44.56	$624.13	$5.29
Other LaVaca Ground Beef				
Pounds	82.52	22.25	104.77	
Dollars	$562.51	$186.60	$749.11	
All Ground Beef				
Pounds	224.57	59.25	283.82	
Dollars	$1,342.64	$436.50	$1,779.14	
Proportion Omega/Total				
Pounds	14.24%	48.95%	21.48%	
Dollars	14.94%	47.04%	22.81%	
Omega-3 Strip Steak				($27.73)
Pounds	12.79	30	42.79	
Dollars	$315.29	$824.96	$1,140.25	$26.65
LaVaca Choice Strip Steak				($21.33)
Pounds	23.71	66.94	90.65	
Dollars	$421.87	$1,391.41	$1,813.28	$20.00
Other LaVaca Steak				
Pounds	462.71	206.38	669.09	
Dollars	$10,081.83	$6,176.70	$16,258.53	
All Steak				
Pounds	499.21	303.31	802.523	
Dollars	$10,818.99	$8,393.07	$19,212.06	
Proportion Omega/Total				
Pounds	2.56%	9.89%	5.33%	
Dollars	2.91%	9.83%	5.94%	

[a] What the price per pound was supposed to be is in parentheses
[b] Average price per pound calculated from actual sales data

Sept. 26, 2014-Nov. 13, 2014	(49 days) In Store	15% premium Online	Totals	Price/lb
Omega-3 Ground Beef				($6.41)[a]
Pounds	36.27	8	44.27	
Dollars	$227.87	$51.76	$279.63	$6.32[b]
LaVaca 80/20 Ground Beef				($5.57)
Pounds	66.16	6	72.16	
Dollars	$358.83	$33.42	$392.25	$5.44
Other LaVaca Ground Beef				
Pounds	64.26	6.125	70.385	
Dollars	$452.58	$42.82	$495.40	
All Ground Beef				
Pounds	166.69	20.13	186.82	
Dollars	$1,039.28	$128.00	$1,167.28	
Proportion Omega/Total				
Pounds	21.76%	39.74%	23.70%	
Dollars	21.93%	40.44%	23.96%	
Omega-3 Strip Steak				($24.53)
Pounds	17.95	9.38	27.33	
Dollars	$403.19	$227.80	630.99	$23.09
LaVaca Choice Strip Steak				($21.33)
Pounds	27.35	17.25	44.6	
Dollars	$492.02	$365.28	857.3	$19.22
Other LaVaca Steak				
Pounds	354.91	53.16	408.07	
Dollars	$7,644.98	$1,702.44	9347.42	
All Steak				
Pounds	400.21	79.78	479.99	
Dollars	$8,540.06	$2,295.52	10835.58	
Proportion Omega/Total				
Pounds	4.49%	11.76%	5.69%	
Dollars	4.72%	9.92%	5.82%	

[a] What the price per pound was supposed to be is in parentheses
[b] Average price per pound calculated from actual sales data

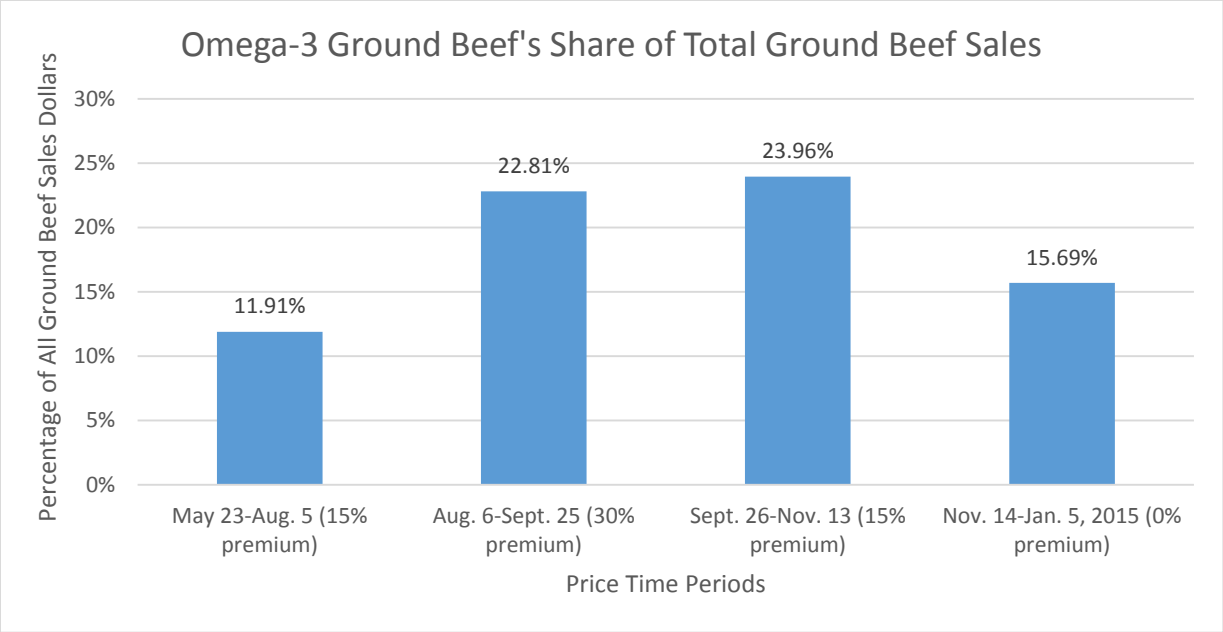
Nov. 14, 2014-Jan. 5, 2015	(53 days) In Store	0% premium Online	Totals	Price/lb
Omega-3 Ground Beef				($5.57) [a]
Pounds	32.09	0	32.09	
Dollars	$177.26	$0.00	$177.26	$5.52[b]
LaVaca 80/20 Ground Beef				($5.57)
Pounds	108.2	3	111.2	
Dollars	$587.68	$16.71	$604.39	$5.44
Other LaVaca Ground Beef				
Pounds	41.52	6.38	47.9	
Dollars	$291.38	$56.82	$348.20	
All Ground Beef				
Pounds	181.81	9.38	191.19	
Dollars	$1,056.32	$73.53	$1,129.85	
Proportion Omega/Total				
Pounds	17.65%	0.00%	16.78%	
Dollars	16.78%	0.00%	15.69% [c]	
Omega-3 Strip Steak				($21.33)
Pounds	7.18	3.75	10.93	
Dollars	$143.53	$79.32	222.85	$20.39
LaVaca Choice Strip Steak				($21.33)
Pounds	38.27	10.19	48.46	
Dollars	$671.91	$215.11	887.02	$18.30
Other LaVaca Steak				
Pounds	487.71	125.94	613.65	
Dollars	$11,328.25	$3,513.18	14841.43	
All Steak				
Pounds	533.16	139.88	673.035	
Dollars	$12,143.69	$3,807.61	15951.3	
Proportion Omega/Total				
Pounds	1.35%	2.68%	1.62%	
Dollars	1.18%	2.08%	1.40% [c]	

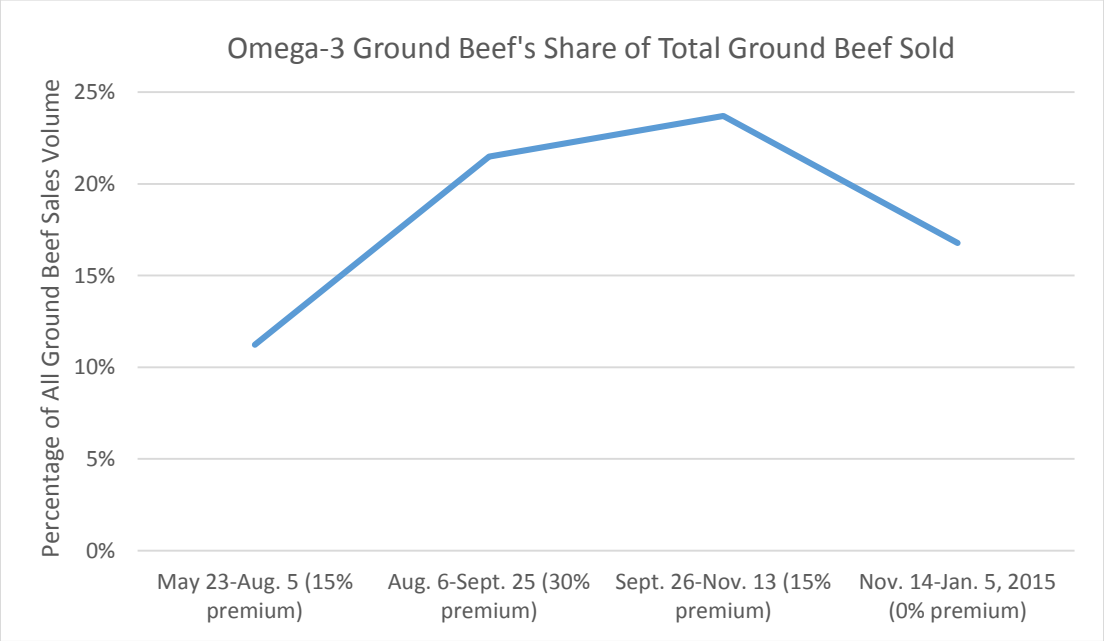
[a] What the price per pound was supposed to be is in parentheses
[b] Average price per pound calculated from actual sales data
[c] Since the omega product is sold at a premium, the percentage of dollars should exceed percentage of sales

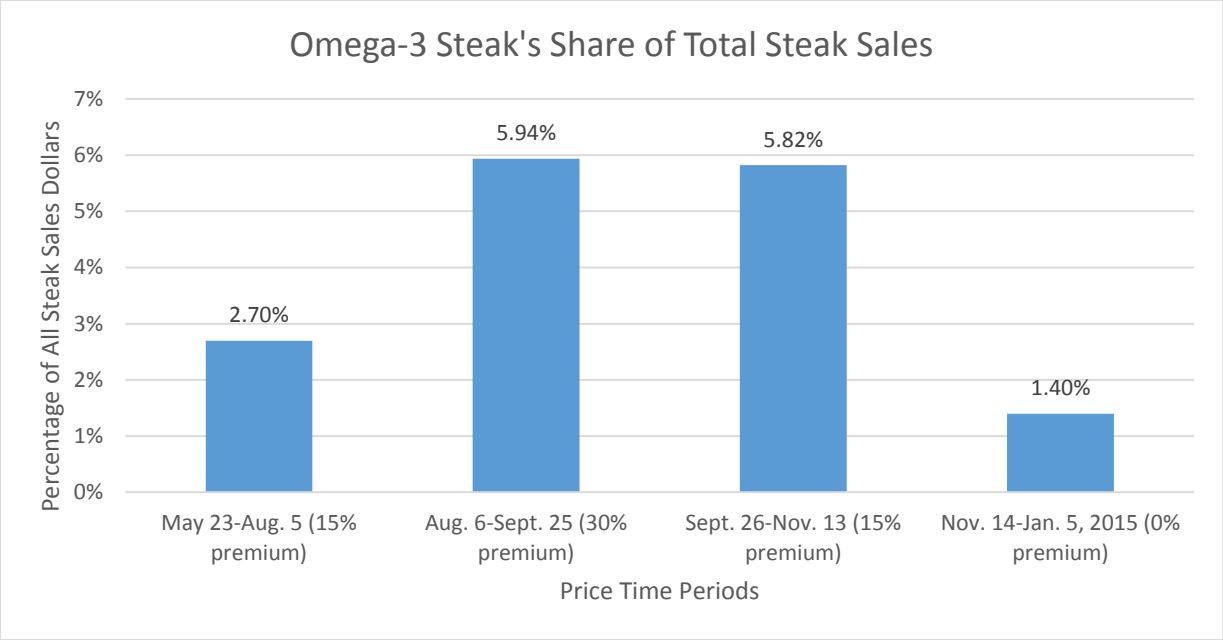
La Vaca Sales

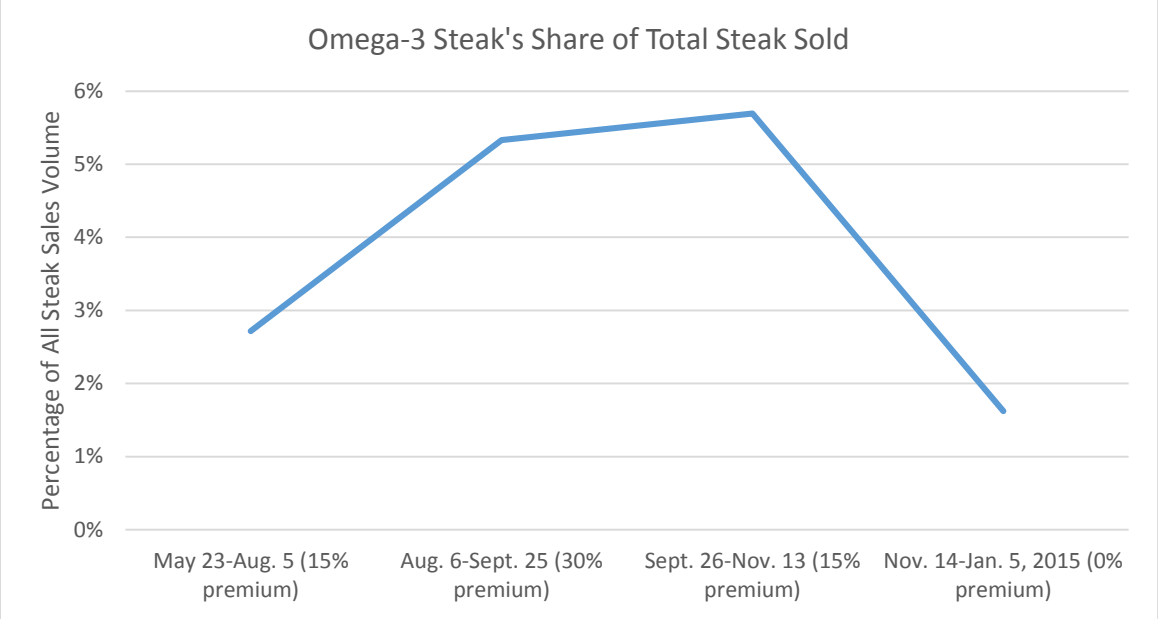
The following tables and figures summarize the percentages for categories discussed above.

Volume (lbs)	May 23-Aug. 5 (15% premium)	Aug. 6-Sept. 25 (30% premium)	Sept. 26-Nov. 13 (15% premium)	Nov. 14-Jan. 5, 2015 (0% premium)
Omega-3 Ground Beef	11.22%	21.48%	23.70%	16.78%
LaVaca 80/20 Ground Beef	42.03%	41.60%	38.63%	58.16%
Other LaVaca Ground Beef	46.75%	36.91%	37.68%	25.05%
Omega-3 Strip Steak	2.72%	5.33%	5.69%	1.62%
LaVaca Choice Strip Steak	5.17%	11.30%	9.29%	7.20%
Other LaVaca Steak	92.11%	83.37%	85.02%	91.18%
Sales ($)	**May 23-Aug. 5 (15% premium)**	**Aug. 6-Sept. 25 (30% premium)**	**Sept. 26-Nov. 13 (15% premium)**	**Nov. 14-Jan. 5, 2015 (0% premium)**
Omega-3 Ground Beef	11.91%	22.81%	23.96%	15.69%
LaVaca 80/20 Ground Beef	36.63%	35.08%	33.60%	53.49%
Other LaVaca Ground Beef	51.47%	42.11%	42.44%	30.82%
Omega-3 Strip Steak	2.70%	5.94%	5.82%	1.40%
LaVaca Choice Strip Steak	4.08%	9.44%	7.91%	5.56%
Other LaVaca Steak	93.22%	84.63%	86.27%	93.04%


Omega-3 Ground Beef's Share of Total Ground Beef Sales
Percentage of All Ground Beef Sales Dollars
30%
25%
20%
15%
10%
5%
0%
11.91%
22.81%
23.96%
15.69%
May 23-Aug. 5 (15% premium)
Aug. 6-Sept. 25 (30% premium)
Sept. 26-Nov. 13 (15% premium)
Nov. 14-Jan. 5, 2015 (0% premium)
Price Time Periods


Omega-3 Ground Beef's Share of Total Ground Beef Sold
Percentage of All Ground Beef Sales Volume
25%
20%
15%
10%
5%
0%
May 23-Aug. 5 (15% premium)
Aug. 6-Sept. 25 (30% premium)
Sept. 26-Nov. 13 (15% premium)
Nov. 14-Jan. 5, 2015 (0% premium)





Period 1 Comments:

- A large part of the 306.125 pounds of "Other LaVaca Steak" is made up of Choice Filets (8 oz. and 11 oz.) with over 75 pounds and $5293.47 for these two items.
- The Choice Filet is a common top seller in steaks
- There was not much Omega Strip sold at the beginning of the trial

- Two transactions from this time period were pulled from online receipts, which are an example of the inconsistency in the data:

Period	Date	Item Name	Qty	Unit Price	Unit Price Total
Period 1	5/23/2014	Omega-3 N.Y. Strip - 15 oz.	2	$27.57	$55.14
Period 1	6/14/2014	Omega-3 Steakburger - 16 oz.	2	$7.80	$15.60

During this time, the price of the omega ground beef was supposed to be $5.57/lb, but we see here that it was $7.80/lb. Also at this time, the price of the omega-3 strip steak was supposed to be $24.53/lb, but it is listed as $27.57 for 15 oz. It could be that the products were listed with these weights in the point of sale system, but they actually weighed something else, which caused the prices to be different. The following is an in store receipt entry, which also shows a different price for the omega-3 ground beef:

Period	Date	Item Name	Qty	Unit Price	Unit Price Total
Period 1	6/28/2014	Omega Burger	1	$6.49	$6.49

Period 2 Comments:

- Omega-3 Beef dollar difference: Likely a discount or coupon used
- Nearly 50% of online sales: Little product sold in other ground beef categories; gets balanced by in store results
- At the highest price period, there was the most online percentage of ground beef sold and also sold the most online pounds of both omega products
- Maybe they marketed the product more during this time (Facebook, Blog, and website) since they made 100% margin on these products?
- Choice Filet is common top seller in steaks
- Choice Filet and Choice Ribeye make up large part of online steak sales
- Sold lots of Choice and Prime Filets and Ribeyes in store

Period 3 Comments:

- Highest proportion of omega ground beef to all ground beef during this time period
- Highest proportion of omega steak to all steak during this time period

Period 4 Comments:

- Odd to go from such high percentages of omega ground beef online sales to 0%
- Did they not want to sell at this 0% premium price?
- Online omega steak is low during this time as well
- High levels of in store ground beef sales
- During the holiday season, there are more roasts and bundles sold
- In online sales, of the top 10 sellers, 6 of them were steak bundles
- In store sales, Prime Rib was a high seller (not included in table), Prime and Choice Filets were high sellers within steak category

Overall comments:

- In store percentages are fairly consistent
- In store levels of all ground beef are consistent over time
- In store top sellers (in dollars sold):
    - 1) Choice Filets, 2) Prime Ribeyes, 3) Prime Filets, 4) Choice Ribeyes, 5) Prime Strip
- Online top sellers (in dollars sold):
    - 1) A Cut Above the Rest bundle, 2) Top Tier Choice Filet Mignon – 8 oz., 3) Top Tier Choice Filet Mignon – 11 oz., 4) The New Yorker bundle, 5) Prime Filet Mignon – 9 oz.
    - 4 of top 10 best sellers are bundles, others are filets and ribeyes

Appendix E - Income Data Transformation

Based on the income categories provided in the survey, respondents selected a category number to represent their income range.

In the ground beef survey, 73 of the 374 respondents did not indicate an income level, while in the steak survey, 46 of 183 respondents did not report income. Where respondents answered "11," (Prefer not to answer) to the income question, these values were eliminated and income values were predicted from a regression equation using as explanatory variables the respondent's age, level of education, household food expenditure, and gender. The following commands were run in LIMDEP:

```
|-> create; income2 = income $
|-> create; if (income=11) income2=-999$
|-> dstat; Rhs= income, age, edu, spend, male, income2 $
```

These commands converted all observations with an 11 (Prefer not to answer) in the "Income" variable to be displayed as a blank entry in the newly created "Income2" variable (since, in LIMDEP, the value -999 is interpreted as a missing value). Descriptive statistics for the variables used in the regression equation (prior to filling in the blank entries) are shown in Table E.1. Table E.1 shows that there were 2628 missing entries for the ground beef survey and Table E.2 shows that there were 1656 missing entries for the steak survey, which is where the number 11 previously existed.

Table E.1 – Descriptive Statistics Prior to Running Regression (Category #) – Ground Beef

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	5.796791	3.247726	1.0	11.0	13464	0
AGE	3.695187	1.061331	2.0	5.0	13464	0
EDU	3.802139	.991118	1.0	5.0	13464	0
SPEND	2.759358	1.147397	1.0	5.0	13464	0
MALE	.443850	.496856	0.0	1.0	13464	0
INCOME2	4.534884	2.224166	1.0	10.0	10836	2628

Table E.2 – Descriptive Statistics Prior to Running Regression (Category #) – Steak

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	6.016393	3.383719	1.0	11.0	6588	0
AGE	3.737705	.984683	2.0	5.0	6588	0
EDU	3.650273	1.028679	1.0	5.0	6588	0
SPEND	2.721311	1.189265	1.0	5.0	6588	0
MALE	.415301	.492811	0.0	1.0	6588	0
INCOME2	4.343066	2.037945	1.0	10.0	4932	1656

Observations with nonblank entries for "Income2" were then used in a regression model to predict income using the following LIMDEP commands:

```
|-> skip$
|-> namelist;x1= one,age,edu, spend, male$
|-> regress;lhs=income2;rhs=x1$
```

The final command above replaces the blank entries in the variable "Income2" with predicted values using the respondent's age, education, food expenditures and gender and the estimated coefficients from the regression model.

Ground Beef:

```
Income3 = -0.66375 + 0.40442 AGE + 0.63841 EDU + 0.45124 SPEND + 0.14622 MALE
```

Where the R-Square value is 0.198.

Steak:

```
Income3 = -0.31842 + 0.42599 AGE + 0.58322 EDU + 0.44048 SPEND -0.46830 MALE
```

Where the R-Square value is 0.22.

These regression equations were used to create the predicted values of income for the missing entries by the following commands:

```
|-> create; if (income2=-999) income2=(x1'B) $
|-> dstat; Rhs = income, age, edu, spend, male, income2 $
```

Descriptive statistics for the ground beef and steak surveys, including values for the "Income" and "Income2" variables, are provided in Tables E.3 and E.4, which show the new mean income levels as 4.57 and 4.41 for ground beef and steak, respectively.

Table E.3 Descriptive Statistics for Income (Using Category #) – Ground Beef Respondents

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	5.796791	3.247726	1.0	11.0	13464	0
AGE	3.695187	1.061331	2.0	5.0	13464	0
EDU	3.802139	.991118	1.0	5.0	13464	0
SPEND	2.759358	1.147397	1.0	5.0	13464	0
MALE	.443850	.496856	0.0	1.0	13464	0
INCOME3	4.568059	2.036203	1.0	10.0	13464	0

Table E.4 Descriptive Statistics for Income (Using Category #) – Steak Respondents

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	6.016393	3.383719	1.0	11.0	6588	0
AGE	3.737705	.984683	2.0	5.0	6588	0
EDU	3.650273	1.028679	1.0	5.0	6588	0
SPEND	2.721311	1.189265	1.0	5.0	6588	0
MALE	.415301	.492811	0.0	1.0	6588	0
INCOME2	4.406946	1.861824	1.0	10.0	6588	0

To get a better summarization of the sample's income data, midpoints from each range were identified to replace the category number. Table E.5 shows the category number associated with each income range and the mid-point for each income range. In the statistical software program used, only a certain number of digits was allowed so the mid-point values were rounded to eliminate the need for decimal points and tenths. Therefore, the values used for further analysis of the income variable are noted in the column "Income Value in LimDep." For example, category 4 was $50,000-$74,999 so the midpoint was $62,499.50, which was then replaced by the value 62,500. Then, all respondents who selected "4" for their income, now have $62,500 for their income level.

Table E.5. Income Ranges and Mid-points Used in Data Sets

Category Number	Income Range	Income Mid-Point	Income Value in LimDep
1	$0-$9999	4999.50	5000
2	$10,000-$24,999	17499.50	17500
3	$25,000-$49,999	37499.50	37500
4	$50,000-$74,999	62499.50	62500
5	$75,000-$99,999	87499.50	87500
6	$100,000-$124,999	112499.50	112500
7	$125,000-$149,999	137499.50	137500
8	$150,000-$174,999	162499.50	162500
9	$175,000-$199,999	187499.50	187500
10	$200,000+	250000	250000

Using the same commands, an additional variable, "Income3," was created with the midpoint values replacing the category numbers. Descriptive statistics for the variables used in the regression equation (prior to filling in the blank entries) are shown in Table E.6 and E.7. Table E.6 shows that there were 2628 missing entries for the ground beef survey and Table E.7 shows that there were 1656 missing entries for the steak survey, which is where the number 11 previously existed.

Table E.6 – Descriptive Statistics Prior to Running Regression (Using Midpoints) – Ground Beef

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	5.796791	3.247726	1.0	11.0	13464	0
AGE	3.695187	1.061331	2.0	5.0	13464	0
EDU	3.802139	.991118	1.0	5.0	13464	0
SPEND	2.759358	1.147397	1.0	5.0	13464	0
MALE	.443850	.496856	0.0	1.0	13464	0
INCOME2	79501.66	58284.43	5000.0	250000.0	10836	2628

Table E.7 – Descriptive Statistics Prior to Running Regression (Using Midpoints) – Steak

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	6.016393	3.383719	1.0	11.0	6588	0
AGE	3.737705	.984683	2.0	5.0	6588	0
EDU	3.650273	1.028679	1.0	5.0	6588	0
SPEND	2.721311	1.189265	1.0	5.0	6588	0
MALE	.415301	.492811	0.0	1.0	6588	0
INCOME2	73722.63	53434.47	5000.0	250000.0	4932	1656

Observations with nonblank entries for "Income3" were then used in a regression model to predict income using the following LIMDEP commands:

```
|-> skip$
|-> namelist;x1= one,age,edu, spend, male$
|-> regress;lhs=income3;rhs=x1$
```

The final command above replaces the blank entries in the variable "Income3" with predicted values using the respondent's age, education, food expenditures and gender and the estimated coefficients from the regression model.

Ground Beef:

```
Income3 = -48626.5 + 9161.68 AGE + 16081.1 EDU + 11792.8 SPEND +3302.53 MALE
```

Where the R-Square value is 0.178, which is slightly smaller than the previous model.

Steak:

```
Income3 = -42139.2 + 10140.4 AGE + 14913.2 EDU + 11143.2 SPEND -12518.0 MALE
```

Where the R-Square value is 0.203, which is slightly smaller than the previous model.

These regression equations were used to create the predicted values of income for the missing entries by the following commands:

```
|-> create; if (income3=-999) income3=(x1'B) $
|-> dstat; Rhs = income, age, edu, spend, male, income3 $
```

Descriptive statistics for the ground beef and steak surveys, including values for the "Income" and "Income3" variables, are provided in Tables E.8 and E.9, which show the new mean income levels as $80,376.33 and $75,325.38 for ground beef and steak, respectively.

Table E.8 Descriptive Statistics for Income (Using Midpoints) – Ground Beef Respondents

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	5.796791	3.247726	1.0	11.0	13464	0
AGE	3.695187	1.061331	2.0	5.0	13464	0
EDU	3.802139	.991118	1.0	5.0	13464	0
SPEND	2.759358	1.147397	1.0	5.0	13464	0
MALE	.443850	.496856	0.0	1.0	13464	0
INCOME3	80376.33	53248.22	5000.0	250000.0	13464	0

In the case of ground beef, the mean for "Income2" is 4.57, the midpoint for category 4 is $62,500 and the midpoint for category 5 is $87,500. Taking the midpoint of these two categories is $75,000, which is fairly close to $80,376.33. Therefore, both approaches of calculating predicted income levels yield similar results. In summary, filling in the missing income values increases the mean income value from $79,501.66 to $80,376.33.

Table E.9 Descriptive Statistics for Income (Using Midpoints) – Steak Respondents

Variable	Mean	Std.Dev.	Minimum	Maximum	Cases	Missing
INCOME	6.016393	3.383719	1.0	11.0	6588	0
AGE	3.737705	.984683	2.0	5.0	6588	0
EDU	3.650273	1.028679	1.0	5.0	6588	0
SPEND	2.721311	1.189265	1.0	5.0	6588	0
MALE	.415301	.492811	0.0	1.0	6588	0
INCOME2	75325.38	48621.06	5000.0	250000.0	6588	0

In the case of steak, the mean for "Income2" is 4.41, which is slightly lower than for ground beef. Again, given the midpoints for categories 4 and 5, the means translate to a mean income in the $75,000 region, which is very close to $75,325.38. Therefore, both approaches of calculating predicted income levels yield similar results. In summary, filling in the missing income values increases the mean income value from $73,722.63 to $75,325.38.

Appendix F - Additional Summary Data Tables and Charts

Approximately how often does your household consume the following products?

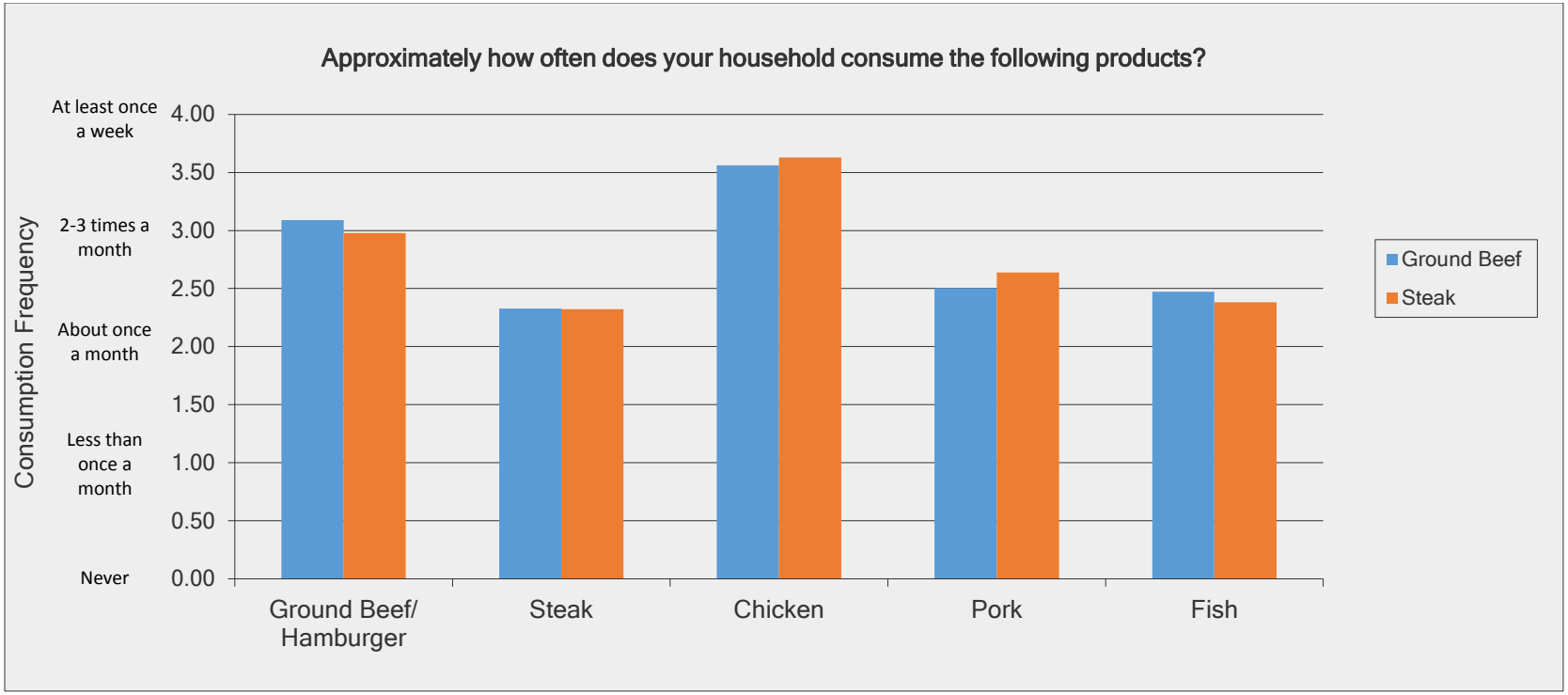
Ground Beef Survey

Answer Options	Never	Less than once a month	About once a month	2-3 times a month	At least once a week	Min	Max	Mean	Std. Dev.	Response Count
Ground Beef/ Hamburger	8	31	39	138	158	0	4	3.09	1.02	374
Steak	13	89	96	114	62	0	4	2.33	1.11	374
Chicken	7	12	13	74	268	0	4	3.56	0.86	374
Pork	32	57	66	129	90	0	4	2.50	1.25	374
Fish	39	56	72	103	104	0	4	2.47	1.32	374
Answered question										**374**
Skipped question										**0**

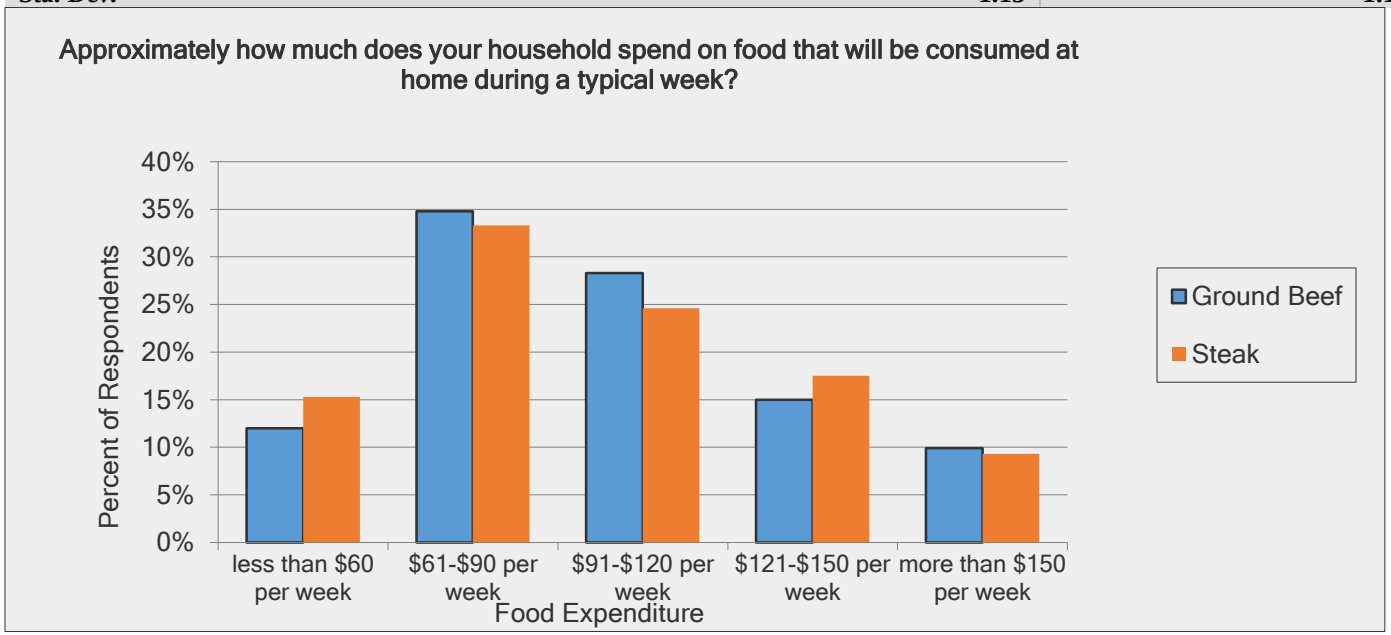
Approximately how often does your household consume the following products?

Steak Survey

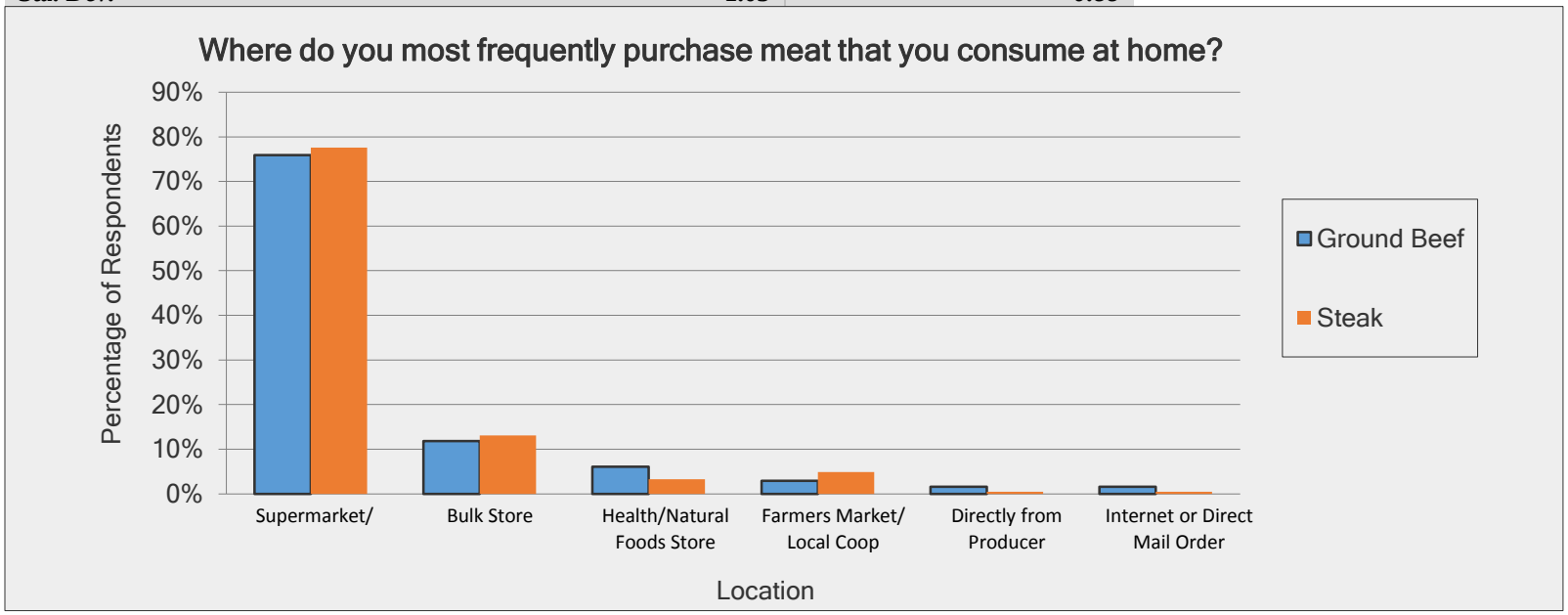
Answer Options	Never	Less than once a month	About once a month	2-3 times a month	At least once a week	Min	Max	Mean	Std. Dev.	Response Count
Ground Beef/ Hamburger	5	9	4	14	17	0	4	2.98	1.19	183
Steak	26	51	3	21	37	0	4	2.32	1.22	183
Chicken	22	33	6	39	34	0	4	3.63	0.81	183
Pork	45	52	31	52	49	0	4	2.64	1.25	183
Fish	85	38	139	57	46	0	4	2.38	1.31	183
Answered question										**183**
Skipped question										**0**


Approximately how often does your household consume the following products?
Consumption Frequency
At least once a week
2-3 times a month
About once a month
Less than once a month
Never
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Ground Beef/ Hamburger
Steak
Chicken
Pork
Fish
Ground Beef
Steak

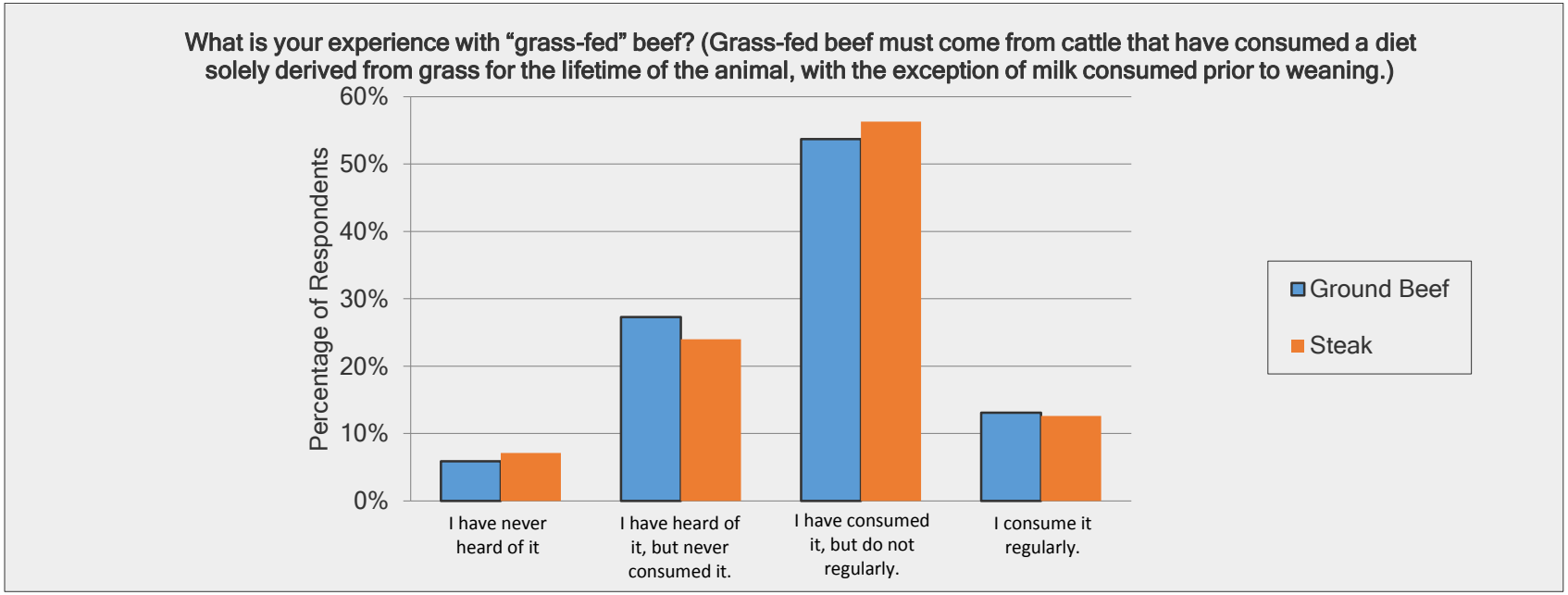
Approximately how much does your household spend on food that will be consumed at home during a typical week?				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
less than $60 per week (1)	12.0%	45	15.3%	28
$61-$90 per week (2)	34.8%	130	33.3%	61
$91-$120 per week (3)	28.3%	106	24.6%	45
$121-$150 per week (4)	15.0%	56	17.5%	32
more than $150 per week (5)	9.9%	37	9.3%	17
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		**1**
Max		**5**		**5**
Mean		**2.76**		**2.72**
Std. Dev.		**1.15**		**1.19**



Where do you most frequently purchase meat that you consume at home?				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
Supermarket/Grocery Store	75.9%	284	77.6%	142
Bulk Store (e.g. Sam's, Costco)	11.8%	44	13.1%	24
Health/Natural Foods Store	6.1%	23	3.3%	6
Farmers Market/Local Cooperative	2.9%	11	4.9%	9
Directly from Producer	1.6%	6	0.5%	1
Internet or Direct Mail Order	1.6%	6	0.5%	1
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**6**		***6***
Mean		**1.47**		***1.39***
Std. Dev.		**1.03**		***0.88***



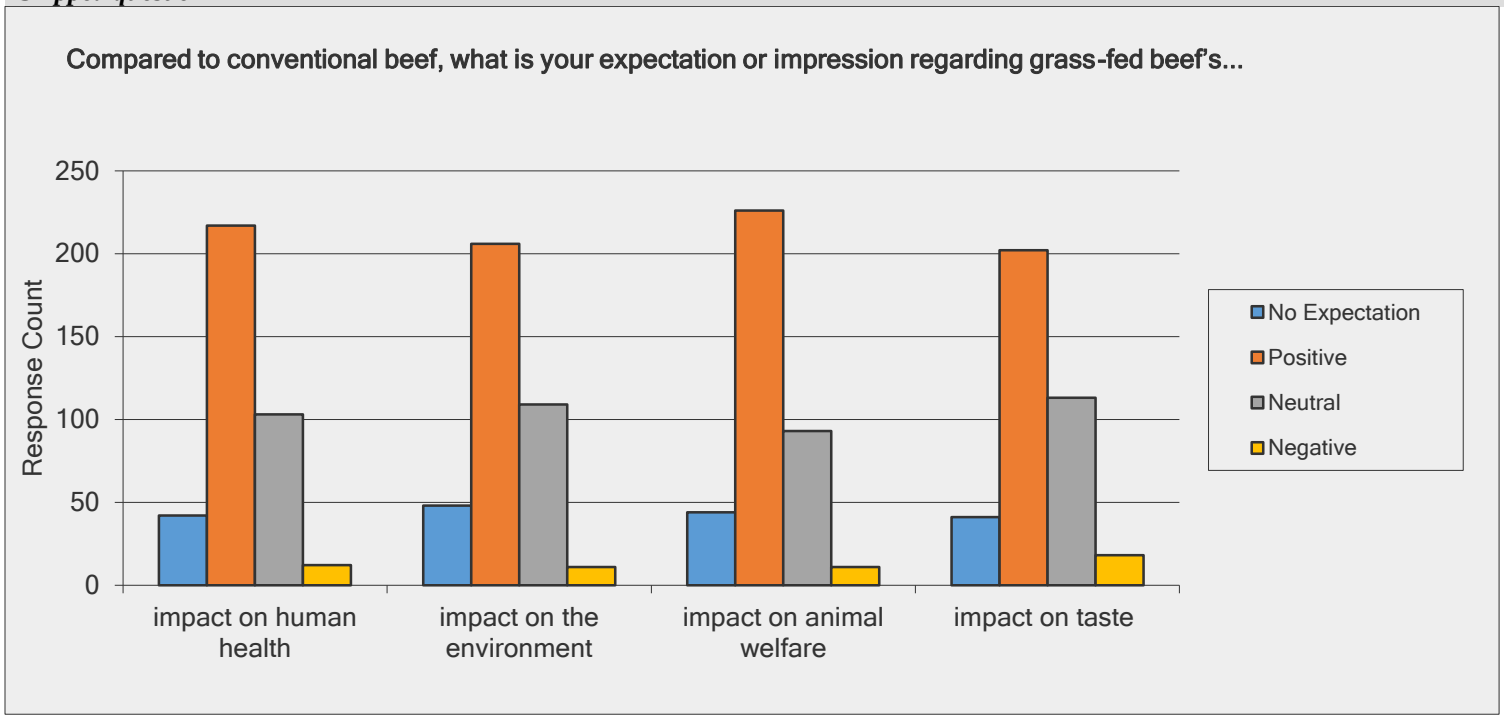
What is your experience with "grass-fed" beef? (Grass-fed beef must come from cattle that have consumed a diet solely derived from grass for the lifetime of the animal, with the exception of milk consumed prior to weaning.)				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
I have never heard of it.	5.9%	22	7.1%	13
I have heard of it, but never consumed it.	27.3%	102	24.0%	44
I have consumed it, but do not regularly consume it.	53.7%	201	56.3%	103
I consume it regularly.	13.1%	49	12.6%	23
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**4**		***4***
Mean		**2.74**		***2.74***
Std. Dev.		**0.76**		***0.76***



Compared to conventional beef, what is your expectation or impression regarding grass-fed beef's...

Ground Beef Survey

Answer Options	Negative	Neutral	Positive	% Responding "Positive"	Avg. of Negative, Neutral, & Positive	Std. Dev.	Response Count	No Expectation	Min	Max	Mean	Std. Dev.	Response Count
impact on human health	12	103	217	58.02%	2.62	0.56	332	42	1	4	2.77	0.68	374
impact on the environment	11	109	206	55.08%	2.60	0.56	326	48	1	4	2.78	0.70	374
impact on animal welfare	11	93	226	60.43%	2.65	0.54	330	44	1	4	2.81	0.67	374
impact on taste	18	113	202	54.01%	2.55	0.60	333	41	1	4	2.71	0.72	374
Answered question													**374**
Skipped question													**0**

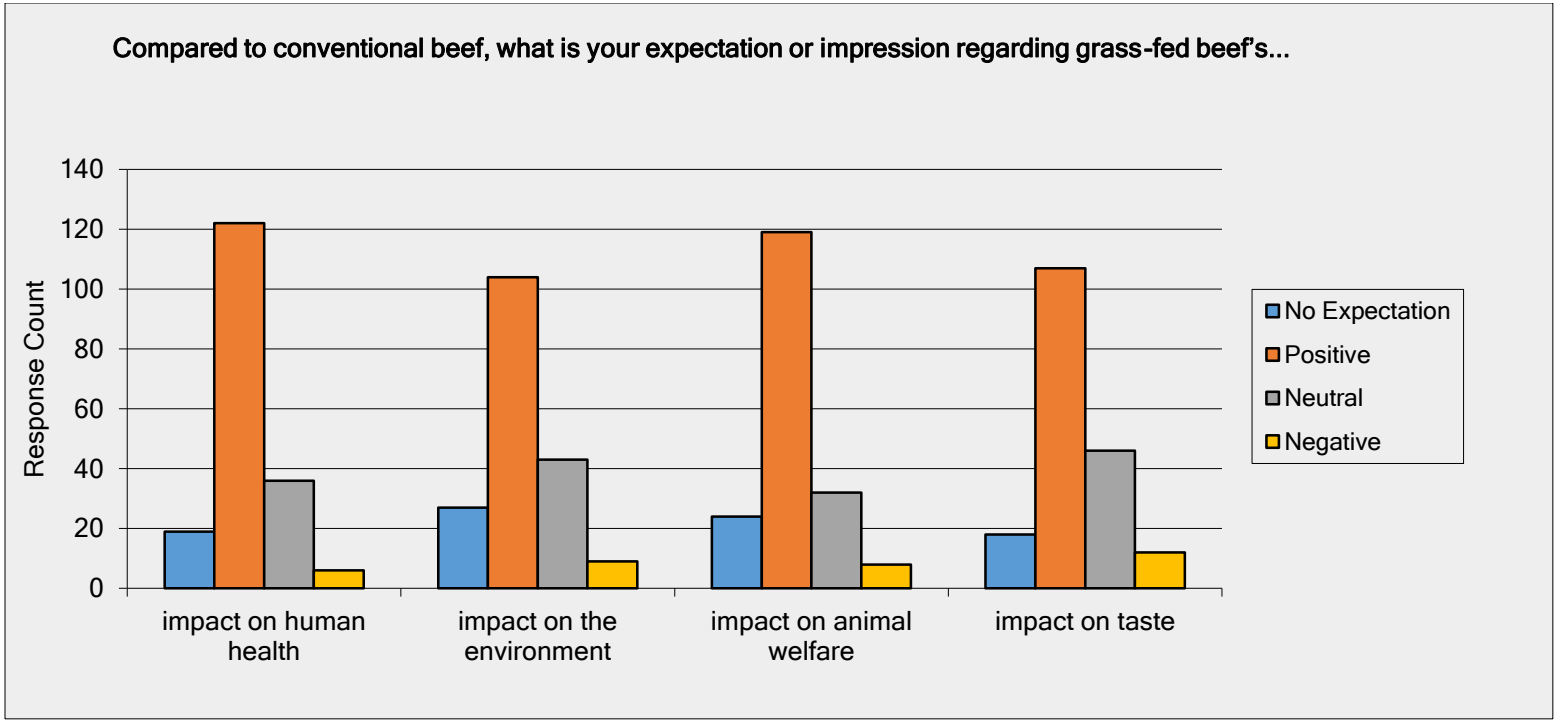


Correlation Matrix for 4 Variables (Ground Beef)				
Variable	GRASHLTH	GRASSENV	GRASWELF	GRASTAST
GRASHLTH	1.0000	0.6915	0.6382	0.6385
GRASSENV	0.6915	1.0000	0.7390	0.5357
GRASWELF	0.6382	0.7390	1.0000	0.5010
GRASTAST	0.6385	0.5357	0.5010	1.0000

Compared to conventional beef, what is your expectation or impression regarding grass-fed beef's...

Steak Survey

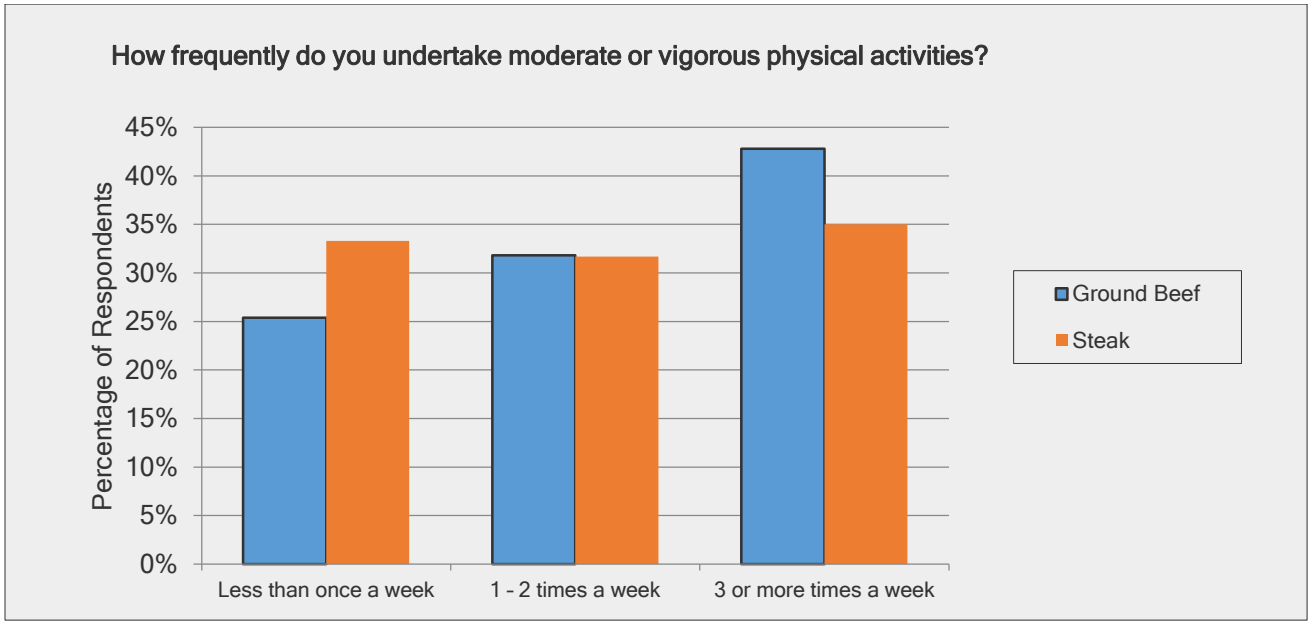
Answer Options	**Negative**	**Neutral**	**Positive**	**% Responding "Positive"**	**Avg. of Negative, Neutral, & Positive**	**Std. Dev.**	**Response Count**	**No Expectation**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Response Count**
impact on human health	6	36	122	66.67%	2.69	0.56	123	19	1	4	2.84	0.64	183
impact on the environment	9	43	104	56.83%	2.59	0.62	116	27	1	4	2.81	0.74	183
impact on animal welfare	8	32	119	65.03%	2.66	0.60	119	24	1	4	2.87	0.68	183
impact on taste	12	46	107	58.47%	2.56	0.64	126	18	1	4	2.72	0.73	183
Answered question													**183**
Skipped question													**0**



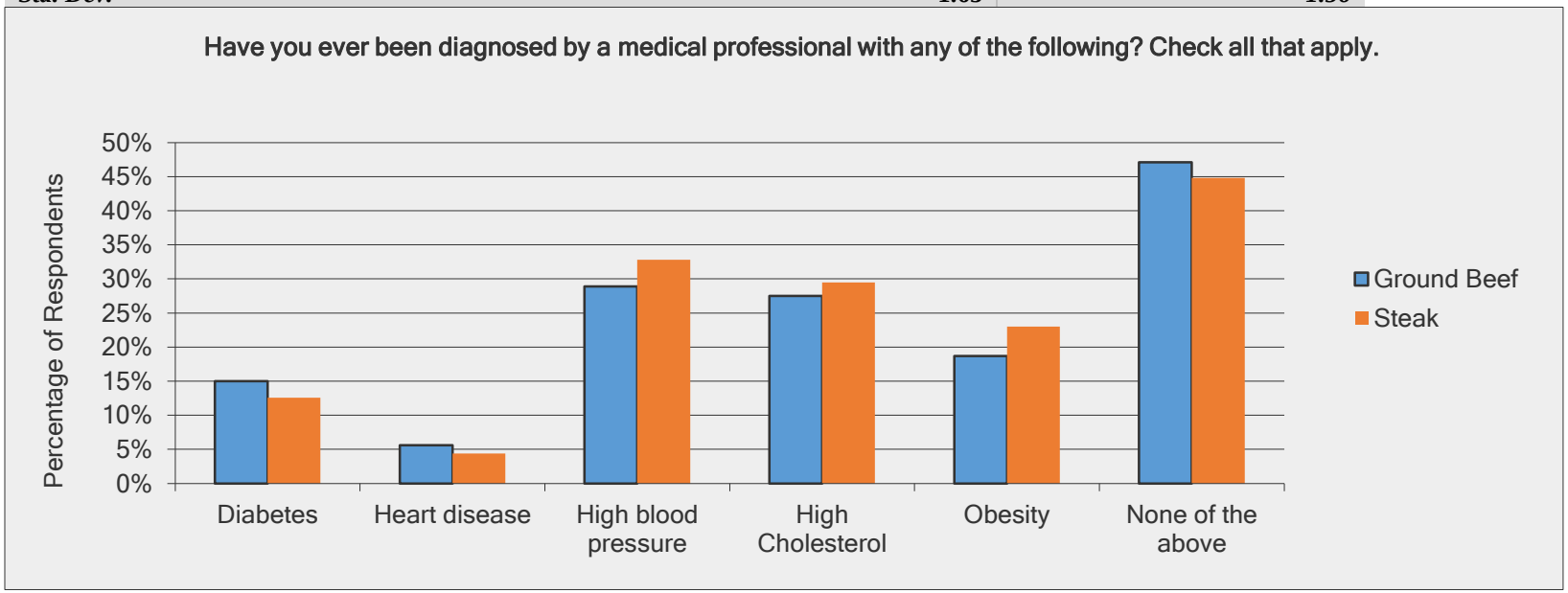
Correlation Matrix for 4 Variables (Steak)				
Variable	GRASHLTH	GRASSENV	GRASWELF	GRASTAST
GRASHLTH	1.0000	0.7735	0.6821	0.6321
GRASSENV	0.7735	1.0000	0.7126	0.6535
GRASWELF	0.6821	0.7126	1.0000	0.5965
GRASTAST	0.6321	0.6535	0.5965	1.0000

How frequently do you undertake moderate or vigorous physical activities (including any activities that cause an increase in your heart or breathing rate so that you can talk but not sing, such as brisk walking, bicycling, vacuuming or other forms of exercise)?

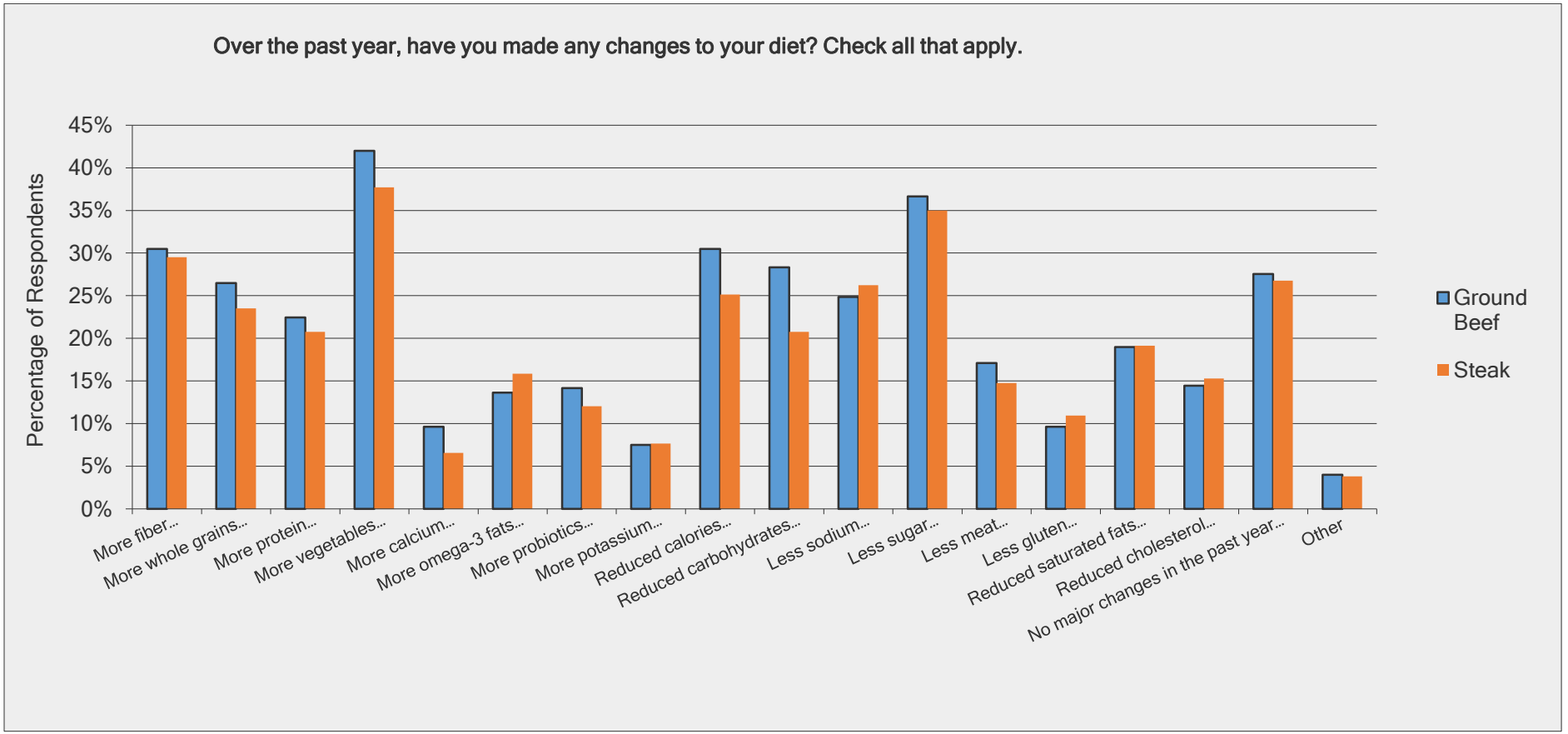
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
Less than once a week	25.4%	95	33.3%	61
1 – 2 times a week	31.8%	119	31.7%	58
3 or more times a week	42.8%	160	35.0%	64
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**3**		***3***
Mean		**2.17**		***2.02***
Std. Dev.		**0.81**		***0.83***



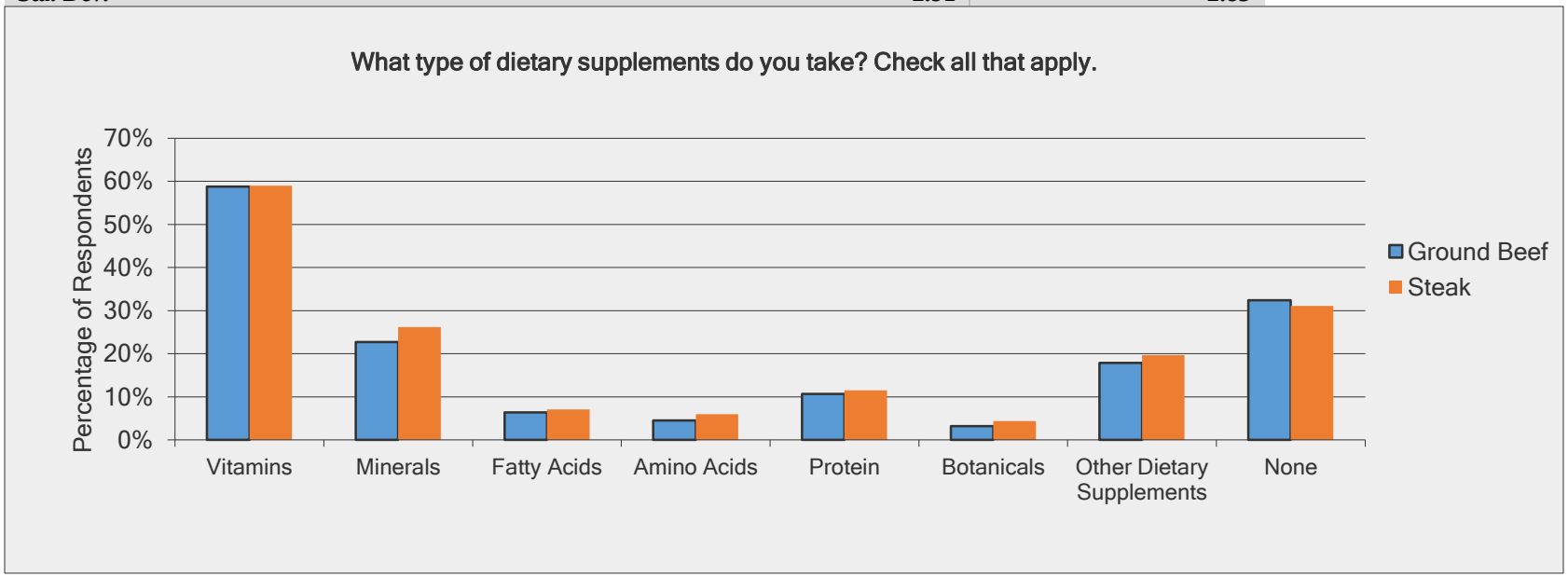
Have you ever been diagnosed by a medical professional with any of the following? Check all that apply.				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
Diabetes	15.0%	56	12.6%	23
Heart disease	5.6%	21	4.4%	8
High blood pressure	28.9%	108	32.8%	60
High Cholesterol	27.5%	103	29.5%	54
Obesity	18.7%	70	23.0%	42
None of the above	47.1%	176	44.8%	82
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**6**		***6***
Mean		**4.19**		***4.23***
Std. Dev.		**1.65**		***1.56***



Over the past year, have you made any changes to your diet? Check all that apply.				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
More fiber	30.5%	114	29.5%	54
More whole grains	26.5%	99	23.5%	43
More protein	22.5%	84	20.8%	38
More vegetables	42.0%	157	37.7%	69
More calcium	9.6%	36	6.6%	12
More omega-3 fats	13.6%	51	15.8%	29
More probiotics	14.2%	53	12.0%	22
More potassium	7.5%	28	7.7%	14
Reduced calories	30.5%	114	25.1%	46
Reduced carbohydrates	28.3%	106	20.8%	38
Less sodium	24.9%	93	26.2%	48
Less sugar	36.6%	137	35.0%	64
Less meat	17.1%	64	14.8%	27
Less gluten	9.6%	36	10.9%	20
Reduced saturated fats	19.0%	71	19.1%	35
Reduced cholesterol	14.4%	54	15.3%	28
No major changes in the past year	27.5%	103	26.8%	49
Other	4.0%	15	3.8%	7
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**17**		***17***
Mean		**8.6**		***8.74***
Std. Dev.		**5.04**		***5.12***


Over the past year, have you made any changes to your diet? Check all that apply.
Percentage of Respondents
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
More fiber...
More whole grains...
More protein...
More vegetables...
More calcium...
More omega-3 fats...
More probiotics...
More potassium...
Reduced calories...
Reduced carbohydrates...
Less sodium...
Less sugar...
Less meat...
Less gluten...
Reduced saturated fats...
Reduced cholesterol...
No major changes in the past year...
Other
Ground Beef
Steak

What type of dietary supplements do you take? Check all that apply.				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
Vitamins	58.8%	220	59.0%	108
Minerals	22.7%	85	26.2%	48
Fatty Acids	6.4%	24	7.1%	13
Amino Acids	4.5%	17	6.0%	11
Protein	10.7%	40	11.5%	21
Botanicals	3.2%	12	4.4%	8
Other Dietary Supplements	17.9%	67	19.7%	36
None	32.4%	121	31.1%	57
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**1**		***1***
Max		**8**		***8***
Mean		**3.82**		***3.8***
Std. Dev.		**2.91**		***2.85***

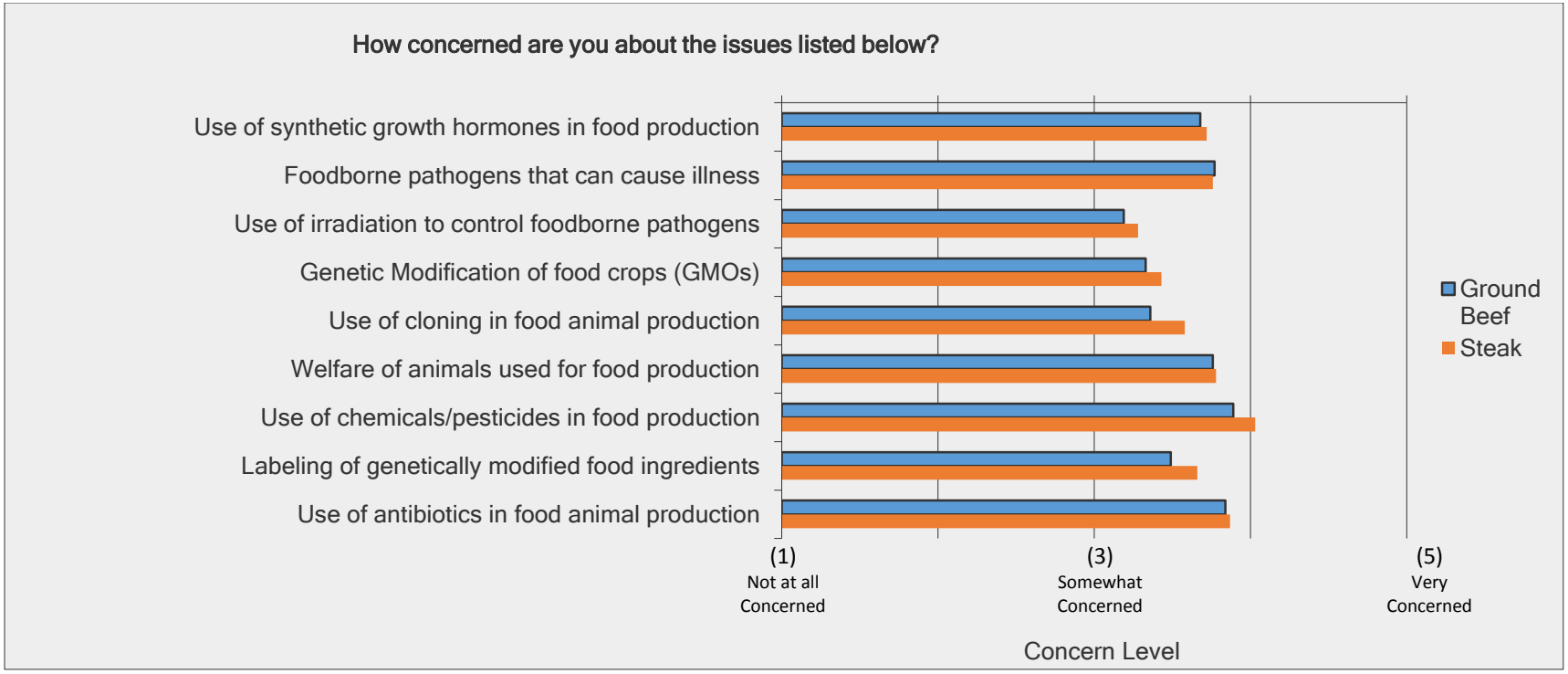


How concerned are you about the issues listed below?

	Ground Beef								Steak							
Answer Options	**Not at all Concerned**		**Somewhat Concerned**		**Very Concerned**	**Mean**	**Std. Dev.**	**Response Count**	**Not at all Concerned**		**Somewhat Concerned**		**Very Concerned**	**Mean**	**Std. Dev.**	**Response Count**
Use of synthetic growth hormones in food production	43	31	87	54	159	3.68	1.39	374	20	17	42	20	84	3.72	1.40	183
Foodborne pathogens that can cause illness	33	26	91	68	156	3.77	1.30	374	12	16	45	41	69	3.76	1.23	183
Use of irradiation to control foodborne pathogens	69	56	83	67	99	3.19	1.45	374	25	30	50	24	54	3.28	1.39	183
Genetic Modification of food crops (GMOs)	68	46	80	53	127	3.33	1.50	374	26	25	38	32	62	3.43	1.43	183
Use of cloning in food animal production	61	52	76	62	123	3.36	1.46	374	20	27	35	29	72	3.58	1.41	183
Welfare of animals used for food production	33	26	94	64	157	3.76	1.30	374	16	18	30	45	74	3.78	1.30	183
Use of chemicals/pesticides in food production	33	32	57	75	177	3.89	1.32	374	11	13	27	40	92	4.03	1.21	183
Labeling of genetically modified food ingredients	59	41	68	69	137	3.49	1.47	374	20	23	33	31	76	3.66	1.40	183
Use of antibiotics in food animal production	35	32	67	62	178	3.84	1.35	374	12	20	29	40	82	3.87	1.27	183
Answered question								**374**								**183**
Skipped question								**0**								**0**
Min								**1**								**1**
Max								**5**								**5**

Correlation Matrix for 9 Variables (Ground Beef)

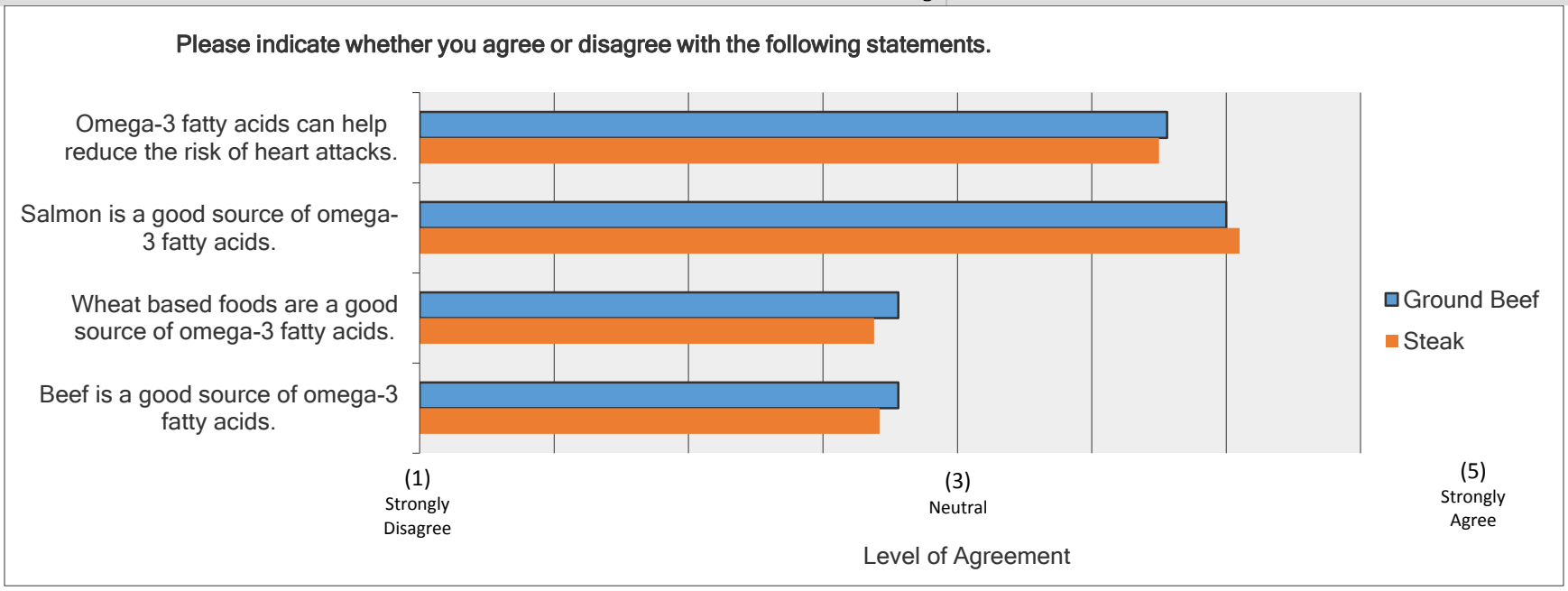
Variable	CONHORM	CONPATH	CONIRRAD	CONGM	CONCLONE	CONWELF	CONCHEM	CONLBLGM	CONANTIB
CONHORM	1.0000	0.6511	0.7158	0.7652	0.6737	0.6323	0.7820	0.7059	0.8079
CONPATH	0.6511	1.0000	0.6127	0.5429	0.5830	0.5887	0.6086	0.5395	0.6104
CONIRRAD	0.7158	0.6127	1.0000	0.7668	0.7295	0.5619	0.6338	0.6879	0.6370
CONGM	0.7652	0.5429	0.7668	1.0000	0.7740	0.5480	0.6519	0.8187	0.6690
CONCLONE	0.6737	0.5830	0.7295	0.7740	1.0000	0.5770	0.6550	0.7239	0.6393
CONWELF	0.6323	0.5887	0.5619	0.5480	0.5770	1.0000	0.6815	0.5480	0.6894
CONCHEM	0.7820	0.6086	0.6338	0.6519	0.6550	0.6815	1.0000	0.7217	0.8648
CONLBLGM	0.7059	0.5395	0.6879	0.8187	0.7239	0.5480	0.7217	1.0000	0.7034
CONANTIB	0.8079	0.6104	0.6370	0.6690	0.6393	0.6894	0.8648	0.7034	1.0000



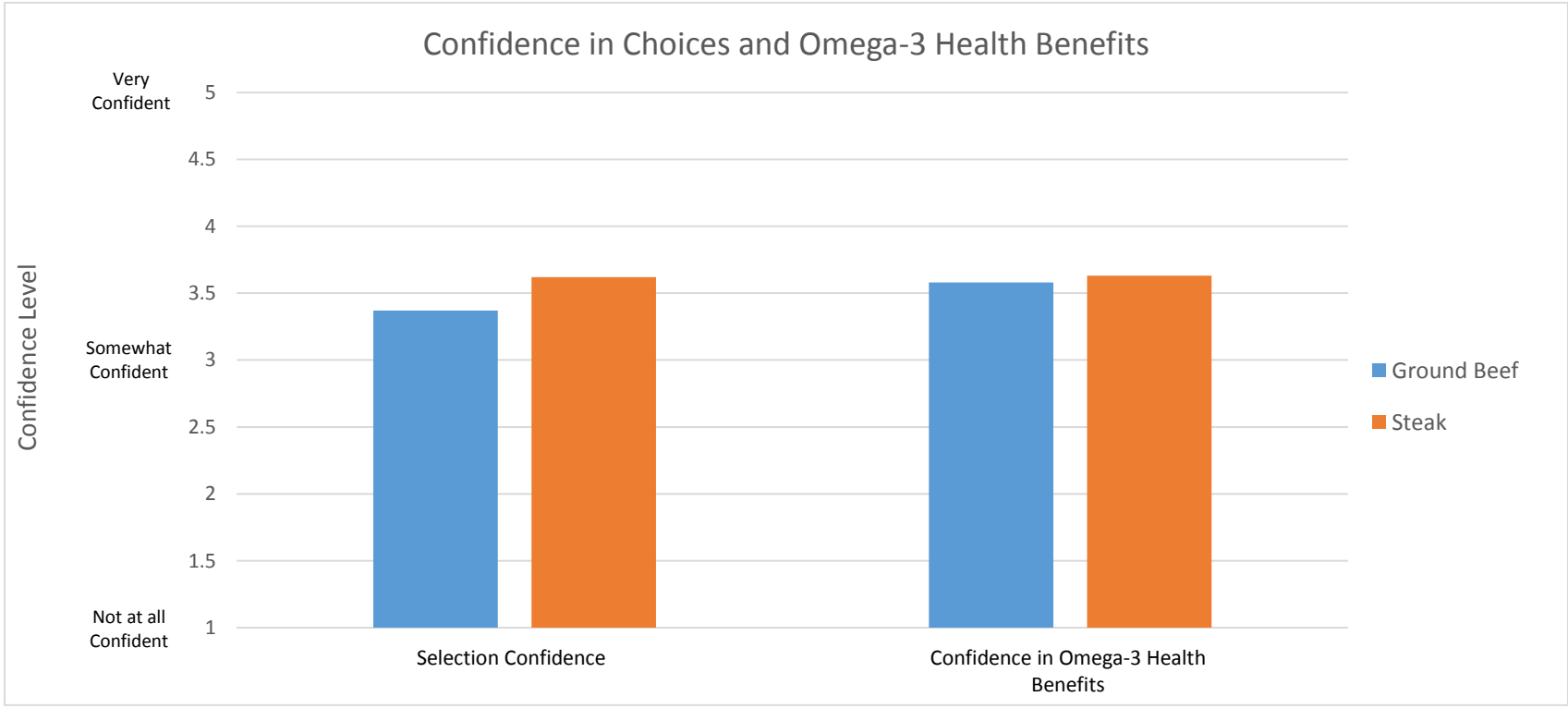
Correlation Matrix for 9 Variables (Steak)									
Variable	CONHORM	CONPATH	CONIRRAD	CONGM	CONCLONE	CONWELF	CONCHEM	CONLBLGM	CONANTIB
CONHORM	1.0000	0.5770	0.7328	0.7969	0.7346	0.6329	0.7989	0.7963	0.7128
CONPATH	0.5770	1.0000	0.6410	0.60994	0.5996	0.5819	0.6803	0.6099	0.6810
CONIRRAD	0.7328	0.6410	1.0000	0.7989	0.6879	0.5906	0.6761	0.7555	0.6337
CONGM	0.7969	0.6099	0.7989	1.0000	0.8062	0.5453	0.6993	0.8779	0.6541
CONCLONE	0.7346	0.5996	0.6879	0.8062	1.0000	0.5542	0.6667	0.7743	0.6205
CONWELF	0.6329	0.5819	0.5906	0.5453	0.5542	1.0000	0.6912	0.5868	0.6126
CONCHEM	0.7989	0.6803	0.6761	0.6993	0.6667	0.6912	1.0000	0.7196	0.8093
CONLBLGM	0.7963	0.6099	0.7555	0.8779	0.7743	0.5868	0.7196	1.0000	0.7023
CONANTIB	0.7128	0.6810	0.6337	0.6541	0.6205	0.6126	0.8093	0.7023	1.0000

Please indicate whether you agree or disagree with the following statements.

Answer Options	Ground Beef								Steak							
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Response Count	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Response Count
Omega-3 fatty acids can help reduce the risk of heart attacks.	17	4	94	190	69	3.78	0.92	374	7	3	46	99	28	3.75	0.87	183
Salmon is a good source of omega-3 fatty acids.	15	5	59	182	113	4.00	0.94	374	7	0	20	105	51	4.05	0.85	183
Wheat based foods are a good source of omega-3 fatty acids.	34	71	222	37	10	2.78	0.84	374	16	52	93	16	6	2.69	0.87	183
Beef is a good source of omega-3 fatty acids.	31	96	188	44	15	2.78	0.90	374	17	53	84	24	5	2.71	0.90	183
Answered question								**374**								**183**
Skipped question								**0**								**0**
Min								**1**								**1**
Max								**5**								**5**

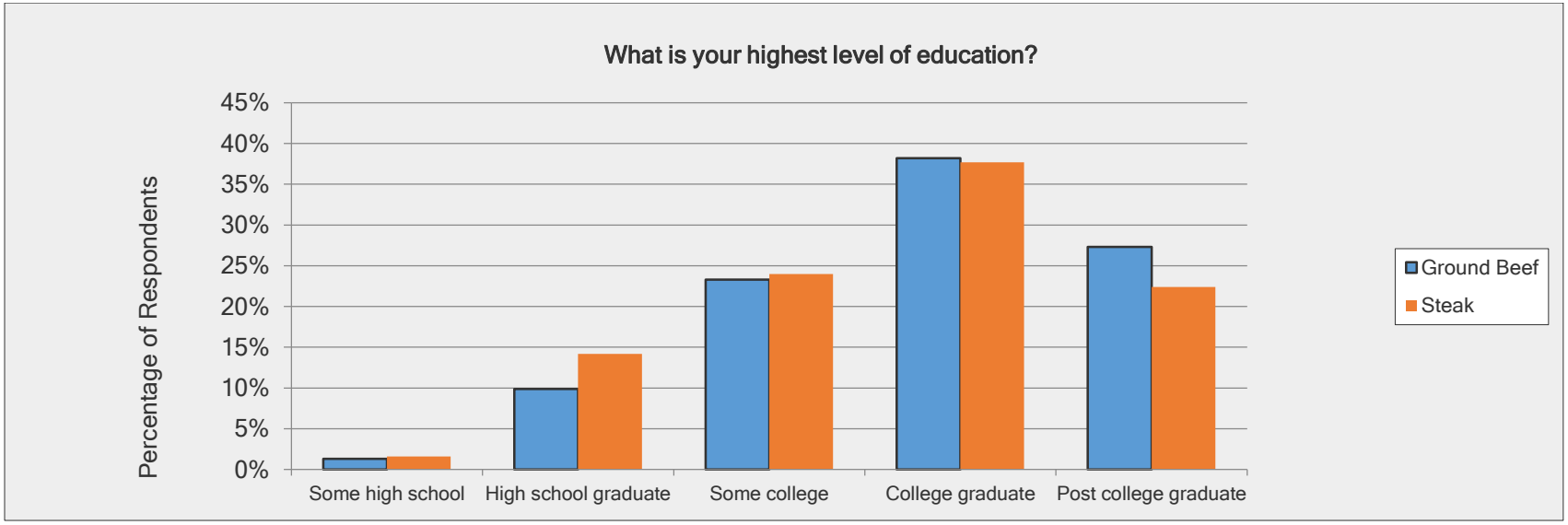


	Ground Beef								Steak							
	Not at all Confident		Somewhat Confident		Very Confident	Mean	Std. Dev.	Response Count	Not at all Confident		Somewhat Confident		Very Confident	Mean	Std. Dev.	Response Count
How confident are you in the selections you just made?	19	37	164	93	61	3.37	1.03	374	4	15	70	52	42	3.62	1.00	183
How confident are you that there are health benefits from omega-3 fatty acids?	14	30	134	118	78	3.58	1.02	374	8	12	65	52	46	3.63	1.06	183
Answered question								**374**								**183**
Skipped question								**0**								**0**
Min								**1**								**1**
Max								**5**								**5**



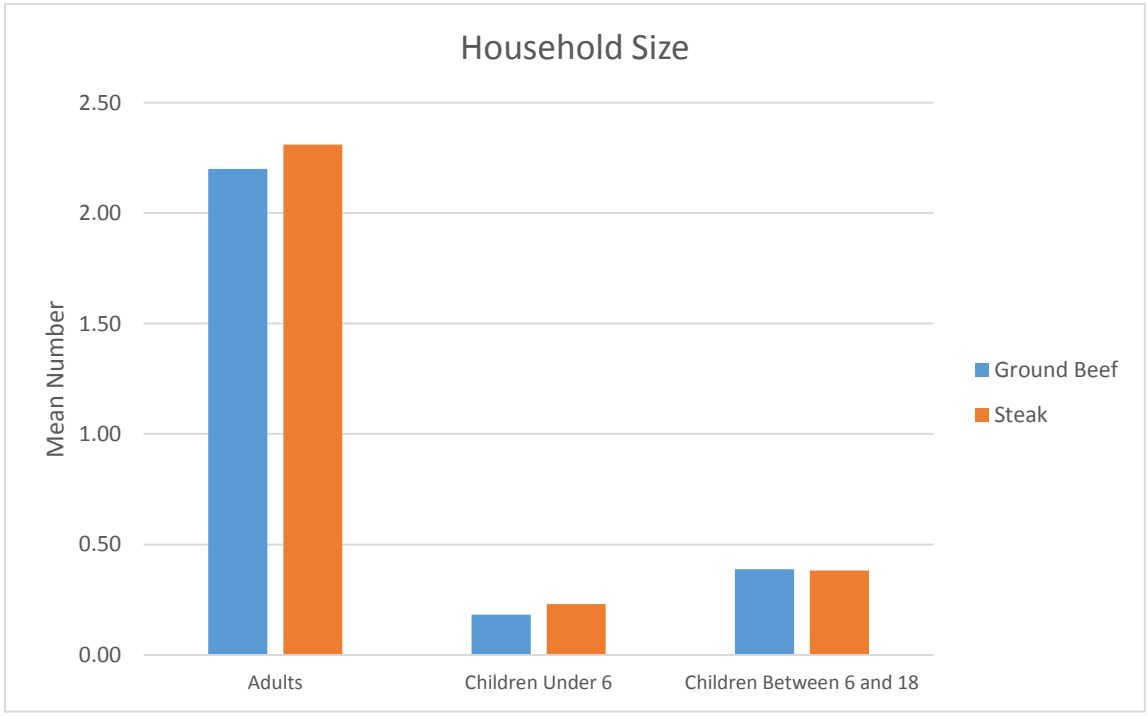
Demographic Information

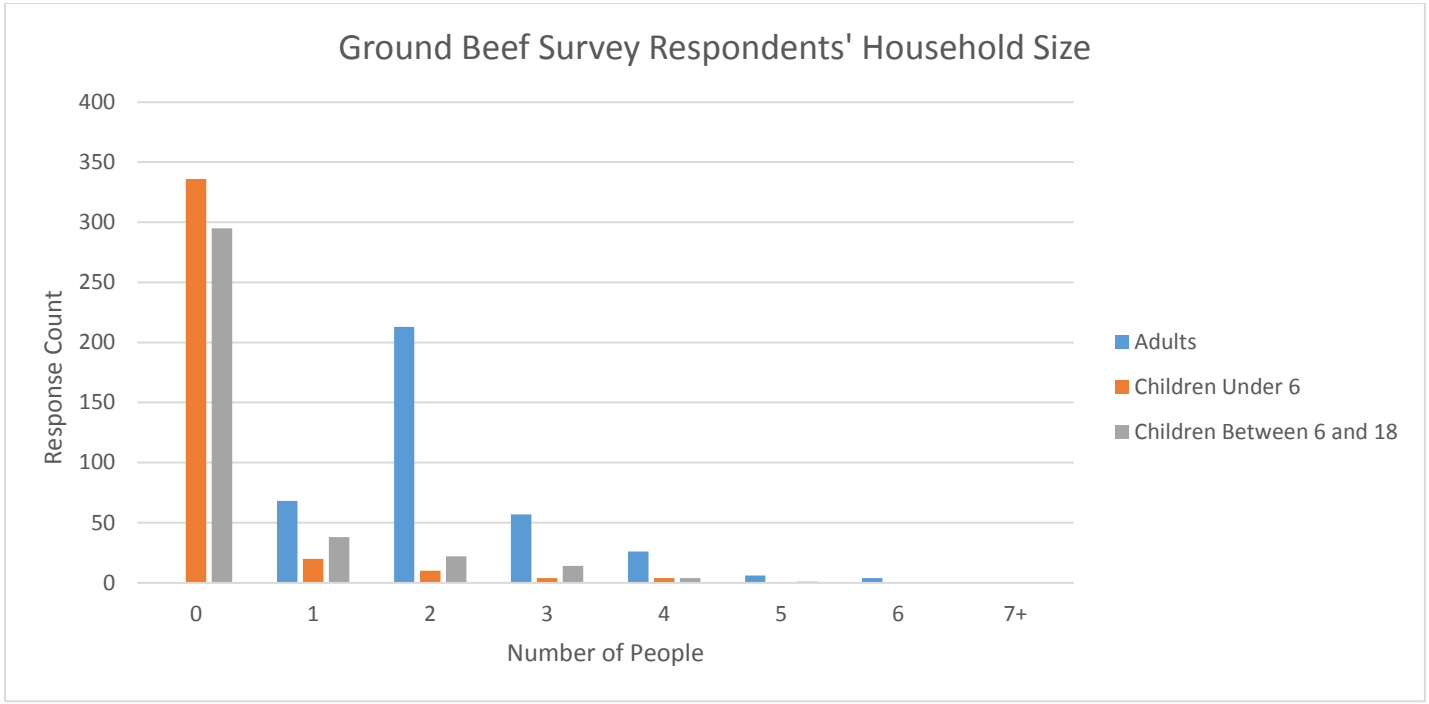
What is your highest level of education?				
	Ground Beef		Steak	
Answer Options	**Response Percent**	**Response Count**	**Response Percent**	**Response Count**
Some high school	1.3%	5	1.6%	3
High school graduate	9.9%	37	14.2%	26
Some college	23.3%	87	24.0%	44
College graduate	38.2%	143	37.7%	69
Post college graduate	27.3%	102	22.4%	41
Answered question		**374**		**183**
Skipped question		**0**		**0**
Min		**1**		**1**
Max		**5**		**5**
Mean		**3.80**		**3.65**
Std. Dev.		**0.99**		**1.03**

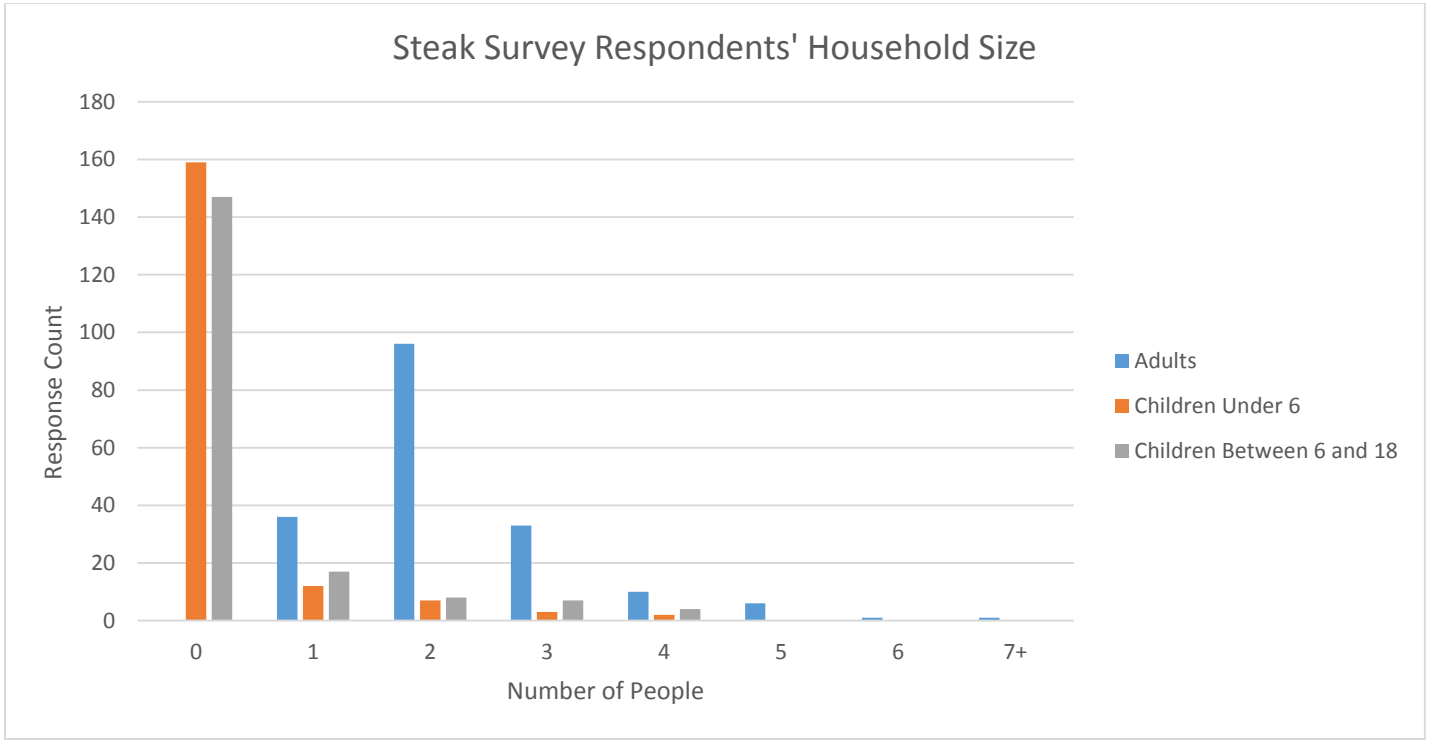


Household Size

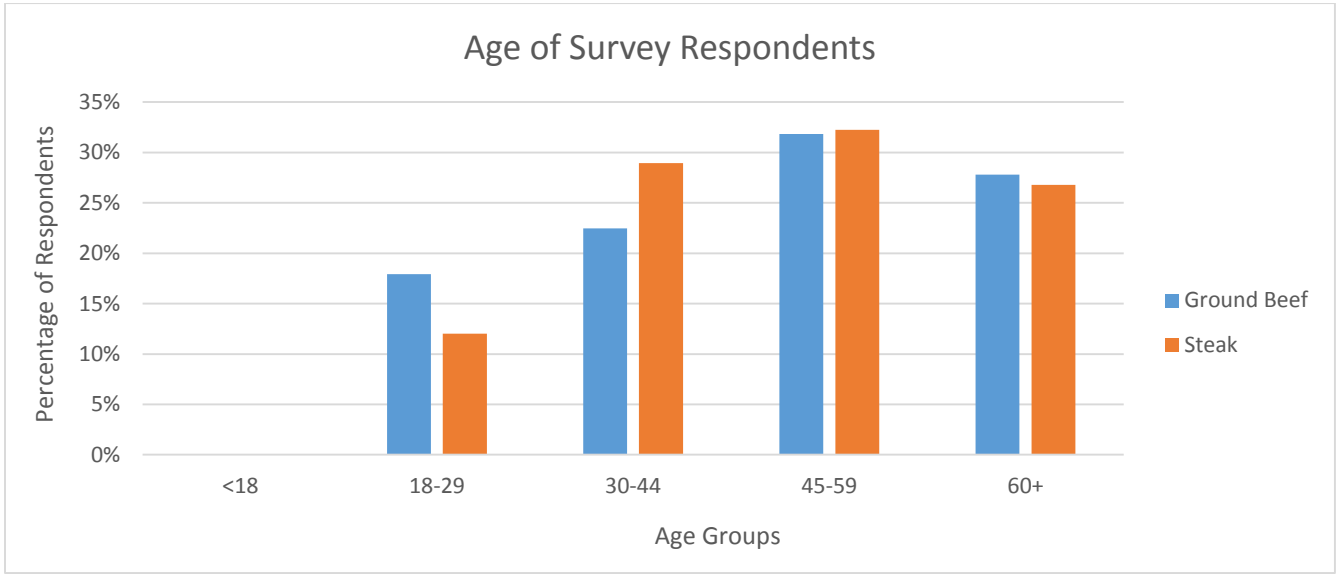
	Ground Beef													Steak											
Answer Options	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Response Count**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7+**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Response Count**
Adults	0	68	213	57	26	6	4	0	1	6	2.20	0.94	374.00	0	36	96	33	10	6	1	1	1	20	2.31	1.63	183
Children Under 6	336	20	10	4	4	0	0	0	0	4	0.18	0.63	374.00	159	12	7	3	2	0	0	0	0	4	0.23	0.70	183
Children Between 6 and 18	295	38	22	14	4	1	0	0	0	5	0.39	0.87	374.00	147	17	8	7	4	0	0	0	0	4	0.38	0.91	183
Answered question													**374**													**183**
Skipped question													**0**													**0**



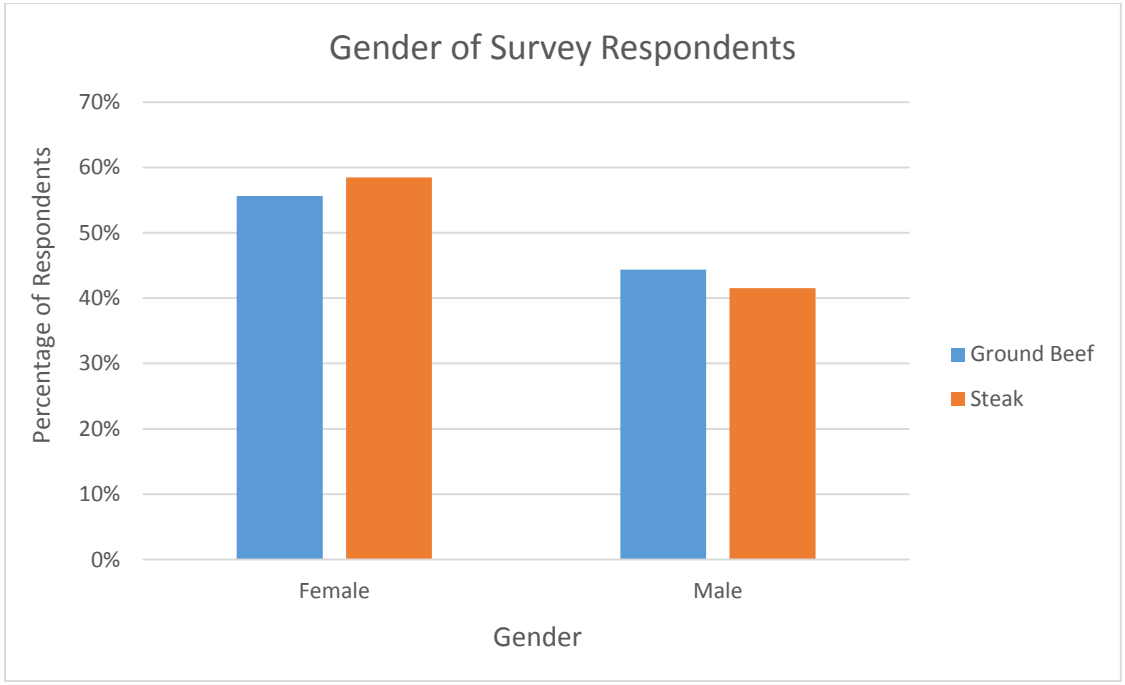

Ground Beef Survey Respondents' Household Size
Response Count
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7+
Number of People
Adults
Children Under 6
Children Between 6 and 18


Steak Survey Respondents' Household Size
180
160
140
120
100
80
60
40
20
0
Response Count
0
1
2
3
4
5
6
7+
Number of People
Adults
Children Under 6
Children Between 6 and 18

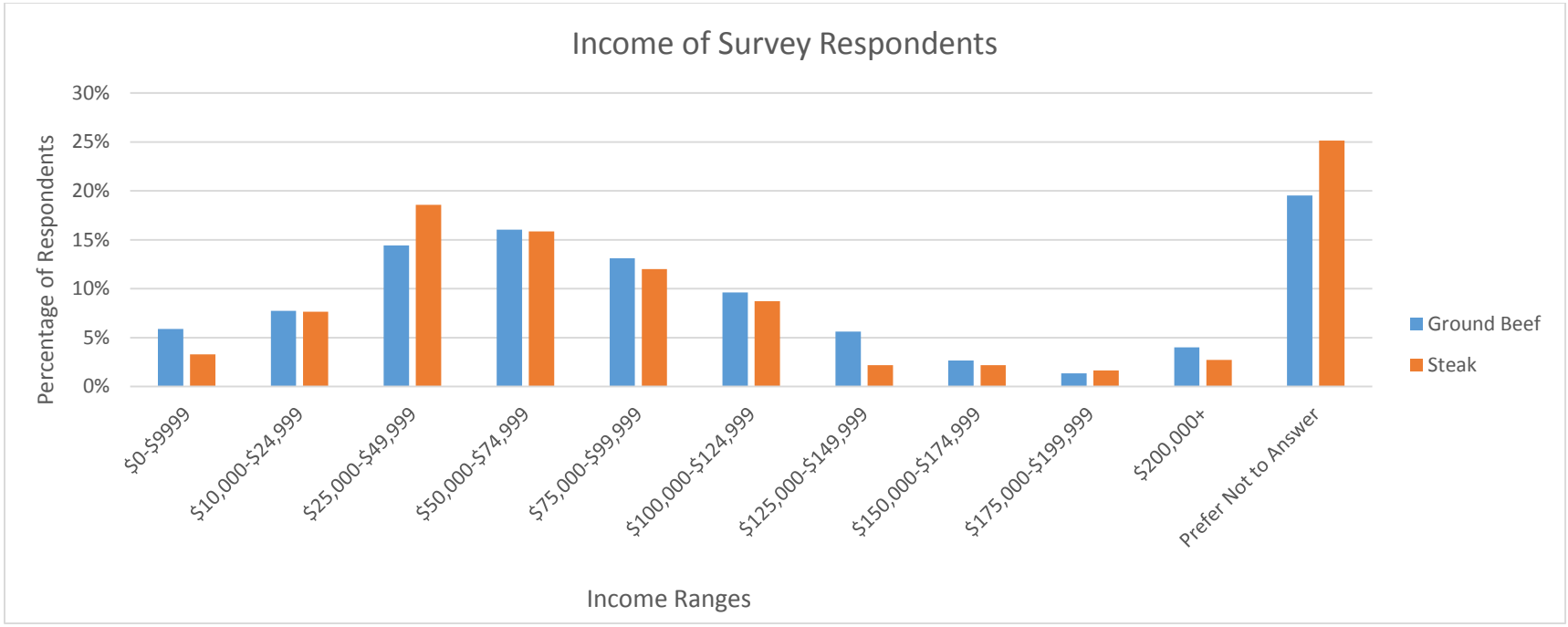
Age				
	Ground Beef		Steak	
Answer Options	Response Percent	Response Count	Response Percent	Response Count
<18	0.00%	0	0.00%	0
18-29	17.91%	67	12.02%	22
30-44	22.46%	84	28.96%	53
45-59	31.82%	119	32.24%	59
60+	27.81%	104	26.78%	49
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**2**		***2***
Max		**5**		***5***
Mean		**3.7**		***3.74***
Std. Dev.		**1.06**		***0.98***



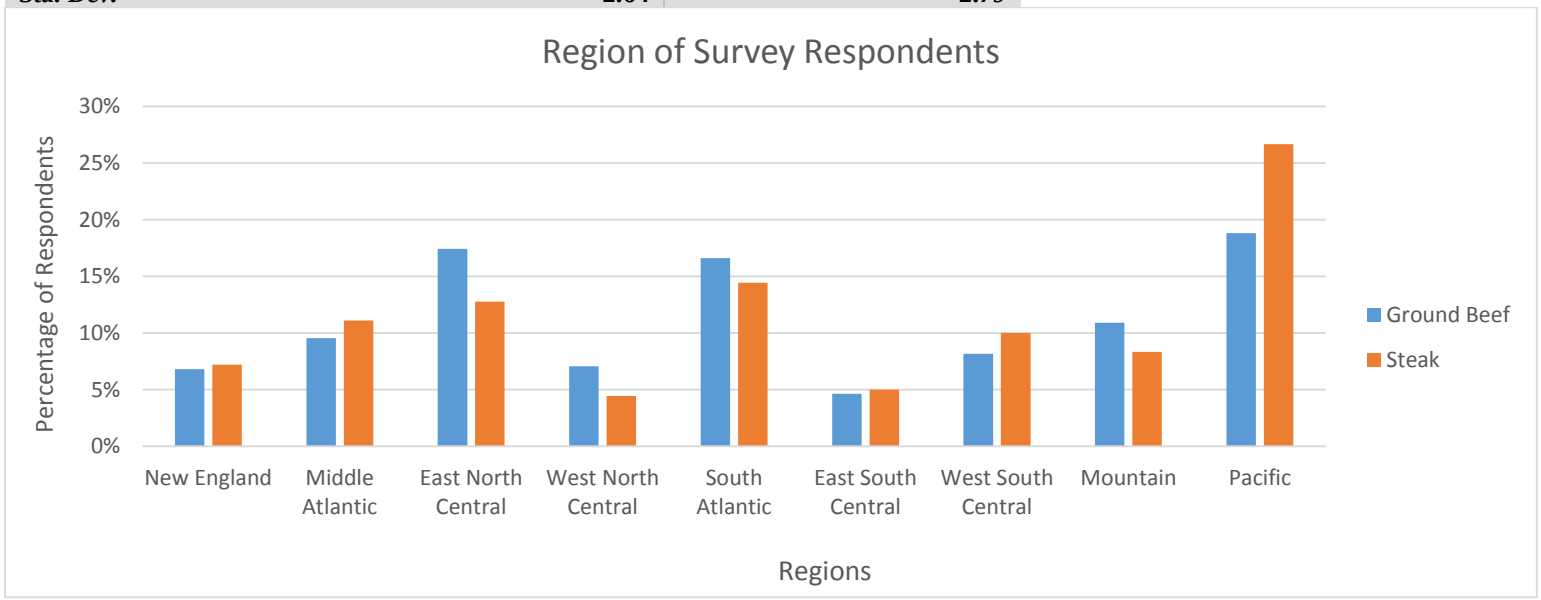
Gender: 1=male; 0=female				
	Ground Beef		Steak	
Answer Options	Response Percent	Response Count	Response Percent	Response Count
Female	55.61%	208	58.47%	107
Male	44.39%	166	41.53%	76
Answered question		**374**		***183***
Skipped question		**0**		***0***
Min		**0**		***0***
Max		**1**		***1***
Mean		**0.44**		***0.42***
Std. Dev.		**0.497**		***0.494***



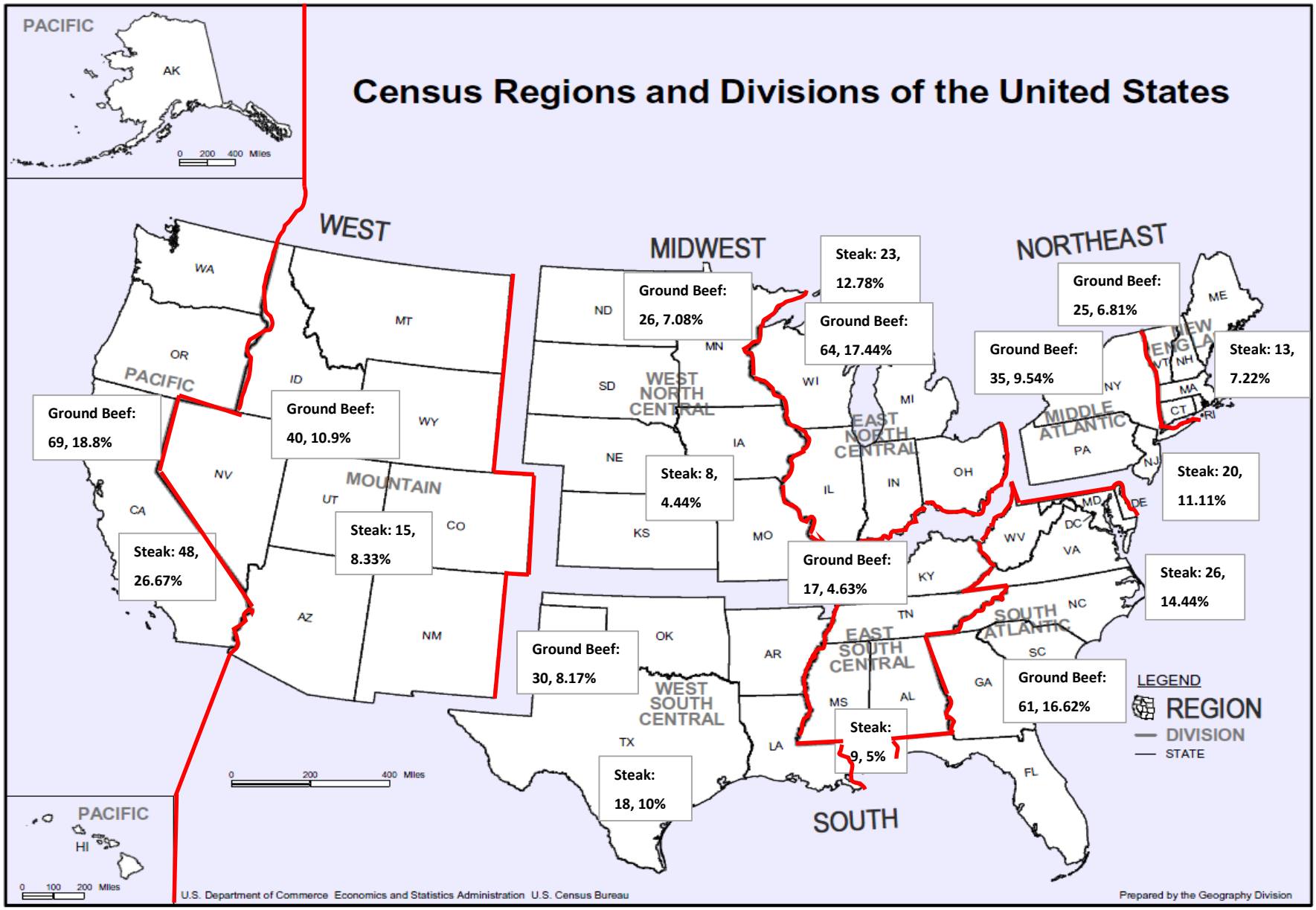
Income				
	Ground Beef		Steak	
Answer Options	Response Percent	Response Count	Response Percent	Response Count
$0-$9999	5.88%	22	3.28%	6
$10,000-$24,999	7.75%	29	7.65%	14
$25,000-$49,999	14.44%	54	18.58%	34
$50,000-$74,999	16.04%	60	15.85%	29
$75,000-$99,999	13.10%	49	12.02%	22
$100,000-$124,999	9.63%	36	8.74%	16
$125,000-$149,999	5.61%	21	2.19%	4
$150,000-$174,999	2.67%	10	2.19%	4
$175,000-$199,999	1.34%	5	1.64%	3
$200,000+	4.01%	15	2.73%	5
Prefer Not to Answer	19.52%	73	25.14%	46
Answered question		374		*183*
Skipped question		0		*0*
Min		1		*1*
Max		11		*11*
Mean		5.80		*6.02*
Std. Dev.		3.25		*3.38*
Without “Prefer Not to Answer”				
Answered question		301		*137*
Skipped question		73		*46*
Min		1		*1*
Max		10		*10*
Mean		4.53		*4.34*
Std. Dev.		2.23		*2.05*


Income of Survey Respondents
30%
25%
20%
15%
10%
5%
0%
Percentage of Respondents
$0-$9999
$10,000-$24,999
$25,000-$49,999
$50,000-$74,999
$75,000-$99,999
$100,000-$124,999
$125,000-$149,999
$150,000-$174,999
$175,000-$199,999
$200,000+
Prefer Not to Answer
Income Ranges
Ground Beef
Steak

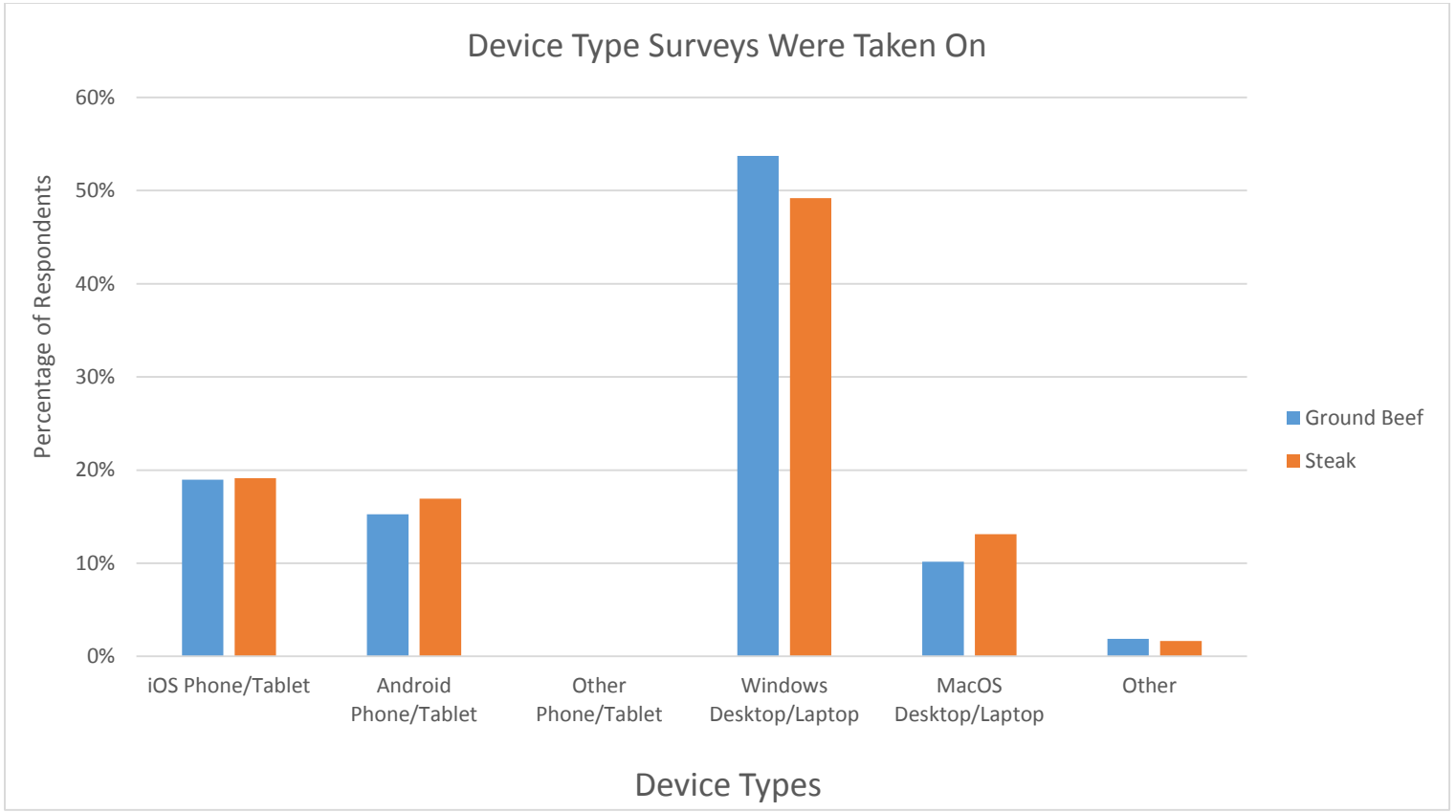
US Region				
	Ground Beef		Steak	
Answer Options	Response Percent	Response Count	Response Percent	Response Count
New England	6.81%	25	7.22%	13
Middle Atlantic	9.54%	35	11.11%	20
East North Central	17.44%	64	12.78%	23
West North Central	7.08%	26	4.44%	8
South Atlantic	16.62%	61	14.44%	26
East South Central	4.63%	17	5.00%	9
West South Central	8.17%	30	10.00%	18
Mountain	10.90%	40	8.33%	15
Pacific	18.80%	69	26.67%	48
Answered question		367		*180*
Skipped question		7		*3*
Min		1		*1*
Max		9		*9*
Mean		5.31		*5.64*
Std. Dev.		2.64		*2.79*



New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
Connecticut	New Jersey	Indiana	Iowa	Delaware	Alabama	Arkansas	Arizona	Alaska
Main	New York	Illinois	Kansas	District of Columbia	Kentucky	Louisiana	Colorado	California
Massachusetts	Pennsylvania	Michigan	Minnesota	Florida	Mississippi	Oklahoma	Idaho	Hawaii
New Hampshire		Ohio	Missouri	Georgia	Tennessee	Texas	New Mexico	Oregon
Rhode Island		Wisconsin	Nebraska	Maryland			Montana	Washington
Vermont			North Dakota	North Carolina			Utah	
			South Dakota	South Carolina			Nevada	
				Virginia			Wyoming	
				West Virginia				


Census Regions and Divisions of the United States
PACIFIC
AK
0 200 400 Miles
WEST
MIDWEST
NORTHEAST
SOUTH
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
MN
IA
MO
WI
IL
MI
IN
OH
KY
TN
MS
AL
GA
FL
SC
NC
VA
WV
PA
NY
ME
VT
NH
MA
CT
RI
NJ
MD
DE
DC
OK
TX
AR
LA
PACIFIC
HI
0 100 200 Miles
0 200 400 Miles
Ground Beef: 69, 18.8%
Ground Beef: 40, 10.9%
Steak: 48, 26.67%
Steak: 15, 8.33%
Steak: 8, 4.44%
Ground Beef: 26, 7.08%
Steak: 23, 12.78%
Ground Beef: 64, 17.44%
Ground Beef: 17, 4.63%
Ground Beef: 30, 8.17%
Steak: 18, 10%
Steak: 9, 5%
Ground Beef: 61, 16.62%
Steak: 26, 14.44%
Steak: 20, 11.11%
Ground Beef: 35, 9.54%
Ground Beef: 25, 6.81%
Steak: 13, 7.22%
LEGEND
REGION
DIVISION
STATE
U.S. Department of Commerce Economics and Statistics Administration U.S. Census Bureau
Prepared by the Geography Division

Device				
	Ground Beef		Steak	
Answer Options	Response Percent	Response Count	Response Percent	Response Count
iOS Phone/Tablet	18.98%	71	19.13%	35
Android Phone/Tablet	15.24%	57	16.94%	31
Other Phone/Tablet	0.00%	0	0.00%	0
Windows Desktop/Laptop	53.74%	201	49.18%	90
MacOS Desktop/Laptop	10.16%	38	13.11%	24
Other	1.87%	7	1.64%	3
Answered question		374		*183*
Skipped question		0		*0*
Min		1		*1*
Max		6		*6*
Mean		3.26		*3.25*
Std. Dev.		1.40		*1.43*


Device Type Surveys Were Taken On
60%
50%
40%
30%
20%
10%
0%
Percentage of Respondents
iOS Phone/Tablet
Android Phone/Tablet
Other Phone/Tablet
Windows Desktop/Laptop
MacOS Desktop/Laptop
Other
Ground Beef
Steak
Device Types