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To the Graduate Council:

I am submitting herewith a thesis written by Meagan Gayle Merritt entitled "Tennessee Consumers' Willingness to Pay for Tennessee Certified Beef and other Beef Attributes." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Andrew P. Griffith, Major Professor

We have read this thesis and recommend its acceptance:

Karen E. Lewis, Kimberly L. Jensen

Accepted for the Council:
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Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Tennessee Consumers' Willingness to Pay for Tennessee Certified Beef and other Beef Attributes

A Thesis Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

Meagan Gayle Merritt

May 2017

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ABSTRACT

Beef producers in Tennessee have expressed interest in the creation of an in-state certified beef program. Therefore, this study evaluates Tennessee consumer preferences for Tennessee Certified Beef and other beef attributes that are likely to appear on Tennessee beef. We define Tennessee Certified Beef as beef originating from animals born, raised, finished, and harvested in Tennessee. The objectives of this research are to provide a measure of Tennessee consumers' willingness to pay (WTP) for Tennessee Certified Beef and the beef attributes grass-fed, no hormones administered, Certified Angus Beef, and Master Quality Raised Beef (label indicating producers completed the Beef Quality Assurance and the Advanced Master Beef Producer educational programs). WTP measures for both boneless ribeye beef steaks and ground beef are obtained in this study. Qualtrics, a software used to distribute online surveys, was used to gather data. The survey contained a choice experiment in which 816 Tennessee beef consumers were surveyed to determine preferences for beef attributes. Results of two treatments were compared for both steak and ground beef. In the Control Treatment, consumers were given a cheap talk script while in the Information Treatment, consumers were given definitions for the different beef attributes and a cheap talk script prior to the choice sets. Data were analyzed using a random parameters logit model. Results indicate steak consumers value Tennessee Certified Beef higher than all other individual attributes and ground beef consumers value the attribute no hormones administered most highly, but only slightly more so than Tennessee Certified Beef. All evaluated attributes garnered a positive WTP, with grass-fed and Certified Angus Beef exhibiting the lowest premium for both steak and ground beef. This survey also examined the interactions between Tennessee Certified Beef and the other attributes. Tennessee steak

consumers in the Control Treatment indicated a preference to see Master Quality Raised Beef in conjunction with Tennessee Certified Beef, and ground beef consumers in the Control Treatment preferred no hormones administered in conjunction with Tennessee Certified Beef. Overall, results indicate that educational programs may increase the premiums that producers could receive for including these attributes in the beef they sell.

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CHAPTER I

INTRODUCTION

Background

According to the Tennessee Department of Agriculture, the Tennessee cattle and calf industry generated approximately $825.1 million in revenue in 2014, which made it the largest agricultural commodity in the state in terms of cash receipts (2015). Cash receipts generated from cattle in 2014 made up approximately 45.3% of the total cash receipts generated from all livestock and livestock products and roughly 19.3% of the total cash receipts generated for all agricultural commodities in the state of Tennessee (Tennessee Department of Agriculture, 2015). However, beef cattle production in the state is primarily comprised of cow-calf and stocker cattle operations which results in most calves and feeder cattle being transported to feedlots in the Mid-West and Western United States to be finished and harvested (Lewis et al., 2016). In 2017, the January 1 Cattle inventory report indicated beef cattle inventory in the state was approximately 909,000 head (United States Department of Agriculture, 2017). Based on commercial slaughter data, only 54,800 of 873,000 head of cattle, or just over 6%, were harvested in Tennessee during 2015 (United States Department of Agriculture, 2015; United States Department of Agriculture, 2016).

In December 2012, Tennessee's Governor challenged policymakers and state agricultural leaders to develop a plan that would help grow the agricultural and forestry industries within the state. This initiative was titled the Governor's Rural Challenge (Johnson, Upchurch, and Arrington, 2012). One approach of achieving this goal that was identified by the Governor's task

force, was to “expand marketing opportunities for Tennessee producers” which includes beef cattle producers. With an understanding of historic beef cattle production and marketing practices currently utilized within Tennessee, cattle producers, policy makers, and industry leaders have shown interest in determining the feasibility of the Tennessee cattle industry being able to capture additional value by potentially finishing and harvesting cattle in the state rather than sending them out of the state.

In order to ascertain whether value can be added to the Tennessee cattle industry by expanding marketing opportunities to the finishing and harvesting sectors, it is essential to evaluate both producer and consumer preferences. From the producer side, it is imperative to evaluate additional costs that would be associated with the process of in-state production including the added costs of finishing and slaughtering the animal. Producer willingness to participate in an in-state branded beef program must also be evaluated as well as the producer ability to supply a certain minimum quality product. From the consumer standpoint, it is integral to evaluate consumer preferences and determine willingness to pay (WTP) for certain attributes associated with beef products.

In recent years, consumers have revealed increased interest in locally produced products. Many studies have been conducted on consumer preferences for local food products and many of them show consumers are interested in and desire locally produced products (Adalja et al. 2015; Carpio & Isengilidina-Massa 2008; Maynard, Burdine, & Meyer 2003; Chang et al. 2013; Eastwood, Brooker, & Orr 1987; Brooker et al. 1988; Dobbs et al. 2016). There has also been increased consumer interest in beef products with specific attributes such as no hormones administered, grass-fed, and breed-specific beef. Several studies have been conducted on

consumer preferences for differentiated beef products and state-branded beef, and the results of these studies show that consumer interest in such products is increasing over time (Carlberg, Froehlich, & Ward 2007; Franken, Parcell, & Tonsor 2011; Mennecke et al. 2007; Grannis, Hooker, & Thilmany 2000; Crawford et al. 2008; Menard, Jensen, & English 2012; Franken, Parcell, & Tonsor 2011; Hanagriff, Rhoades, & Wilmeth 2009).

In addition to consumer interest in specific beef attributes, locally produced products, and state-branded programs, many consumers have vocalized the desire to know the production practices utilized to produce food products. There are numerous educational programs, which address production practices, that beef producers in Tennessee can participate in. Two such programs are the Advanced Master Beef Producer Program and the Beef Quality Assurance program. The Advanced Master Beef Producer Program is a program delivered through the University of Tennessee Extension office, and it covers multiple topics that cattle producers may find helpful in the management of their businesses including but not limited to; herd health management, cattle nutrition, current consumer interests, and animal genetics (Advanced Master Beef Producer Program, 2016). The Beef Quality Assurance program is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions (Beef Quality Assurance, 2016). The level of information consumers know about these programs may be limited and as a result, producers who are involved in the programs may be missing out on premiums that could be garnered from including a label on beef products that indicates a producer's participation in such programs.

While there have been numerous studies dedicated to beef attributes, locally produced, and state branded beef programs, a better understanding of the interactions between these different marketing attributes and WTP for beef production practices is warranted. The results of this evaluation can provide important pricing information to Tennessee beef producers who are considering supplying beef with particular attributes, including in-state production, grass-fed, no hormones administered, Certified Angus Beef, and Master Quality Raised Beef (label indicating producers completed the Beef Quality Assurance and the Advanced Master Beef Producer educational programs). This could provide Tennessee beef cattle producers and the harvesting/processing industry with a better understanding of whether consumers are willing to pay a premium for beef born, raised, finished, and harvested in Tennessee, as well as WTP for other beef attributes. If premiums do exist, producers adopting in-state finishing and harvesting would have the opportunity to capture additional value by finishing their cattle in Tennessee rather than sending them out-of-state to be finished.

Objectives

The purpose of this study is to provide an evaluation of consumer preferences for beef that is branded as Tennessee Certified Beef and to provide an estimate of consumer WTP based on those evaluated preferences. Tennessee Certified Beef is defined as beef which originates from animals which are born, raised, finished, and harvested within the state of Tennessee. This study also provides an evaluation of consumer preferences for and provides estimates of consumer WTP for other beef attributes likely to appear on retail Tennessee branded beef products. With that in mind, the objectives of this research are to: (1) provide an estimate of consumer WTP for Tennessee Certified Beef, (2) provide an estimate of consumer WTP for the

beef attributes grass-fed, no hormones administered, Certified Angus Beef, and Master Quality Raised Beef, (3) provide an estimate of consumer WTP for interactions between Tennessee Certified Beef and other attributes, and (4) provide a measure for the difference in consumer WTP for specific attributes when consumers are informed of the definition of the individual attributes prior to purchase.

CHAPTER II

LITERATURE REVIEW

Studies evaluating consumer preferences and willingness to pay for food attributes are well noted. However, there have been limited analyses related specifically to locally branded beef products in Tennessee as well as Tennessee consumer preferences for other attributes that may appear on beef products. Additionally, there is little known about the value consumers place on beef produced by producers having attended educational programs influencing production practices and herd management.

Consumer Preferences for Desirable Attributes on Beef Products

Several studies have examined consumer preferences for desirable attributes on beef products. Carlberg, Froehlich, and Ward (2007) surveyed consumers in both an auction environment and a mail survey to determine consumer WTP for four hypothetical branded beef attributes including; guaranteed tender, premium, breed-specific (Angus breed), and "Nature Friendly". "Nature Friendly" beef had the following qualifications; no added hormones, no antibiotics, all vegetarian diet for the animal, animal welfare practices followed, environmental practices followed, and animal was both pasture and grain fed. They found premiums ranging from $1.20 to $1.83 per 12-ounce ribeye steak which equates to a premium of $1.60 to $2.44 per pound for the different beef attributes.

Grannis, Hooker, and Thilmany (2000) performed a study using a mail survey distributed to consumers in Colorado, Utah, and New Mexico. The goal of the study was to determine which production practices consumers value the greatest in reference to beef products. Results indicated

that among a list of attributes including; use of growth hormones, use of antibiotics, type of animal enclosure, grass-fed, meat raised within 250 miles, and several others, consumers placed the least value on locally produced ground beef and locally produced steak and the most value on hormone free beef.

Mennecke et al. (2007) used a conjoint analysis method to survey U.S. consumers in order to determine utility from different characteristics in beef steaks. Results indicated the most important characteristic studied was region of origin. This attribute was followed by animal breed, traceability, animal feed, and beef quality. These factors were all more important to national consumers than the cost of cut, farm ownership, use of or lack of use of growth promoters, and guaranteed product tenderness.

Studies on State-branded Beef Programs and Differentiated Beef Products

Several studies have evaluated state-branded beef programs. Previous studies assessed product differentiation that has the potential to help create a specialized product garnering a premium in states such as New Mexico, Tennessee, Missouri, and Texas (Crawford et al., 2008; Menard, Jensen, and English, 2012; Franken, Parcell, and Tonsor, 2011; Hanagriff, Rhoades, and Wilmeth, 2009).

Crawford et al. (2008) performed a study which evaluated ways to add additional value to the New Mexico beef industry. They provided an in-depth analysis on the feasibility of using a local, state-branded beef program to add value to the beef market in the state of New Mexico. Crawford et al. (2008) concluded that a state or regional branding program used in combination with a certification process, would have a high chance of success in regards to adding value to

the New Mexico beef market due to low cost of implementing such a program as well as the high chance of obtaining a loyal customer base.

Menard, Jensen, and English (2012) performed an analysis regarding methods of adding value to the Tennessee beef cattle market by providing market information in reference to Tennessee cattle producers selling locally produced and/or differentiated beef products to consumers in Tennessee. The results of the analysis depended on how differentiated the beef product was. Thus, the premium consumers were willing to pay could range from $1.00 to $2.56 per pound more depending on the level of differentiation. This analysis also indicates the target market for differentiated beef products should be young, female, educated, high income, and small household sizes.

Franken, Parcell, and Tonsor (2011) performed a study measuring consumer WTP for retail branded beef products that had bundled attributes in the state of Missouri. They found younger people, females, and individuals with higher incomes were all more receptive to branded products with several of the bundled attributes. The results indicated consumers were willing to pay the highest premium, $1.09 more, for a Kansas City Strip Steak that had the attribute of grass-fed/lean. This premium was followed closely by $1.00 more for organic and $0.95 for All Natural. Locally produced garnered a premium of $0.83 which was higher than the premiums indicated for nature friendly, low carbon footprint, and U.S. produced.

Hanagriff, Rhoades, and Wilmeth (2009) performed a study to determine which attributes were most important to consumers when purchasing a branded beef product. They found guaranteed tender, guaranteed satisfaction, low price, good color, lean products, and health attributes were the most important attributes consumers look for when purchasing branded beef.

Additionally, approximately 59% of the sample indicated the attribute “locally grown in Texas” was either moderately or always important.

U.S. Consumer Preferences for Local Products

Numerous studies have examined U.S. consumers’ WTP for local products. Loureiro and Hine (2002) performed a study using a multiple bound probit model in order to assess consumer WTP for a “Colorado Grown” local designation, an “organic” designation, or a “GMO-Free” designation on potatoes. The results of the study indicated consumers were willing to pay a 10% premium, or 9.37 cents per pound more, for locally grown potatoes. The WTP premium for local exceeded the WTP premium for both the organic and GMO-free product. However, consumers who were willing to pay more for locally grown potatoes were only willing to pay more if they considered the potato to be of a higher nutritional value. Results of this study determined age, income, and gender had no effect on WTP.

Adams and Adams (2008) conducted a survey at a farmers’ market in Gainesville, Florida where they looked at several different aspects of consumer preferences and WTP for local foods. When asking consumers an open-ended question about how much more they would be willing to pay for local produce, they determined that 10.75% of the respondents were willing to pay over two times the regular price for produce specified as local produce, while only 13.98% of respondents were not willing to pay more for a local product. Interestingly, this study also found that people who have their own gardens are willing to pay on average, $0.65 more for local produce, and that females were willing to pay $0.49 more than males for local produce (Adams and Adams, 2008).

Hu et al. (2012) performed a conjoint experiment using a survey of a random sample of consumers in Ohio and Kentucky. The study estimated consumer WTP for blackberry jam with several attributes including; brand of jam, organic certification, a State Proud logo which was an indication that the blackberry jam was produced within the state that it was being purchased in, and an identification of the sub-state region or multi-state region of production, and a few other attributes (Hu et al., 2012). Results indicated consumers preferred a product that was produced within the state and were willing to pay about $0.14 more per 12-ounce jar of blackberry jam if it had a State Proud logo. In addition, consumers were willing to pay up to $0.31 more for jam that was produced in a small region close to them.

Darby et al., (2006) performed a study estimating consumer WTP for locally produced strawberries in which they interviewed randomly selected shoppers at different Ohio retail food locations that varied in type. They used choice experiments to elicit consumer preferences and the results indicated consumers were willing to pay more for locally produced strawberries. Consumers surveyed at grocery stores were willing to pay $0.64 more per quart when the strawberries were local. Additionally, Darby et al. (2006) found shoppers at direct markets were willing to pay $1.17 more per carton of strawberries that were designated as local. Interestingly, this study showed that direct market males showed stronger preferences for local products than females did.

Nganje, Hughner, and Lee (2011) used a conjoint analysis approach to elicit consumer preferences and attitudes in reference to the state-branded program, “Arizona Grown”, and locally grown produce in the state of Arizona. According to the outcomes of the study, consumers were willing to pay $0.18 per pound more for state-branded spinach and $0.10 per

pound for carrots that were locally grown. Results also showed age, income, and level of education all had a significant impact on the decision of the consumer to choose “Arizona Grown”.

Carpio and Isengilidina-Massa (2008) performed a telephone survey to elicit consumer preferences from a sample of South Carolina consumers. This study used a contingent valuation framework to look at consumer WTP for local products in the state of South Carolina. They found consumers were willing to pay an average premium of 27% for local produce and about 23% for local animal products. Carpio and Isengilidina-Massa (2008) found some factors that were likely to affect willingness to pay were socioeconomic characteristics, age, gender, and income.

Chang et al. (2013) used a choice based conjoint technique to elicit consumer preferences and determine consumer WTP for locally produced ground beef. The survey was distributed to grocery shoppers in two different retail supermarkets in the state of South Dakota. The results indicated consumers were willing to pay a premium of $0.71 per pound for local beef when the consumers were informed of the definition of cheap talk prior to taking the survey. When the definition was not presented to the participants the premium was $1.55 per pound which is significantly higher. These results show that informed consumers tend to make different choices than uniformed consumers.

Maynard, Burdine and Meyer (2003) studied consumer WTP in Kentucky for various locally produced meats including ground beef, beef steaks, chicken, and sausage. In reference to beef steak, about 20% of respondents stated they were willing to pay a 40% premium for local and 52% stated a 20% premium would be acceptable. When asked about WTP for locally

produced ground beef, 15% of the survey participants indicated they were willing to pay the 40% premium and 64% indicated they would pay a 20% premium. Approximately 36% of people in the study were willing to pay a 50% premium on local chicken and 52% were willing to pay a 20% premium on local sausage. Results of the study indicated single consumers, consumers who already shop in a specialty meat store, and consumers who purchase meat directly from farms all indicated a higher WTP for locally produced meats.

Adalja et al. (2015) used a choice based conjoint survey analysis in order to estimate consumer WTP for distance-based locally produced ground beef. Consumer WTP for beef raised within 100 miles of the general population of Maryland, was $2.71 per pound whereas for a representative sample of members of a buying club, the premium was $1.21 per pound. When the distance was increased to 400 miles away, the buying club members WTP was not significant but the general population was willing to pay $2.39 per pound more than they would for the non-local product.

Tennessee Consumer Preferences for Local Products

Several studies have examined Tennessee specific consumers' preferences for local food products. Eastwood, Brooker, and Orr (1987) used probit regressions to analyze data gathered from a sample of consumers from Knoxville, TN. The results of the study showed that when it came to tomatoes and peaches, consumers were not necessarily willing to pay more for a local designation unless the produce exhibited an increased level of freshness or quality (Eastwood, Brooker, and Orr, 1987). This study also determined that income, age, and employment status were not significant determinants in consumer WTP for local peaches. However, in the case of

tomatoes, they determined type of employment did have an effect on the increased WTP for local.

Brooker et al. (1988) performed an in-store experiment and a mail survey in Knox County, TN in order to determine consumer desire for locally grown tomatoes. The results from the in-store experiment indicated the price elasticity of demand for locally grown tomatoes is inelastic when price of tomatoes is increased by up to $0.30 per pound. Brooker et al. (1988) used probit regressions to analyze the data collected from the returned questionnaires, and the results showed older consumers were most likely to care where their food was grown and that high school graduates' purchasing decisions were not influenced by the presence of a local brand on the tomatoes.

Dobbs et al. (2016) surveyed consumers in five metropolitan areas in the state of Tennessee. Their results indicated that consumers with a preference for grain-fed beef were willing to pay more for Tennessee beef steaks. Results of the study also indicated gender and education were not likely to affect WTP for Tennessee beef whereas, age was a factor when it came to Tennessee steak. Overall, the research determined consumers were willing to pay a positive premium of 54.39% for ribeye beef steaks and 49.67% for 85/15 ground beef for Tennessee beef.

While previous studies lend credence to Tennessee consumers' increased WTP for locally produced beef, they have either examined other products, were conducted many years ago, or were limited to metro consumers. This study measures overall (metro and non-metro) Tennessee beef consumers' WTP for locally produced beef, and it looks at other beef attributes that have the potential to garner a premium from consumers. In addition, this study will evaluate

what attributes Tennessee consumers would like to see in addition to Tennessee Certified Beef. Finally this research will determine whether providing educational information about certain beef attributes to Tennessee consumers has the potential to increase the WTP premiums garnered from adding certain labels to beef products.

CHAPTER III

DATA AND METHODS

Conceptual Framework

The objective of this study is to provide an estimate of consumer WTP for Tennessee Certified Beef, grass-fed beef, beef with no hormones administered, Certified Angus Beef, and Master Quality Raised Beef. In order to determine WTP, consumer preferences must first be determined. Economic theory assumes consumers are utility maximizers. This is known as the random utility theory. Random utility theory (McFadden, 1974) states that if consumers are given the choice between two different products with different attributes, they will choose to purchase the product that maximizes their utility, or level of satisfaction, given their specific constraints (Loureiro and Umberger, 2007). For this study specifically, when choosing among different beef product options which were labeled with various different attributes, it is assumed that consumers were most likely to choose the option that maximized their utility given their specific budget.

Previous literature states that choice experiments, or stated preference methods, are a useful method for eliciting consumer preferences in accordance with the random utility theory (Adamowicz et al., 1998). Choice experiments have the ability to garner a more accurate representation of consumer preferences due to the unique ability to pinpoint specific desirable attributes using a set of controlled decision scenarios (Adamowicz, Louviere, and Swait, 1998). Adamowicz, Louviere, and Swait (1998) also state an objective of the choice experiment design should be to minimize the number of choice sets that need to be given to any one survey participant but still be able to maintain statistically valid consumer preferences. According to

Savage and Waldman (2008), minimizing the number of choice sets is especially important when conducting surveys because consumers tend to become fatigued when asked too many questions and may stop fully contemplating their options prior to answering which can provide a skewed representation of preferences.

Data Collection

Data were collected in order to determine Tennessee consumers' thoughts and preferences regarding several attributes that could potentially appear on the following beef products; USDA Choice boneless ribeye beef steaks and USDA Choice ground beef that is 85% fat and 15% lean. The method used to collect the data for this research was an online survey which was distributed using Qualtrics survey software. The consumers who participated in the survey were selected from a panel of participants. The full survey was launched at the end of September 2016 and it was distributed to 816 Tennessee consumers. A copy of the full survey can be found in Appendix B. Each participant had to meet the following requirements; they had to be a Tennessee resident, be age 18 or older, and they had to be a purchaser of beef for their household in order to participate in the survey.

The survey participants first saw a general information screen which told them about the purpose of the survey, the anonymity of their responses, what risks they could expect from completing the survey, benefits of providing their input for this research, and contact information for the researcher in case they had any questions or concerns regarding the survey. The survey participants were first asked some general questions to ensure that they met the requirements to continue taking the survey. Every survey participant then saw a choice experiment in which they were sorted in to two treatments: the Control Treatment and the Information Treatment. Figure 1

shows the choice experiment flow for all survey participants. All tables and figures can be found in Appendix A.

In the Control Treatment, prior to seeing the choice sets, participants were given a cheap talk script which followed the script presented by Tonsor and Schupp (2011). The cheap talk script presented to participants was as follows:

> *"The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias. Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases".*

The cheap talk script was used to attempt to decrease the amount of hypothetical bias incurred in the WTP estimates garnered from this research. Studies have shown that hypothetical bias is an issue known to occur in online or hypothetical choice experiment surveys as consumers tend to overstate the amount of money they are willing to pay when they are not faced with the actuality of spending real money on their purchases (Cummings and Taylor, 1999; Tonsor and Schupp,

2011). Chang et al. (2013) determined South Dakota consumers were willing to pay a premium of $0.71 per pound for local beef when the consumers were informed of the definition of cheap talk prior to taking the survey. When the definition was not presented to the participants the premium was $1.55 per pound which is significantly higher. Additionally, Tonsor and Schupp found that some hypothetical bias can be avoided by including a cheap talk script in online choice experiment surveys (2011).

Prior to beginning the choice sets in the Information Treatment, survey participants were provided with the cheap talk script in addition to a definition which pertained to each individual beef attribute being studied in this research. Definitions were given for the following attributes; Tennessee Certified Beef, grass-fed, no hormones administered, Certified Angus Beef, and Master Quality Raised Beef. The definitions provided to each survey participant in the Information Treatment were as follows:

> *Tennessee Certified Beef Label Definition: Tennessee Certified Beef declares that the animal was born, raised, and harvested in Tennessee and graded USDA Choice or Prime.*
>
> *Master Quality Raised Beef Label Definition: Master Quality Raised Beef ensures that the beef purchased originated from cattle that were raised throughout their entire lifespan by farmers who are certified in the following two programs:*
>
> > *(1) Advanced Master Beef Producer Program: The Advanced Master Beef Producer Program (AMBPP) is an educational program provided by the University of Tennessee designed to help cattle farmers improve cattle health management and*

cattle farm profitability. This program is open to any cattle farmers in the United States. The AMBPP certification is given to producers who complete the program.

(2) Beef Quality Assurance Program: Beef Quality Assurance (BQA) is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. BQA guidelines are designed to make certain all beef consumers can take pride in what they purchase – and can trust and have confidence in the entire beef industry.

Certified Angus Beef Label Definition: USDA graders inspect black-hided cattle (typical of the Angus breed) and give it a grade. All beef considered for the brand must grade in the top two thirds of Choice or Prime.

Grass-Fed Beef Label Definition: This label indicates that the animal was fed only grass and forage.

Beef with No Hormones Administered Label Definition: The term "no hormones administered" may be approved for use on the label of beef products if sufficient documentation is provided to the United States Department of Agriculture by the beef producer showing no hormones have been used in raising the animals.

The purpose of providing these definitions to the survey participants was to determine if the informed consumer, a participant who was given the definitions, would be willing to pay a

different amount than the consumer who has no precise knowledge of the attributes prior to making their decisions for beef products with various attributes.

Following the specific treatment information, participants were given instructions on how to complete the choice sets and then they were presented with the twelve questions which made up the choice sets. Choice sets are further explained in the next section. Following the choice sets, the participants were given questions about their beef consumption patterns, which attributes may have factored into their decision-making processes, how likely they were to consume beef products with each of the attributes included in this study, how likely they thought it would be that the answers they provided would be taken into account by state policy makers and producers, their general feeling about local foods, general risk questions, and other general demographic questions.

Choice Experiment

To elicit consumer preferences for different specific beef product attributes, an online choice experiment was conducted. Each participant was presented with choice sets allowing them to choose between two alternatives with different attributes. The participants were also presented with the option to choose neither of the products shown which is known as the alternative specific constant. The alternatives were between two boneless ribeye beef steaks grading USDA Choice or two one pound packages of 85% Lean/15% Fat ground beef grading USDA Choice. The consumers were given the following script for each choice set question for steak: "*Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.*" or, in the case of ground

beef, they saw this script, *"Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option."* Each of the products were deemed visually identical and identical pictures were included to reinforce this point, however, the beef products differed in one or more of the following attributes; price, Tennessee Certified Beef, Certified Angus Beef, grass-fed beef, no hormones administered, or Master Quality Raised Beef. Figures 2 and 3 show examples of the choice sets presented to consumers. There were four price levels ($/lb) for steak and four for ground beef. The price levels were chosen based on the market price of beef, provided by the USDA National Retail Report for Beef (2016), when the full survey was launched. The product attributes being examined, the prices used in the choice experiments, and the different attribute levels are shown in Table 1.

The choice sets presented to each individual taking the survey were determined by the program NGene (ChoiceMetrics, 2014). This software was used to generate an efficient design with interactions generated using priors which were obtained from a survey pre-test given to 80 Tennessee beef consumers age 18 and older. The full survey design contained two blocks and twelve choice sets in each block for both the ground beef and the boneless ribeye beef steak. When constructing the choice sets, the D-error was minimized. Each survey participant answered twelve choice sets and the choice sets that were given were evenly randomized. Prior to the choice sets, participants were asked the following question *"What beef products do you purchase (select all that supply)".* The options available were *"Steak"*, *"Ground Beef"*, and *"Neither"*. If the participant responded with the steak option, they were randomly and evenly assigned to one

of the steak choice sets, and if they responded ground beef, they were randomly and evenly assigned one of the ground beef choice sets. Consumers who chose both ground beef and steak were randomly and evenly assigned to either the steak or the ground beef choice sets. Consumers who chose the neither option were not allowed to continue taking the survey. The distribution of random assignments was equally distributed, with each choice set having n=204 survey participants in each of the four treatments. Each survey participant only saw twelve choice set questions and the reasoning behind this was to avoid the fatigue effects which are common in this type of survey. When participants see too many questions, they have the potential to begin answering the questions quickly so they can be done with the survey rather than fully contemplating each of their options and making the most realistic decision (Savage and Waldman, 2008). The questions within the choice sets were randomized in order to avoid ordering effects (Loureiro and Umberger, 2007).

Model Estimation

Economic Model

Random utility models are widely used models which are used for understanding what factors influence consumer choice and for allowing for the utility a consumer receives from either choosing an item or electing not to purchase an item to be calculated (McFadden, 1974) The factors that influence a consumer to make a choice on a specific item are unknown to a researcher; however, the theory is that consumers will choose to purchase an item which maximizes their utility.

For this research, the random utility theory was used to determine Tennessee consumers' preferences for Tennessee Certified Beef, grass-fed beef, Certified Angus Beef, Master Quality

Raised Beef, and beef with no hormones administered. A linear random utility framework was utilized to determine the utility each participant received from each beef alternative *j*, within each choice scenario *c*. Each survey participant *n* (1,…, *n*) faced a total of *c* (*c*= 1,…,12) choice scenarios for USDA choice boneless ribeye beef steaks or USDA Choice 85% lean/15% fat ground beef. Following Train (2002), the utility-maximizing derivation for each individual *n* for each beef alternative *j*, in each choice scenario *c* can be represented by:

$$U_{njc} = \boldsymbol{\beta}_n \boldsymbol{X}_{njc} + \varepsilon_{njc} \tag{1}$$

where $\boldsymbol{X}_{njc}$ are the observed attribute variables that relate to alternative *j* and decision maker *n* for each choice scenario *c*, $\boldsymbol{\beta}_n$ is a vector of coefficients of these variables for individual *n* which represents the person's tastes, and ε_{njc} is a random error term that is *independent and identically distributed (iid)* extreme value. The coefficients vary over individuals in the population with density $f(\beta)$. The density, $f(\beta)$ is a function of the parameters θ which represent the mean and covariance for the β's in the population when β is normally distributed (Revelt and Train, 2000).

Estimated Model

A random parameters logit model, also known as a mixed logit model, was utilized to ascertain consumer preferences and utility for locally produced Tennessee Certified Beef as well as for the formerly mentioned attributes. The random parameters logit model differs from the probit model and the standard logit model. Unlike the probit, the random parameters logit is not confined to normal distributions and it differs from the standard logit in three ways; it allows for random taste variation, it accounts for correlation in unobserved factors over time, and it permits unrestricted substitution patterns (Train 2002, Revelt and Train 1997). The random parameters

logit allows for taste heterogeneity in preferences across consumers by specifying the attribute coefficients as random, which reflects the heterogeneity of individual consumers' preferences. A random parameters logit model is appropriate for this study due to the likeliness that there is unobserved heterogeneity present in Tennessee consumers' preferences for steak and ground beef products carrying different attribute labels.

By expanding equation (1) to incorporate the beef attributes being evaluated in this survey, we can use an equation to estimate the utility consumer *n* receives from each beef alternative *j* in each choice scenario *c*:

$$U_{njc} = \beta_0 Price_{njc} + \beta_1 TCB_{njc} + \beta_2 CAB_{njc} + \beta_3 GF_{njc} + \beta_4 MQRB_{njc} + \beta_5 NH_{njc} + \beta_6 TCB_{njc} * CAB_{njc} + \beta_7 TCB_{njc} * GF_{njc} + \beta_8 TCB_{njc} * MQRB_{njc} + \beta_9 TCB_{njc} * NH_{njc} + \beta_{10} NEITHER_{njc} + \varepsilon_{njc} \quad (2)$$

where *Price* represents the price of one beef alternative *j*, *TCB* represents the dummy variable equal to one if the beef alternative *j* was labeled as *Tennessee Certified Beef* and zero if it was not, *CAB* represents the dummy variable equal to one if the beef alternative *j* was labeled as *Certified Angus Beef* and zero otherwise, *GF* represents the dummy variable equal to one if the beef alternative *j* was labeled as *grass-fed* and zero otherwise, *NH* represents the dummy variable equal to one if the beef alternative *j* was labeled as *no hormones administered*, and zero otherwise, and *MQRB* represents the dummy variable equal to one if the beef alternative *j* was labeled as *Master Quality Raised Beef* and zero otherwise. This equation includes the interactions between *Tennessee Certified Beef* and each of the other possible attributes. An example of an interaction variable would be *TCB* * *CAB* which represents the dummy variable

equal to one if the beef alternative *j* was labeled as both *Tennessee Certified Beef* and *Certified Angus Beef*, and zero if it was not. *NEITHER* is the dummy variable that is equal to one if the participant chose the alternative specific constant option and zero otherwise.

Following from equation (1) and Train (2002), β_n is known to the decision maker only and unknown to the researcher following that the unconditional choice probability of individual *n*'s choice of alternative *j* in choice set *c* for the boneless ribeye beef steaks or ground beef is the following:

$$P_{ni} = \int \left(\frac{e^{\beta_n x_{njc}}}{\sum_j e^{\beta_n x_{njc}}} \right) f(\beta) d\beta \tag{3}$$

where *j* is the jth choice for respondent *n* in choice set *c* and the variables are defined the same as in equation (2). P_{ni} is referred to as the mixed logit probability which is a weighted average of the logit formula evaluated at different values of β with the weights given by density function $f(\beta)$ (Train, 2002). The parameter estimation is obtained by maximizing the simulated log-likelihood function. Following Revelt and Train (2000), properties of the maximum simulated likelihood estimator are given by Hajivassiliou and Ruud (1994).

The parameter distributions are assumed to be independent normal distributions for the estimated model. The price coefficient was fixed across all individuals. The advantage of having a fixed coefficient for price is that the WTP for each non-price attribute has the same distribution as the attribute's coefficient. For this research, the random parameters logit estimates were obtained using a simulated maximum likelihood using 250 Halton draws. The software NLogit was used to estimate the random parameters logit model and obtain estimated parameter coefficients. The code was designed for panel data and it accounts explicitly for the correlation

over time in unobserved utility that arises when there are repeated choices by a given individual. The panel version of the random parameters logit was used because each participant's choices make a panel of twelve choices for the USDA Choice boneless ribeye beef steaks and the USDA choice ground beef (85% lean/15% fat).

Willingness to Pay

Non-Interaction Terms

WTP estimates for the non-interaction terms was calculated using the following equation:

$$WTP_{non-interactions} = \frac{\beta_k}{-\beta_0} \tag{4}$$

where β_k is the specific attribute coefficient and $k = 1, \ldots, 5$, and β_0 is the negative price coefficient. The variance of the WTP for the non-interaction coefficients was calculated following Daly et al. (2012),

$$\left(\frac{\beta_1}{\beta_0}\right)^2 \left(\frac{\omega_{11}}{\beta_1^2} + \frac{\omega_{00}}{\beta_0^2} - 2\frac{\omega_{10}}{\beta_1\beta_0}\right) \tag{5}$$

where β_1 is the parameter of the attribute and β_0 is the parameters price respectively, and ω_{11} is the variance of the parameter estimate, ω_{00} is the variance of the price, and ω_{10} is the covariance of the price and the specific attribute coefficient. Then the square root of the variance (5) was taken, which gave the standard error. Then the t-statistic was determined by dividing the WTP estimate by the standard error. A t-test was then used to determine the significance of each of the non-interaction terms.

Interaction Terms

WTP estimates for the interaction terms was calculated using the following equation:

$$WTP_{Interaction} = (\beta_1 + \beta_2 + \beta_d) \,/ -\beta_0 \tag{6}$$

where β_1 and β_2 are the coefficients of attributes one and two respectively, β_d is the coefficient of the interaction term of attributes one and two, and β_0 is the coefficient of the price. The WTP significance for the interaction terms was estimated following methods of Daly, Hess, and Jong (2012) and Syrengelas et al. (2017). The variances of the interaction terms were calculated by using the formula **L**'**ΩL**, which is known as the Delta Method, where **L** is a 1x4 column vector of the partial first derivatives of the interaction WTP with respect to the betas, and **Ω** is the associated variance and covariance matrix of the coefficients that were involved in the calculation of the interaction WTP. Following from this, the derivation of the variance of the interaction term's WTP was found using the following equation:

$$\left(-\frac{1}{\beta_0}\right)^2 \left(\omega_{11} + \omega_{22} + \omega_{dd} + 2(\omega_{21} + \omega_{d1} + \omega_{d2})\right) +$$

$$\left(-\frac{1}{\beta_0}\right)\left(\frac{\beta_1+\beta_2+\beta_d}{(-\beta_0)^2}\right)\left(2(\omega_{01} + \omega_{02} + \omega_{0d})\right) + \left(\frac{\beta_1+\beta_2+\beta_d}{(-\beta_0)^2}\right)^2 \omega_{00} \tag{7}$$

where β_0 is the coefficient of the price, ω_{11} is the variance of attribute one, ω_{22} is the variance of attribute two, ω_{dd} is the variance of the interaction coefficient of attributes one and two, ω_{21} is the covariance of attributes one and two, ω_{d1} is the covariance of the interaction term and attribute one, ω_{d2} is the covariance of the interaction term and attribute two, β_1 and β_2 are the coefficients of attribute one and two respectively, β_d is the coefficient of the interaction term of attributes one and two, ω_{01} is the covariance of price and attribute one, ω_{02} is the covariance of

price and attribute two, ω_{0d} is the covariance of the price and the interaction coefficient, and ω_{00} is the variance of price. The standard error was then determined by taking the square root of the variance (7). The t-statistic was then calculated by dividing the WTP estimate for the interaction term by the standard error. A t-test was then used to determine if the WTP estimates for the interaction terms were significant.

CHAPTER IV

RESULTS AND DISCUSSION

Survey Participants' Characteristics

Qualtrics, an online survey tool, was used to survey participants in order to garner a sample representative of the Tennessee population. Participants of the survey were residents of the state of Tennessee who were 18 years old or older, and who purchased beef products for their household. A survey pretest was conducted prior to distributing the full survey. The pretest was distributed to eighty Tennessee beef consumers over the age of eighteen. The full survey was launched using an efficient design with interactions, which was generated using priors from the pretest. There were 408 participants in both the Control Treatment and the Information Treatment. Each treatment contained two choice sets, ground beef and ribeye steak, consisting of 204 participants each.

Consumer demographics for participants in the Control Treatment and the Information Treatment are presented in Table 2. Significance tests were used to determine if the demographics for participants in the Control and Information Treatments were statistically different. The only statistical difference observed at the 1% level was race in the case of ground beef which was 89.7% Caucasian for the Control Treatment and 77.0% Caucasian for the Information Treatment. On average, 81.7% of the participants in the steak choice experiment were Caucasian. At the 5% level, there was a difference in levels of educational attainment between treatments for the ground beef. In the Control Treatment, 22.5% of participants had achieved a Bachelor's degree or better whereas for the Information Treatment, only 33.3% had. The average percent of participants in the steak choice experiment who had a Bachelor's degree

or higher was 28.2% and their average household income was $51,241.19. For the ground beef choice experiments, the average household income was $48,444.91 annually.

The median age in the Control Treatment was 42 for steak and 39 for ground beef. For the Information Treatment, the median age was 41.5 for steak and 42 for ground beef. Average household size for the steak and ground beef participants was approximately three members. There was a significant difference (5% level) in the proportion of females in the Control Treatment, 78.9%, versus the Information Treatment, 70.6%, for steak. In the ground beef choice experiment, 77.0% of the participants were female. All of these proportions are higher than the overall average percent of females in the state of Tennessee which is 51.3% (United States Census Bureau, 2016). However, this discrepancy is expected as survey participants who did not purchase beef for their household were not permitted to continue with the survey, and women are the primary grocery shoppers for many households.

There was a statistical difference between treatments for the mean household size for the ground beef choice sets. The average household size for the Control Treatment was 2.96 whereas for the Information Treatment, it was 2.68. Average household size for the steak choice sets was 2.98 inhabitants. In the steak choice sets, approximately 35.3% of respondents said they had children under the age of 12 living in the household, and in the ground beef choice sets, about 36% of respondents stated that there were children under 12 in the household. Approximately 12% of participants in the steak choice sets and about 10.1% of participants in the ground beef choice sets indicated they were students.

Approximately 26.8% of survey respondents in the steak choice sets and 23.1% of responders in the ground beef choice sets indicated they had a farm background. Consumers

were asked questions representing whether they currently lived in an urban, rural, or suburban area and what type of area they grew up in. Of the 408 people in the steak choice sets, roughly 41.2% indicated they currently lived in a rural area and about 52.3% indicated their roots were rural. In the ground beef choice sets, approximately 36.8% said they lived in a rural area currently and 47.3% claimed to have roots in rural communities.

Figure 4 presents the regional distribution of survey respondents for the steak choice sets. On average for the steak choice experiment, 37.3% of participants resided in East Tennessee, 36.3% resided in Middle Tennessee, and 26.5% in resided in West TN. In the ground beef choice experiment, on average, 40.2% of participants resided in East Tennessee, 41.9% resided in Middle Tennessee, and 17.9% resided in West Tennessee (Figure 5). According to the United States Census (2015) the percent of the Tennessee population residing in East Tennessee is 36.7%, Middle Tennessee is 38.7%, and West Tennessee is 24.6%.

Likeliness to Consume Tennessee Certified Beef and other Beef Attributes

Survey participants were asked to "*Please indicate how likely you are to consume the following products: Tennessee Certified Beef, Certified Angus Beef, Grass-fed beef, Master Quality Raised Beef, and Beef with no hormones administered."* Participants were given a scale of one to five for each attribute with one being "not at all likely" and five being "extremely likely". Table 3 shows the mean values to this question for each treatment and product by attribute. For Tennessee Certified Beef the average likeliness to consume was about 4.00 across all of the treatments and beef products. The average likeliness to consume Certified Angus Beef across all treatments and beef products was about 4.00 with steak consumers showing a slightly higher likeliness to consume beef with this attribute. The attribute grass-fed had an average

likeliness to consume of approximately 3.90 and the attribute Master Quality Raised Beef had an average likeliness to consume of 3.83 with the informed consumer slightly more willing to consume each product than the uniformed consumer. No hormones administered had the highest average likeliness to consume at approximately 4.08 with the informed consumer being more likely to consume beef with this attribute than the uninformed consumer.

Results for USDA Choice Boneless Ribeye Beef Steaks

Attributes affecting Consumers' Decisions for Beef Products

Consumers were asked the question "*When making your choices for the beef products, which of these attributes factored into your decision?*" after completing the choice sets. They could choose either yes or no for each of the attributes price, Tennessee Certified Beef, Grass-fed, Certified Angus Beef, Master Quality Raised Beef, and No hormones administered. Table 4 shows the percentage of survey participants that answered yes for each of the attributes in each treatment relative to USDA Choice boneless ribeye beef steaks. Two-sample proportions tests were used to determine if there were significant differences between the percent of consumers who said yes in the Control Treatment versus the Information Treatment. If there was not a significant difference in the two treatments, the data was pooled and an average taken of the two percentages. Master Quality Raised Beef was the only attribute that showed a significance in the differences between the two treatments with 43.6% of participants in the Control Treatment indicating this attribute as a factor and 52.5% of the participants in the Information Treatment indicating it as a factor. This difference was significant at the 10% level. Most of the participants, on average 90.7%, stated that price was a factor in their decision-making process as would be expected due to the budget constraints that all consumers face. About 58.6% of

participants indicated Tennessee Certified Beef as a contributing factor to their decisions and 56.1% of participants cited Certified Angus Beef as a factor. Additionally, 59.3% of participants reported that grass-fed was a factor and 64.5% indicated that no hormones administered played a role in their decisions.

Random Parameters Logit Model Results

Random parameters logit model results for USDA Choice boneless ribeye beef steaks for both the Control Treatment and the Information Treatment are presented in Table 5. Results indicate that an increase in price results in a negative and significant impact on consumer utility in both the Control and Information Treatments which is to be expected. Consumers in both treatments exhibited a negative and significant utility for the "neither", or the no choice, option which is to be expected as consumers will gain a higher utility from choosing any given alternative than they would from choosing not to buy a product.

Consumers in both treatments exhibited positive and significant utility in response to steak products labeled with each of the individual attributes: Tennessee Certified Beef, Certified Angus Beef, grass-fed beef, beef with no hormones administered, and Master Quality Raised Beef. There was an increase in mean parameter estimates from the Control Treatment to the Information Treatment for each of the individual attributes being evaluated which suggests that consumers who are informed are likely to garner more satisfaction from these attributes than the consumers who are not. The largest increases in consumer utility when they were given the definitions were for the attributes Tennessee Certified Beef and grass-fed.

Significance in the standard deviations of the estimated parameters is an indicator of heterogeneity in consumer preferences. In an experiment of this type, preference heterogeneity is

to be expected. Many of the standard deviation results show significance which is an indication that a random parameters logit model was the correct model to use. Standard deviation results for Tennessee Certified Beef became slightly smaller once the consumers were given the definitions which indicates informed consumers, while still displaying heterogeneity, show less variation in their utility for this attribute. Additionally, the grass-fed attribute went from having consumers with clearly heterogenous preferences in the Control Treatment to having relatively homogenous preferences in the Information Treatment. The attribute combination of Tennessee Certified Beef and Master Quality Raised Beef showed a slight increase in the mean parameter estimate from the Control Treatment to the Information Treatment which indicates an increase in consumer utility. Interestingly, there was a substantial increase in the standard deviation parameter estimate and consumer preferences went from being homogenous to highly heterogenous indicating that consumers went from being fairly consistent to having a large amount of variability in their preferences.

Willingness to Pay Results

Willingness to pay results for USDA Choice boneless ribeye beef steaks are shown in Table 6 and Figure 6. Consumers in both the Control Treatment (uninformed consumers) and the Information Treatment (informed consumers) indicated positive and significant WTP for steak labeled with each of the individual attributes and the interactions between Tennessee Certified Beef and each of the attributes. As it concerns individual attributes, consumers indicated the highest WTP for Tennessee Certified Beef in both treatments with no hormones administered garnering the second highest premium. Uninformed consumers were willing to pay $2.42 more per pound over unlabeled steak for steak labeled with Tennessee Certified Beef and $2.35 more

per pound when the steak exhibited the no hormones administered label. Informed consumers indicated an increased WTP of $2.89 per pound for Tennessee Certified Beef and $2.71 per pound for no hormones administered label. When looking at steak, both the uninformed and informed consumers had the lowest WTP for grass-fed and Certified Angus Beef labels, however, they were still willing to pay a positive and significant premium for both. When looking at Master Quality Raised Beef, consumers in the Control Treatment were willing to pay a positive premium of $1.39 per pound when the label appeared on steak and consumers in the Information Treatment were willing to pay a positive premium of $1.67 per pound. In the case of each individual attribute, the informed consumer was willing to pay higher premiums than the uninformed consumer with the highest increases being $0.48 more per pound for grass-fed and $0.47 more per pound for Tennessee Certified Beef (Table 7).

Interactions between Tennessee Certified Beef and each other attribute also garnered positive and significant premiums in both treatments in reference to steak. The uninformed consumer was willing to pay a positive premium of $4.37 per pound for steak labeled as both Tennessee Certified Beef and no hormones administered, whereas the informed consumer was only willing to pay $3.28 per pound (Table 7). This interaction was one of two that had a decreased WTP when the consumers were given the definition prior to the choice sets in the case of steak. This decrease in the premium could indicate consumers who normally place significant value on no hormones administered beef believe that in conjunction with Tennessee Certified Beef, this attribute is not as necessary as when it is one attribute or the other. The other instance of the premium decreasing when given the definitions was the interaction of Tennessee Certified Beef and grass-fed which went from a premium of $3.93 per pound to a premium of $3.56 per

pound. Again, this could indicate consumers have a different idea of what grass-fed actually means. The decrease in the premium for informed consumers could also be due to the fact that consumers may believe grass-fed is a redundant attribute when combined with Tennessee Certified Beef after they know the actual definition. However, the interaction between Tennessee Certified Beef and grass-fed did garner the second highest premium in both the Control Treatment and the Information Treatment. When consumers were given the definitions, the interaction between Tennessee Certified Beef and Master Quality Raised Beef garnered the highest premium in the Information Treatment at $3.67 per pound which was $1.05 higher than what the uninformed consumer indicated as their WTP. This large increase in WTP indicates consumers are poorly educated on what the Advanced Master Beef Producer Program and the Beef Quality Assurance program are and when they are informed, they are willing to pay more for beef with those attributes. The lowest premium in the Control Treatment was for Tennessee Certified Beef and Certified Angus Beef, however, consumers were still willing to pay $2.51 more for this label over unlabeled beef steaks. In the Information Treatment, the lowest premium consumers were willing to pay was $3.28 per pound when it came to Tennessee Certified Beef and no hormones administered.

Substitutes versus Complements for Attributes

Consumers may consider certain attributes as either complements to or substitutes for each other. Following Meas et al., (2014), if the sum of the individual attributes' WTP was greater than the interaction WTP estimate, then the two attributes were considered substitutes for each other and if the sum was less than the interaction WTP estimate, the attributes are considered complements to each other. The larger the difference is between the sum of the

individual attributes WTP and the interaction WTP, the stronger the substitute or the complement.

Table 8 shows whether each attribute is a complement to or a substitute for Tennessee Certified Beef. In the Control Treatment, Certified Angus Beef, Master Quality Raised Beef, and beef with no hormones administered were considered substitutes for Tennessee Certified Beef and grass-fed beef was considered a complement. Master Quality Raised Beef and Certified Angus Beef were rather strong substitutes; whereas, comparatively, beef with no hormones administered was a weak substitute.

In the Information Treatment, all of the attribute labels were considered substitutes for Tennessee Certified Beef. Beef carrying the no hormones administered label could be considered a relatively strong substitute as compared to each of the other attributes included in this study. In the case of informed consumers, beef that is grass-fed would be considered the weakest substitute for Tennessee Certified Beef.

Results for USDA Choice Ground Beef (85% Lean/15% Fat)

Attributes affecting Consumers' Decisions for Beef Products

Consumers were asked to indicate which attributes influenced their decisions. Table 7 shows the percentage of survey participants that answered yes for each of the attributes in each treatment for USDA Choice ground beef (85% Lean/15% Fat). Two-sample proportions tests were used to determine if there were significant differences between the percent of consumers who said yes in each treatment. Again, Master Quality Raised Beef was the only attribute that showed a significance in the differences between the two treatments with 43.6% of participants in the Control Treatment indicating this attribute as a factor and 52.0% of the participants in the

Information Treatment indicating it as a factor. This difference was significant at the 10% level. Price was a factor in 90.5% of participant's decision making process and 56.3% of participants indicated Tennessee Certified Beef as a contributing factor to their decisions and 55.3% of participants cited Certified Angus Beef as a factor. About 56.0% of participants reported that grass-fed was a factor and 66.7% indicated that no hormones administered was a contributing factor in their decisions.

Random Parameters Logit Model Results

Random parameters logit model results for USDA Choice ground beef (85% Lean/15% Fat) for both treatments are presented in Table 10. As with the boneless ribeye beef steak, there was a decrease in consumer utility correlated with an increase in price in both treatments which is to be expected. Again, consumers in both treatments exhibited a negative and significant utility for the "neither" option indicating consumers gain a higher utility from choosing a beef alternative than they would from choosing not to buy a product. Individual beef attributes all had a positive and significant influence on consumer utility in both the Control and Information Treatments. There was an increase in utility between the Control Treatment and the Information Treatment in all of the individual attributes except for grass-fed. This indicates that consumers gained utility from each attribute when they were aware of what that attribute meant with the exception of grass-fed. The fact that utility decreased for grass-fed could be indicative of a lack of knowledge concerning what the term grass-fed actually means and when given the definition, the attribute becomes less desirable.

Again, as to be expected, heterogeneity in consumer preferences is indicated by significance in many of the standard deviations of the parameter estimates in both the Control

Treatment and the Information Treatment. In addition to there being a relatively large decrease in the mean parameter estimate for the attribute grass-fed, there was also large decrease in standard deviation between treatments. Informed consumers still had heterogeneity in their preferences toward grass-fed, however, the variation in these preferences was smaller. While consumer utility for the interaction between Tennessee Certified Beef and no hormones administered showed a slight increase, there was a substantial decrease in the standard deviation parameter estimate. Consumers went from having highly heterogenous preferences for Tennessee Certified Beef and no hormones administered to having homogenous preferences after they were given the definitions.

Willingness to Pay Results

Willingness to pay results for USDA Choice ground beef (85% Lean/15% Fat) are shown in Table 11 and Figure 7. In reference to ground beef, consumers indicated the highest WTP for no hormones administered followed closely by Tennessee Certified Beef in both treatments. The uninformed consumer was willing to pay a premium of $1.27 per pound over the price of unlabeled ground beef and the informed consumer was willing to pay an additional $1.59 per pound when the no hormones administered label was present. Consumers in the Control Treatment were willing to pay an additional $1.15 per pound for the Tennessee Certified Beef label and consumers in the Information Treatment were willing to pay a premium of $1.53 per pound. Ground beef consumers placed the least value on Certified Angus Beef in the Control Treatment. However, they still indicated they were willing to pay $0.41 more per pound when this attribute was present. Uninformed consumers were willing to pay an $0.81 and $0.65 per pound premium for grass-fed and Master Quality Raised Beef respectively. Informed consumers

indicated they would pay positive premiums for Certified Angus Beef, grass-fed, and Master Quality Raised Beef as well with premiums of $0.73, $0.59, and $0.91 per pound respectively. The informed consumer was willing to pay a higher premium than the uninformed consumer in the case of almost every attribute (Table 7). Grass-fed was the only attribute in the ground beef choice experiment that showed a decrease in the WTP premium when consumers were given the definition prior to completing the choice sets. This could be due to consumers having a misconstrued representation of what the term grass-fed beef actually means and when they are informed of the definition, they place less value on it.

Again, there was a significant positive WTP for all of the interactions between Tennessee Certified Beef and each of the other attributes. In the Control Treatment, the highest premium garnered was for Tennessee Certified Beef and grass-fed, $1.76 per pound, and the second highest premium was for Tennessee Certified Beef and no hormones administered, $1.63 per pound. Tennessee Certified Beef and Master Quality Raised Beef garnered a premium of $1.45 in the Control Treatment and the lowest premium was $1.29 per pound for Tennessee Certified Beef and Certified Angus Beef. In the Information Treatment, Tennessee Certified Beef and no hormones administered garnered the highest premium of $2.41 per pound followed by $1.98 per pound for Tennessee Certified Beef and grass-fed, $1.72 per pound for Tennessee Certified Beef and Master Quality Raised Beef, and $1.61 per pound for Tennessee Certified Beef and Certified Angus Beef. The informed consumers indicated a higher WTP than the uninformed consumers in the case of each of the interactions for ground beef (Table 7).

Substitutes versus Complements for Beef Attributes

Table 12 shows whether each attribute is a complement to or a substitute for Tennessee Certified Beef as it regards ground beef. In the Control Treatment, each of the attributes Certified Angus Beef, Master Quality Raised Beef, grass-fed beef, and beef with no hormones administered were considered substitutes for Tennessee Certified Beef. Beef with no hormones administered can be considered a relatively strong substitute compared to each of the other attributes. Beef carrying the grass-fed label is the weakest substitute for Tennessee Certified Beef when looking at ground beef.

In the Information Treatment, Certified Angus Beef, Master Quality Raised Beef, and beef with no hormones administered were considered substitutes for Tennessee Certified Beef whereas, grass-fed beef was considered a complement. None of the labels that were classified as substitutes could be considered a very strong substitutes for Tennessee Certified Beef, but rather they were moderately strong. Beef that is grass-fed could be considered a moderately weak substitute for Tennessee Certified Beef.

CHAPTER V

CONCLUSIONS

This study was conducted to measure consumer preferences and provide an estimate of Tennessee beef consumers' WTP for selected beef attributes. One of the goals was to determine if additional value could be captured by the state agricultural industry and by Tennessee beef producers if an in-state branded beef program was created and implemented within the state. In addition, this study looked at whether providing some form of advertising or other educational information to consumers about certain beef attributes would have the potential to significantly effect consumer WTP for these attributes.

Results from this study indicate Tennessee beef consumers place value on an in-state branded beef product and are willing to pay more when this label is present on the beef product as opposed to unlabeled USDA Choice beef. While they were willing to pay premiums in both the Control Treatment and the Information Treatment, consumers were willing to pay more for Tennessee Certified Beef when they were informed of the definition prior to completing the choice sets with the informed consumer willing to pay $0.47 more per pound for boneless ribeye beef steaks and $0.38 more per pound for ground beef than the uninformed consumer. Thus, policy makers and producers may want to consider providing some form of educational information to consumers on the definition of Tennessee Certified Beef if this program is adopted. A higher premium was shown in the case of almost every individual attribute as well as the interactions between Tennessee Certified Beef and each other attribute when consumers were informed of the definitions prior to the choice sets, which is indicative of the possible need to better educate beef consumers in order to garner the additional value that could come with

including these attributes on beef products in Tennessee. If producers already include any of these attributes in their production practices, they may want to consider including a label saying so on the beef products they sell.

For both steak and ground beef, consumers indicated a substantial interest in the attribute no hormones administered. This attribute garnered the second highest premium in reference to steak and the highest premium as it applies to ground beef regardless of whether the consumers were informed or uniformed. Over 60% of consumers self-reported this attribute as being a factor that contributed to their purchasing decisions. These findings indicate consumers highly desire this attribute and therefore producers may want to evaluate the feasibility of including this in their production practices in order to capture additional value. If this is a production practice that producers already utilize, then they may want to consider labeling their beef as such in order to garner additional premiums for the beef they are marketing. When including the no hormones administered attribute in conjunction with Tennessee Certified Beef, uninformed consumers were willing to pay $4.37 more per pound for boneless ribeye beef steaks and $1.63 more per pound for ground beef. Informed consumers indicated a positive WTP premium of $3.28 per pound for steak and $2.41 more per pound for ground beef when the no hormones administered label was included along with the Tennessee Certified Beef label.

In both the Control Treatment and the Information Treatment and in both the case of ribeye steaks and ground beef, consumers placed high premiums on beef products that carried both the Tennessee Certified Beef and the grass-fed labels. This is interesting because when looking at the attributes individually, grass-fed garnered some of the lowest premiums. One

explanation for this could be that consumers who prefer locally raised beef from Tennessee also prefer grass-fed beef.

When looking at the interaction between Tennessee Certified Beef and Master Quality Raised Beef consumers indicated a WTP premium of $1.05 more per pound when they were informed versus when they were not. These results suggest that increasing the information available to consumers about the Beef Quality Assurance program and the Advanced Master Beef Producers Program and the production practices that go along with those programs could potentially increase the premiums consumers would be willing to pay for beef with these attributes. Additional evidence indicating that advertising for Master Quality Raised beef is the differences in the percent of consumers who cited this attribute as a factor in their decision-making process between the Control and Information treatments. A statistically higher percentage of informed consumers indicated that Master Quality Raised Beef affected their decisions than did the uniformed consumers in both the case of ground beef and ribeye steaks.

This research provides valuable information in evaluating the feasibility of finishing beef-in state for added value to beef producers. Consumers are willing to pay a positive premium for Tennessee Certified Beef, Certified Angus Beef, grass-fed beef, Master Quality Raised Beef, and beef that has had no hormones administered. Research findings also indicate promotion and advertising that provide the definitions of these attributes can help consumers make informed decisions to pay additional premiums for these attributes.

While this study provides valuable information, further research is needed on the subject of a state-branded beef program. Research should be done to determine the feasibility of implementing this program from the producer side. This can be done by determining whether

producers are willing to participate in and supply an in-state branded beef. Research should also be done to examine if the premiums determined in this study are high enough to cover the cost of and be profitable to the Tennessee beef industry and individual beef producers after considering the cost of implementing these attributes in to Tennessee beef cattle production. Other research could possibly be done to determine the most effective way of advertising to Tennessee consumers in order to get the highest possible premiums for differentiated beef products.

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APPENDICES

APPENDIX A: TABLES AND FIGURES

TABLES

Table 1: Attribute descriptions and attribute levels included in the choice experiment for steak and ground beef

	USDA Choice Boneless Ribeye Beef Steak	**USDA Choice Ground Beef (85% Lean/ 15% Fat)**
Attribute	**Attribute Levels**	**Attribute Levels**
Price	$5.99/lb	$1.99/lb
	$7.99/lb	$2.99/lb
	$9.99/lb	$3.99/lb
	$11.99/lb	$4.99/lb
Tennessee Certified Beef	Tennessee Certified Beef label	Tennessee Certified Beef label
	None	None
Grass-fed	Grass-fed label	Grass-fed label
	None	None
Certified Angus Beef	Certified Angus Beef label	Certified Angus Beef label
	None	None
No hormones administered	No hormones administered	No hormones administered
	None	None
Master Quality Raised Beef	Master Quality Raised Beef label	Master Quality Raised Beef label
	None	None

Note: Price levels were based on the average weighted price for each beef product obtained from the National Retail Report for beef from the USDA at the time the survey was launched in September, 2016.

Table 2: Sample demographics for the control and information treatments arranged by steak and ground beef and population demographics for Tennessee

	Control Treatment		Information Treatment		
Variable	**Ribeye Steak** n=204	**Ground Beef** n=204	**Ribeye Steak** n=204	**Ground Beef** n=204	**Tennessee Population**
Gender (% female)	78.9%**	78.9%	70.6%**	75.0%	51.3%[2]
Median Age (years)	42.0	39.0	41.5	42.0	38.7[1]
Race (% white)	81.9%	89.7%***	81.4%	77.0%***	78.8%[2]
Education (Bachelor's Degree or Higher)	27.0%	22.5%**	29.4%	33.3%**	24.9%[2]
Average Household Income	$51,078.43	$46,840.80	$51,403.94	$50,049.02	$45,219[2]
Household Size	2.97	2.96*	3.00	2.68*	2.53[2]
Kids under 12 (% yes)	36.3%	38.7%	34.3%	33.3%	-
Farm Background (% yes)	26.6%	20.1%	27.0%	26.0%	-
Type of Region (% Rural)	39.7%	33.3%	42.6%	40.2%	-
Type of Roots (% Rural)	52.5%	49.0%	52.0%	45.6%	-
Student (% yes)	10.3%	9.3%	13.7%	10.8%	-
Area of Residence					
East Tennessee	33.3%	42.2%	41.2%	38.2%	36.7%[2]
Middle Tennessee	36.8%	42.6%	35.8%	41.2%	38.7%[2]
West Tennessee	29.9%	15.2%	23.0%	20.6%	24.6%[2]

Notes: [1] Tennessee Department of Economic and Community Development, 2016. [2] U.S. Census Bureau, 2016; ***,**,* Denote statistically different means between the Control Treatment and the Information Treatment sample at the 1%, 5%, and 10% levels respectively using statistical tests.

Table 3: Mean and standard deviation for consumer likeliness to consume each attribute on a scale of 1 to 5 with 1 being "not at all likely" and 5 being "extremely likely"

	USDA Choice Boneless Ribeye Beef Steaks		USDA Choice Ground Beef (85% Lean/15% Fat)	
Attribute	**Control Treatment**	**Information Treatment**	**Control Treatment**	**Information Treatment**
Tennessee Certified Beef	3.98 (0.89)	4.03 (0.94)	3.98 (0.85)	4.00 (0.95)
Certified Angus Beef	4.00 (0.93)	4.07 (0.87)	3.97 (0.88)	3.95 (1.03)
Grass-fed	3.95 (1.01)	3.88 (1.04)	3.89 (1.00)	3.89 (1.10)
Master Quality Raised Beef	3.78 (0.93)	3.89 (0.97)	3.82 (0.87)	3.86 (1.02)
No hormones administered	4.00 (1.03)	4.14 (0.93)	4.04 (0.97)	4.13 (0.98)

Mean with standard deviation in parenthesis

Table 4: Consumer indicated results for which attributes factored into their decision-making process for USDA Choice boneless ribeye beef steaks

Attribute	Control Treatment	Information Treatment
Price	90.2%	91.2%
Tennessee Certified Beef	57.4%	59.8%
Certified Angus Beef	56.2%	55.9%
Grass-fed	60.8%	57.8%
Master Quality Raised Beef	43.6%*	52.5%*
No hormones administered	62.7%	66.2%

*Denotes statistically different means between the Control Treatment and the Information Treatment sample at the 10% level using a two-sample test of proportions

Table 5: Random parameter logit results for USDA Choice boneless ribeye beef steak for the Control and Information Treatments

	Parameter Estimates			
	Control Treatment		Information Treatment	
Attributes	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Price	-0.5083***		-0.5272***	
Tennessee Certified Beef	1.2294***	0.9509***	1.5218***	0.8674***
Certified Angus Beef	0.6042***	0.4979**	0.7526***	0.6374***
Grass-fed	0.4829**	0.7874***	0.7554***	0.3779
Master Quality Raised Beef	0.7068***	0.1812	0.8782***	0.0674
No hormones administered	1.1928***	1.9300***	1.4299***	1.7749***
Tennessee Certified Beef & Certified Angus Beef	-0.5560**	0.7081**	-0.5031*	0.7633***
Tennessee Certified Beef & Grass-fed	0.2859	0.1278	-0.3979	0.0641
Tennessee Certified Beef & Master Quality Raised Beef	-0.6034***	0.1557	-0.4655**	1.0002***
Tennessee Certified Beef & No hormones administered	-0.1990	0.6495	-1.2248***	0.2901
No-choice option	-7.039***	3.4198***	-5.7733***	2.9819***
Observations	2,448		2,448	
Log-likelihood	-1715.3510		-1787.5798	
McFadden's Pseudo R-squared	0.3622		0.3353	

***,**,* indicate significance at the 1%, 5%, and 10% level respectively.

Table 6: Willingness to pay results for USDA Choice boneless ribeye beef steak for the control and information treatments

	Control Treatment			Information Treatment		
Attributes	**Willingness to pay (per pound)**	**95% Confidence Interval Lower Bound**	**95% Confidence Interval Upper Bound**	**Willingness to pay (per pound)**	**95% Confidence Interval Lower Bound**	**95% Confidence Interval Upper Bound**
Tennessee Certified Beef	$2.42***	$1.64	$3.20	$2.89***	$2.15	$3.62
Certified Angus Beef	$1.19***	$0.42	$1.95	$1.43***	$0.69	$2.17
Grass-fed	$0.95**	$0.15	$1.75	$1.43***	$0.67	$2.19
Master Quality Raised Beef	$1.39***	$0.91	$1.87	$1.67***	$1.21	$2.13
No hormones administered	$2.35***	$1.55	$3.14	$2.71***	$1.96	$3.47
Tennessee Certified Beef & Certified Angus Beef	$2.51***	$1.80	$3.22	$3.36***	$2.66	$4.06
Tennessee Certified Beef & Grass-fed	$3.93***	$3.04	$4.82	$3.56***	$2.74	$4.39
Tennessee Certified Beef & Master Quality Raised Beef	$2.62***	$1.74	$3.50	$3.67***	$2.78	$4.56
Tennessee Certified Beef & No hormones administered	$4.37***	$3.24	$5.51	$3.28***	$2.13	$4.42

***,**,* indicate significance at the 1%, 5%, and 10% level respectively.

Table 7: Willingness to pay differences between treatments for steak and ground beef

	USDA Choice Boneless Ribeye Beef Steaks	USDA Choice Ground Beef (85% Lean / 15% Fat)
Attributes	**WTP Difference**	**WTP Difference**
Tennessee Certified Beef	$0.47	$0.38
Certified Angus Beef	$0.24	$0.32
Grass-fed	$0.48	($0.22)
Master Quality Raised Beef	$0.28	$0.26
No hormones administered	$0.36	$0.32
Tennessee Certified Beef & Certified Angus Beef	$0.85	$0.32
Tennessee Certified Beef & Grass-fed	($0.37)	$0.22
Tennessee Certified Beef & Master Quality Raised Beef	$1.05	$0.27
Tennessee Certified Beef & No hormones administered	($1.09)	$0.78

Table 8: Substitutes versus complements for each attribute for USDA Choice boneless ribeye beef steaks for the control and information treatments

Attributes by Treatment	Attribute 1 WTP	Attribute 2 WTP	Sum WTP	Interaction WTP	Substitutes or Complements	Difference between the Sum and Interaction WTP
Control Treatment						
Tennessee Certified Beef & Certified Angus Beef	$2.42	$1.19	$3.61	$2.51	Substitutes	$1.10
Tennessee Certified Beef & Grass-fed	$2.42	$0.95	$3.37	$3.93	Complements	($0.56)
Tennessee Certified Beef & Master Quality Raised Beef	$2.42	$1.39	$3.81	$2.62	Substitutes	$1.19
Tennessee Certified Beef & No hormones administered	$2.42	$2.35	$4.77	$4.37	Substitutes	$0.40
Information Treatment						
Tennessee Certified Beef & Certified Angus Beef	$2.42	$1.43	$3.85	$3.36	Substitutes	$0.49
Tennessee Certified Beef & Grass-fed	$2.42	$1.43	$3.85	$3.56	Substitutes	$0.29
Tennessee Certified Beef & Master Quality Raised Beef	$2.42	$1.67	$4.09	$3.67	Substitutes	$0.42
Tennessee Certified Beef & No hormones administered	$2.42	$2.71	$5.13	$3.28	Substitutes	$1.85

Note: If the sum of the individual attributes' WTP is greater than the interaction WTP, then the two attributes are substitutes. If not, they are considered complements. All WTP estimates are significant at the 5% level or higher.

Table 9: Consumer indicated results for which attributes factored into their decision-making process for USDA Choice ground beef (85% Lean/15% Fat)

Attribute	Control Treatment	Information Treatment
Price	90.7%	90.2%
Tennessee Certified Beef	53.2%	59.3%
Certified Angus Beef	51.7%	58.8%
Grass-fed	56.2%	55.7%
Master Quality Raised Beef	43.6%*	52.0%*
No hormones administered	63.7%	69.6%

*Denotes statistically different means between the Control Treatment and the Information Treatment sample at the 10% level using a two-sample test of proportions.

Table 10: Random parameter logit results for 85% Lean/15% Fat USDA Choice ground beef for the Control and Information Treatments

	Parameter Estimates			
	Control Treatment		Information Treatment	
Attributes	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**
Price	-1.2725***		-1.0854***	
Tennessee Certified Beef	1.4642***	0.8539***	1.6571***	0.9041***
Certified Angus Beef	0.5169***	0.7508***	0.7970***	0.4809**
Grass-fed	1.0305***	0.9216***	0.6352***	0.5188**
Master Quality Raised Beef	0.8272***	0.1989	0.9870***	0.4651**
No hormones administered	1.6130***	1.8196***	1.7301***	1.9615***
Tennessee Certified Beef & Certified Angus Beef	-0.3356	0.4853	-0.7093**	0.9006***
Tennessee Certified Beef & Grass-fed	-0.2566	0.3338	-0.1461	0.3977*
Tennessee Certified Beef & Master Quality Raised Beef	-0.4485**	0.4994	-0.7793***	0.6624**
Tennessee Certified Beef & No hormones administered	-1.0070**	2.0984***	-0.7747**	0.7070
No-choice option	-6.2287***	2.8525***	-5.3729***	2.7739***
Observations	2,448		2,448	
Log-likelihood	-1632.0250		-1699.1063	
McFadden's Pseudo R-squared	0.3932		0.3682	

***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

Table 11: Willingness to pay results for 85% Lean/15% Fat USDA Choice ground beef for the control and information treatments

	Control Treatment			Information Treatment		
Attributes	**Willingness to pay (per pound)**	**95% Confidence Interval Lower Bound**	**95% Confidence Interval Upper Bound**	**Willingness to pay (per pound)**	**95% Confidence Interval Lower Bound**	**95% Confidence Interval Upper Bound**
Tennessee Certified Beef	$1.15***	$0.83	$1.47	$1.53***	$1.15	$1.90
Certified Angus Beef	$0.41**	$0.10	$0.72	$0.73***	$0.36	$1.10
Grass-fed	$0.81***	$0.47	$1.15	$0.59***	$0.20	$0.97
Master Quality Raised Beef	$0.65***	$0.45	$0.85	$0.91***	$0.67	$1.14
No hormones administered	$1.27***	$0.94	$1.60	$1.59***	$1.21	$1.98
Tennessee Certified Beef & Certified Angus Beef	$1.29***	$0.99	$1.60	$1.61***	$1.27	$1.95
Tennessee Certified Beef & Grass-fed	$1.76***	$1.35	$2.16	$1.98***	$1.56	$1.40
Tennessee Certified Beef & Master Quality Raised Beef	$1.45***	$1.08	$1.81	$1.72***	$1.29	$2.15
Tennessee Certified Beef & No hormones administered	$1.63***	$1.04	$2.22	$2.41***	$1.88	$2.94

***, **, * indicate significance at the 1%, 5%, and 10% level respectively.

Table 12: Substitutes versus complements for each attribute for 85% Lean/15% Fat USDA Choice ground beef for the control and information treatments

Attributes by Treatment	Attribute 1 WTP	Attribute 2 WTP	Sum WTP	Interaction WTP	Substitutes or Complements	Difference between the Sum and Interaction WTP
Control Treatment						
Tennessee Certified Beef & Certified Angus Beef	$1.15	$0.41	$1.56	$1.29	Substitutes	$0.27
Tennessee Certified Beef & Grass-fed	$1.15	$0.81	$1.96	$1.76	Substitutes	$0.20
Tennessee Certified Beef & Master Quality Raised Beef	$1.15	$0.65	$1.80	$1.45	Substitutes	$0.35
Tennessee Certified Beef & No hormones administered	$1.15	$1.27	$2.42	$1.63	Substitutes	$0.79
Information Treatment						
Tennessee Certified Beef & Certified Angus Beef	$1.15	$0.73	$1.88	$1.61	Substitutes	$0.27
Tennessee Certified Beef & Grass-fed	$1.15	$0.59	$1.74	$1.98	Complements	($0.24)
Tennessee Certified Beef & Master Quality Raised Beef	$1.15	$0.91	$2.06	$1.72	Substitutes	$0.34
Tennessee Certified Beef & No hormones administered	$1.15	$1.59	$2.74	$2.41	Substitutes	$0.33

Note: If the sum of the individual attributes' WTP is greater than the interaction WTP, then the two attributes are substitutes. If not, they are considered complements. All WTP estimates are significant at the 5% level or higher.

FIGURES

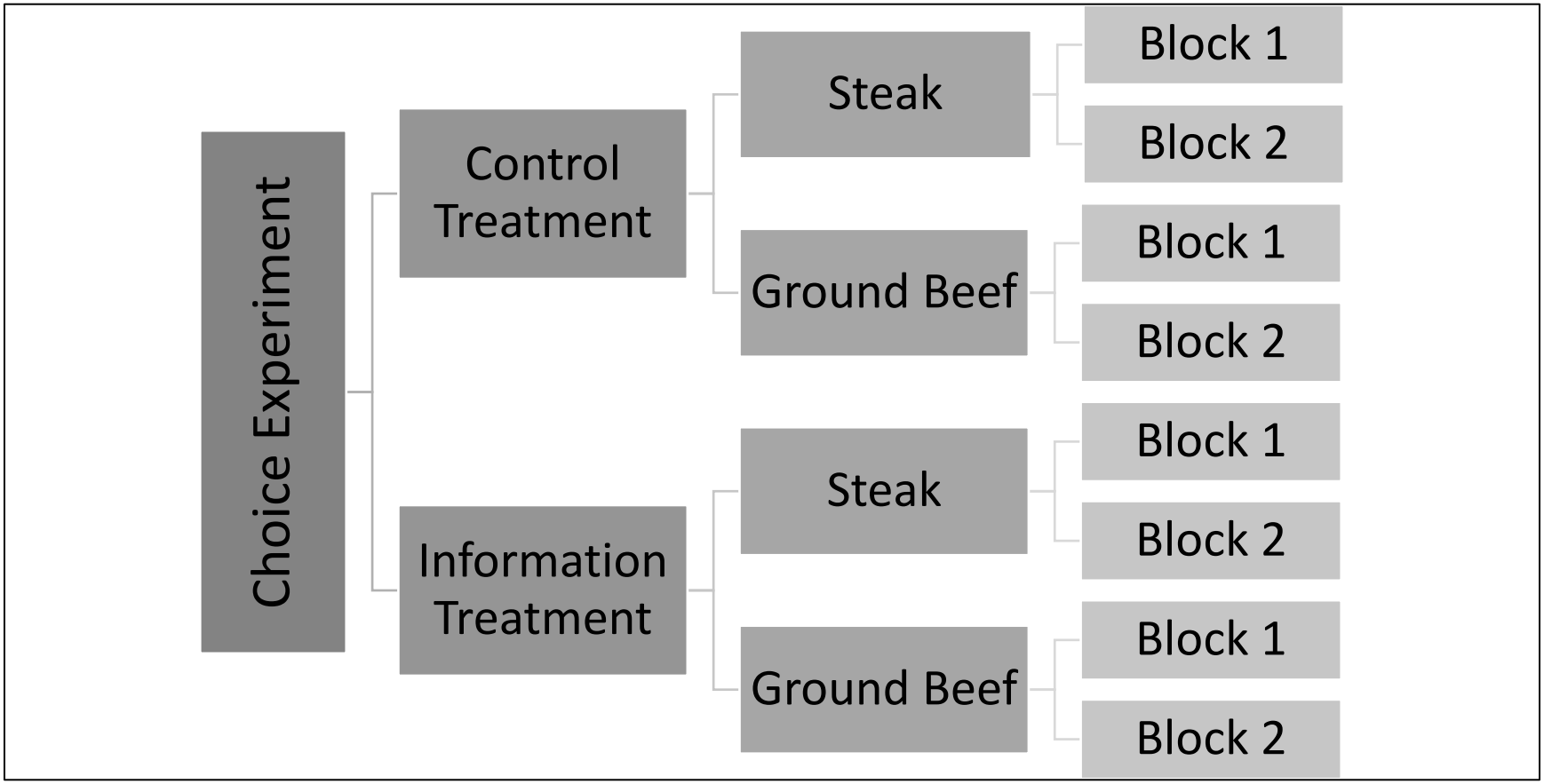


Figure 1: Choice experiment flow for each survey participant

Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

○
- $9.99 per pound
- Tennessee Certified Beef
- Certified Angus Beef

○
- $5.99 per pound
- Certified Angus Beef

○ Neither

Figure 2: Example of steak choice set that a consumer would have seen while participating in the survey

Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

○
- $3.99 per pound
- Master Quality Raised Beef
- Certified Angus Beef

○
- $2.99 per pound
- Tennessee Certified Beef

○ Neither

Figure 3: Example of ground beef choice set that a consumer would have seen while participating in the survey

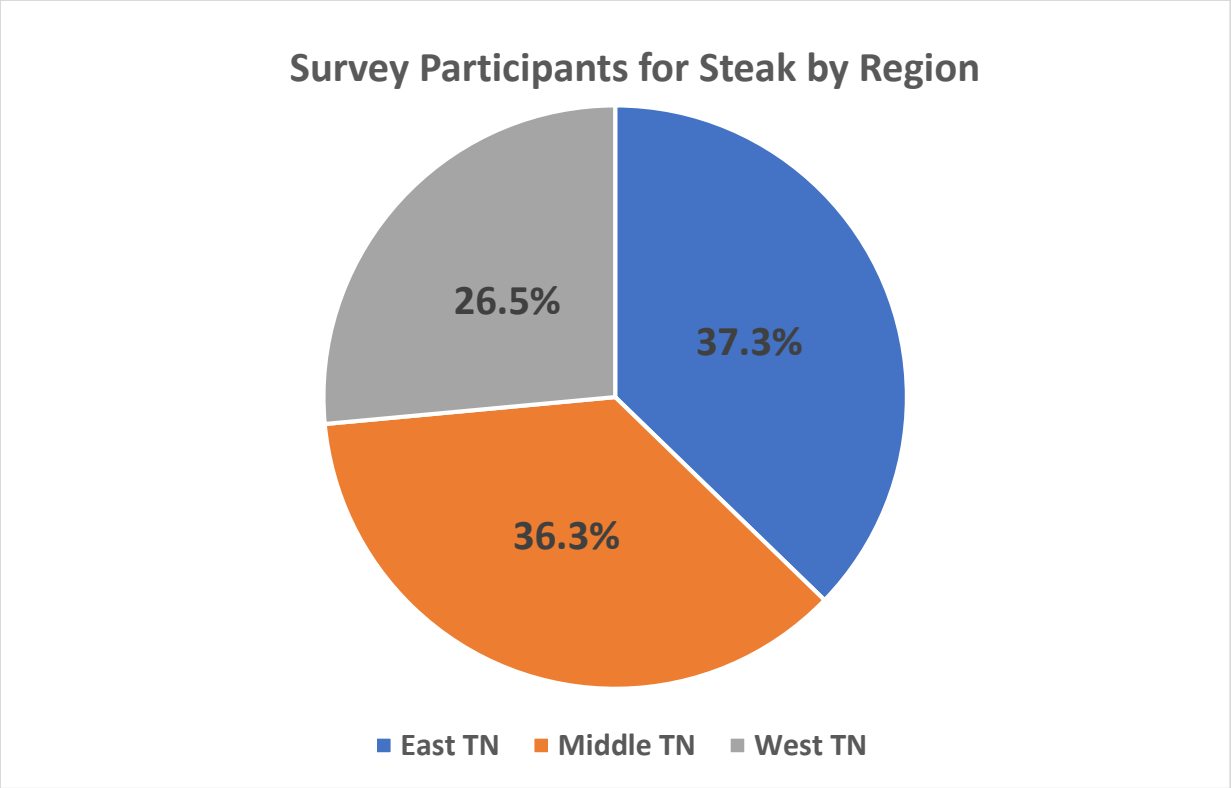


Figure 4: Average distribution by region of Tennessee for the survey participants in the USDA Choice Boneless Ribeye Beef Steak choice sets

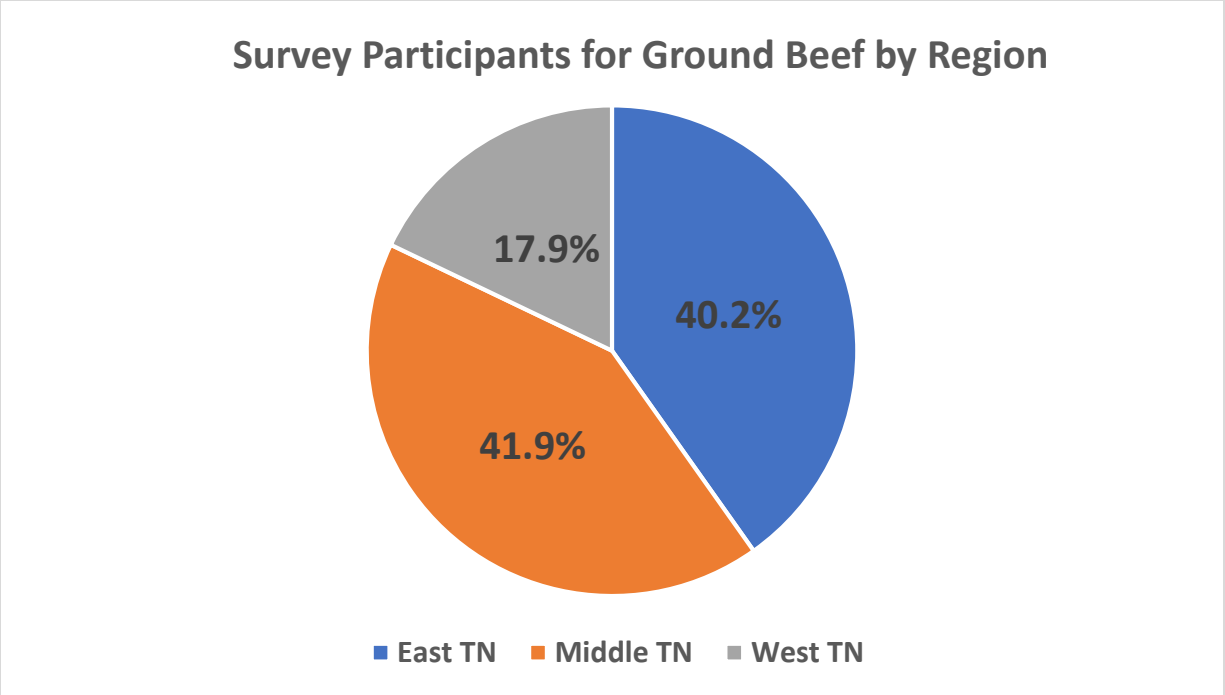


Figure 5: Average distribution by region of Tennessee for the survey participants in the USDA Choice ground beef (85% Lean/15% Fat) choice sets

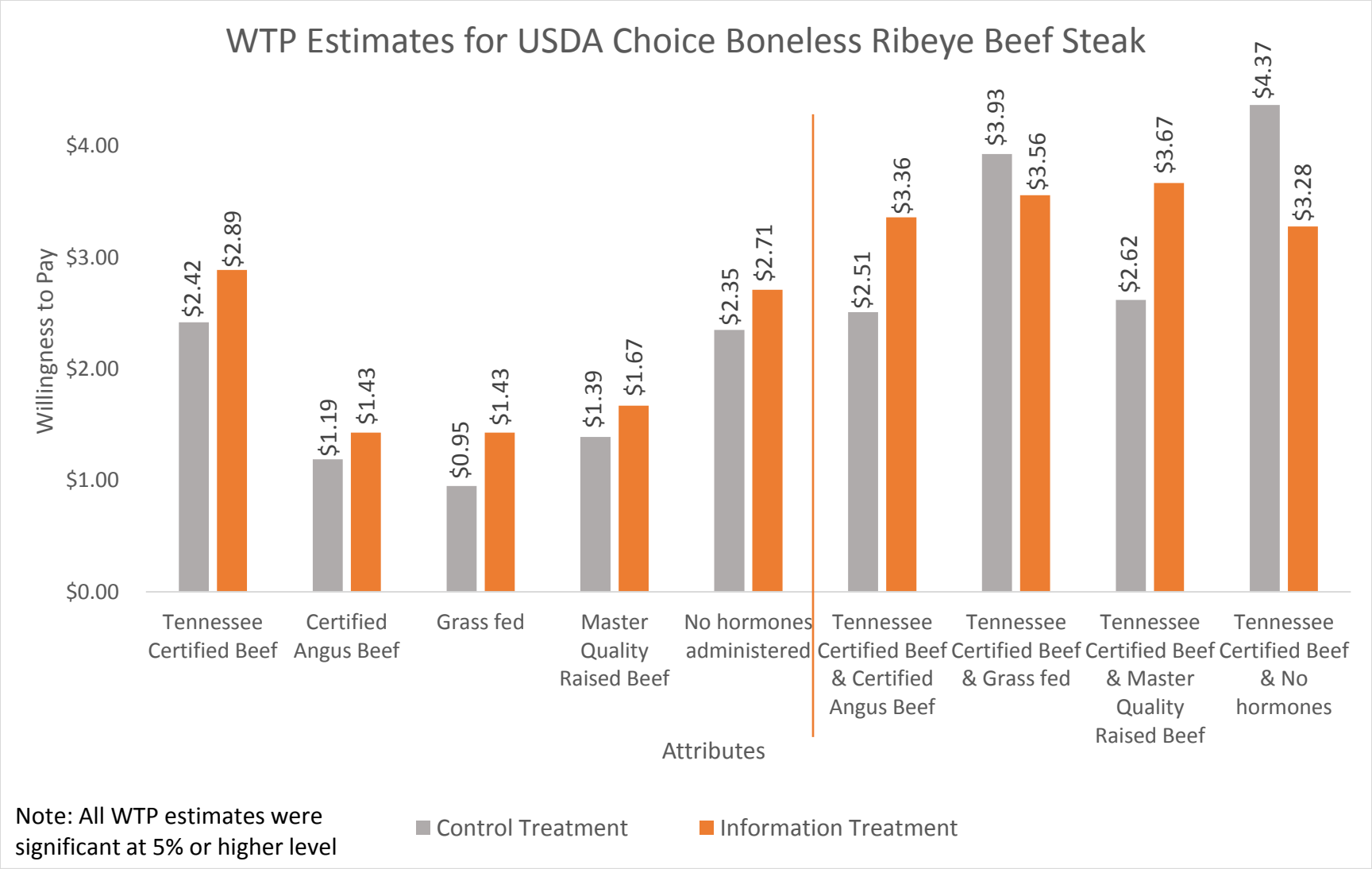


Figure 6: Willingness to pay estimates for USDA Choice boneless ribeye beef steaks for the Control and Information treatments

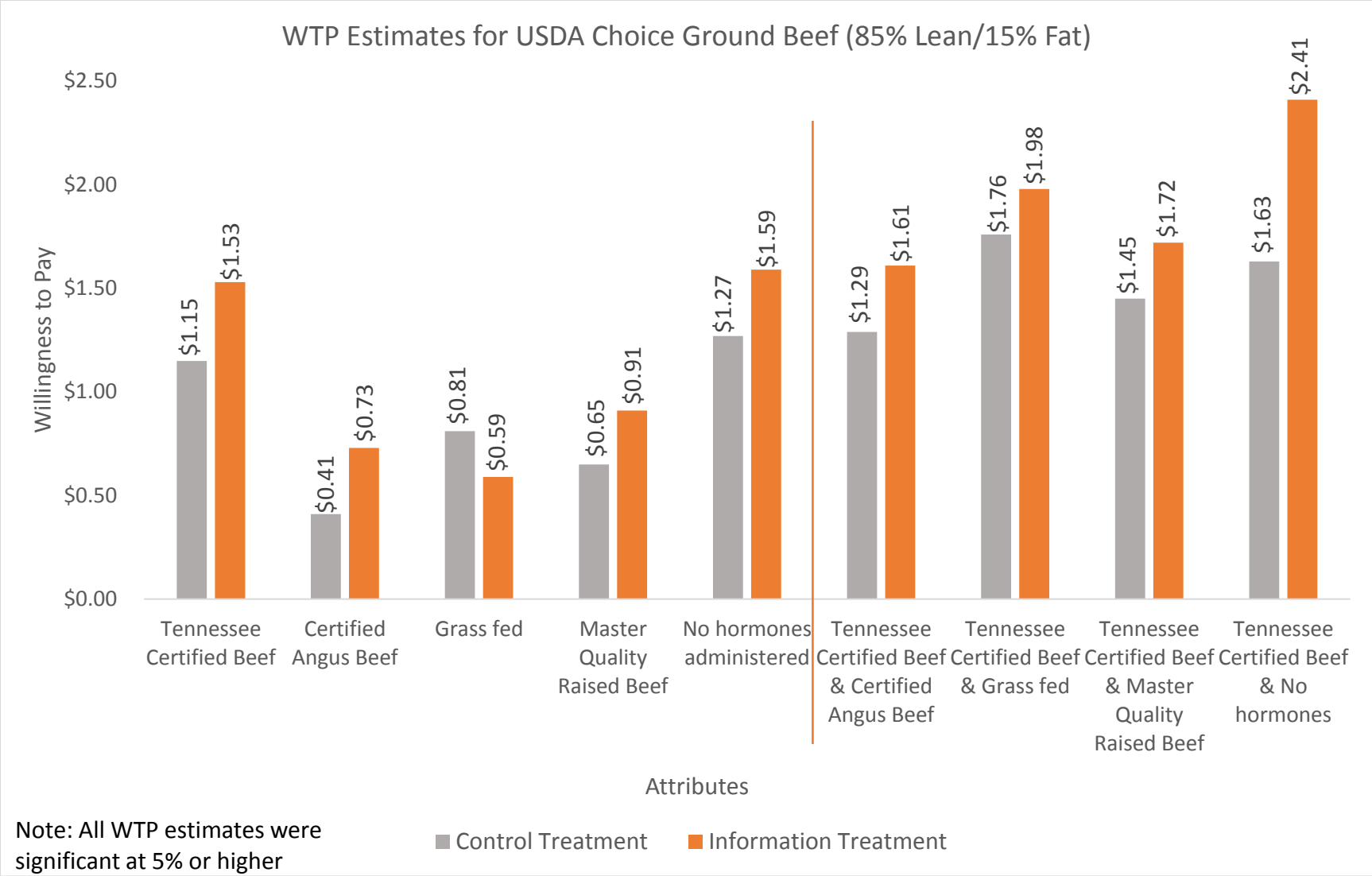


Figure 7: Willingness to pay estimates for USDA Choice 85% lean/15% fat ground beef for the Control and Information treatments

APPENDIX B: CONSUMER SURVEY

Online Qualtrics Survey

Participant Info (all participants saw this information before beginning the survey)

Research Investigators:
Dr. Andrew Griffith, Assistant Professor (agriff14@utk.edu)
Dr. Kimberly Jensen, Professor (kjensen@utk.edu)
Dr. Karen E. Lewis, Assistant Professor (klewis39@utk.edu)
Meagan G. Merritt, Graduate Research Assistant (mmerrit9@vols.utk.edu)

This study is being conducted by researchers from the University of Tennessee. The purpose is to determine consumer willingness to pay for Tennessee (TN) produced and branded beef products. It is hoped that by studying consumer willingness to pay for TN beef, knowledge can be gained on the market desire for TN beef. Results from the study could be used to help gain information on developing a market channel for TN produced, finished, and harvested beef as well as determining whether this venture could be profitable for TN cattle producers.

You are being asked, as a consumer of beef, to participate in a research project through taking an online survey. We expect the online survey might take about 20 minutes of your time. You can be assured that your answers are confidential and will only be released as summaries. Your name will not be collected as part of your survey response and thus can never be associated with the data. Your responses will not be individually identified or publicized. Your answers are strictly voluntary. You are free to withdraw from the survey at any time or leave any questions unanswered. You must be 18 or older to participate.

The submitted data will be used for statistical purposes only and statistical results will be reported in research papers, technical reports and academic journals. In the future, the statistical data may be used for subsequent research in the area of consumer preferences, as a basis for comparison to future results, and as an example in teaching. There are no anticipated risks to participating in this study. Benefits include a broader understanding of consumer preferences of beef that can contribute to the formation of public policy.

If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study,) you may contact the researcher, Dr. Karen Lewis, at klewis39@utk.edu, and (865) 974-7465. If you have questions about your rights as a participant, you may contact the University of Tennessee IRB Compliance Officer at utkirb@utk.edu or (865) 974-7697. Completing the survey and clicking the next arrow to continue will be considered your consent to participate.

Icebreaker Questions

Q1> What is your age? _____
If less than 18, skip to end of survey.

Q2> Do you currently live in Tennessee?
- o Yes
- o No

If participant chooses "No", skip to end of survey.

Q3> What beef products do you purchase (select all that apply)?
- o Steak
- o Ground Beef
- o Neither

If participant chooses "Steak", evenly sort into one of the three steak treatments, then evenly distribute between Steak Block 1 and Steak Block 2.
If participant chooses "Ground Beef", evenly sort into one of the two ground beef treatments, then evenly distribute between Ground Beef Block 1 and Ground Beef Block 2.
If participant chooses "Neither", skip to end of survey.

Q4> What is your gender?
- o Male
- o Female

Q5> Are you responsible for food shopping in your household?
- o Always
- o Sometimes
- o Never

If participant chooses "Never", skip to end of survey.

Cheap Talk Only Steak (Treatment 1)

Now, please take time to carefully read the following instructions before proceeding.

Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following screens you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their price, and whether it is Tennessee Certified Beef, Master Quality Raised Beef, Certified Angus Beef, grass-fed or no hormones administered. In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT:

CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product. Assume that the options on each page are the only ones available. Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Cheap Talk and Labeling Information Steak (Treatment 2)

In the next section you will see information describing five different beef labels.

Tennessee Certified Beef Label Definition:

Tennessee Certified Beef declares that the animal was born, raised and harvested in Tennessee and graded USDA Choice or Prime.

Master Quality Raised Beef Label Definition:

Master Quality Raised Beef ensures that the beef purchased originated from cattle that were raised throughout their entire lifespan by farmers who are certified in the following two programs:

(1) Advanced Master Beef Producer Program

(2) Beef Quality Assurance Program

Each program is now defined below:

<u>Advanced Master Beef Producer Program:</u>

The Advanced Master Beef Producer Program (AMBPP) is an educational program provided by the University of Tennessee designed to help cattle farmers improve cattle health management and cattle farm profitability. This program is open to any cattle farmers in the United States. The AMBPP certification is given to producers who complete the program.

<u>Beef Quality Assurance Program:</u>

Beef Quality Assurance (BQA) is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. BQA guidelines are designed to make certain all beef consumers can take pride in what they purchase – and can trust and have confidence in the entire beef industry.

Certified Angus Beef Label Definition:

USDA graders inspect black-hided cattle (typical of the Angus breed) and give it a grade. All beef considered for the brand must grade in the top two thirds of Choice or Prime.

Grass-Fed Label Definition:

This label indicates that the animal was fed only grass and forage.

No Hormones Administered Definition:

The term "no hormones administered" may be approved for use on the label of beef products if sufficient documentation is provided to the United States Department of Agriculture by the beef producer showing no hormones have been used in raising the animals.

Now, please take time to carefully read the following instructions before proceeding.

Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following screens you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their price, and whether it is Tennessee Certified Beef, Master Quality Raised Beef, Certified Angus Beef, grass-fed or no hormones administered. In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT:

CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product. Assume that the options on each page are the only ones available. Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Visual Cheap Talk Steak (Treatment 3)

Now, please take time to carefully read the following instructions before proceeding.

Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following screens you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their price, and whether it is Tennessee Certified Beef, Master Quality Raised Beef, Certified Angus Beef, grass-fed or no hormones administered. In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT:

CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product. Assume that the options on each page are the only ones available. Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

While the choices you are about to make are purely hypothetical, please make your choices as though you are at a store and you actually have to pay money for these products. Remember, buying a product means that you would have less money available for other purchases.

Steak Block 1

Q1> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ Neither

Q2> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $5.99 per pound
- ✓ Certified Angus Beef

- ✓ Neither

Q3> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ No hormones administered

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ Neither

Q4> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $5.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q5> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $5.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q6> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $7.99 per pound
- ✓ No hormones administered

- ✓ Neither

Q7> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound
- ✓ No hormones administered

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Grass-fed

- ✓ Neither

Q8> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Grass-fed

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ Neither

Q9> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q10> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $9.99 per pound
- ✓ Master Quality Raised Beef

- ✓ Neither

Q11> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $11.99 per pound
- ✓ No hormones administered

- ✓ Neither

Q12> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $9.99 per pound
- ✓ No hormones administered

- ✓ Neither

Steak Block 2

Q1> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q2> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $9.99 per pound
- ✓ Master Quality Raised Beef

- ✓ Neither

Q3> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef

- ✓ Neither

Q4> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound
- ✓ No hormones administered

- ✓ $5.99 per pound
- ✓ Tennessee Certified Beef

- ✓ Neither

Q5> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $11.99 per pound
- ✓ Grass-fed

- ✓ Neither

Q6> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $7.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q7> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $7.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q8> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $5.99 per pound

- ✓ $11.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ Neither

Q9> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $9.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $5.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q10> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $7.99 per pound

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ No hormones administered

- ✓ Neither

Q11> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $7.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q12> Assume you are in the grocery store and you wish to purchase a boneless ribeye beef steak that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $11.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $5.99 per pound
- ✓ Certified Angus Beef

- ✓ Neither

Cheap Talk Only Ground Beef (Treatment 4)

Now, please take time to carefully read the following instructions before proceeding.

Imagine you are in your usual grocery store and considering the purchase of ground beef (85% lean/15% fat). In the following screens you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their price, and whether it is Tennessee Certified Beef, Master Quality Raised Beef, Certified Angus Beef, grass-fed or no hormones administered. In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT:

CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product. Assume that the options on each page are the only ones available. Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Cheap Talk and Labeling Information Ground Beef (Treatment 5)

In the next section you will see information describing five different beef labels.

Tennessee Certified Beef Label Definition:

Tennessee Certified Beef declares that the animal was born, raised and harvested in Tennessee and graded USDA Choice or Prime.

Master Quality Raised Beef Label Definition:

Master Quality Raised Beef ensures that the beef purchased originated from cattle that were raised throughout their entire lifespan by farmers who are certified in the following two programs:

(1) Advanced Master Beef Producer Program

(2) Beef Quality Assurance Program

Each program is now defined below:

<u>Advanced Master Beef Producer Program:</u>

The Advanced Master Beef Producer Program (AMBPP) is an educational program provided by the University of Tennessee designed to help cattle farmers improve cattle health management and cattle farm profitability. This program is open to any cattle farmers in the United States. The AMBPP certification is given to producers who complete the program.

<u>Beef Quality Assurance Program:</u>

Beef Quality Assurance (BQA) is a nationally coordinated, state implemented program that provides systematic information to U.S. beef producers and beef consumers of how common husbandry techniques can be coupled with accepted scientific knowledge to raise cattle under optimum management and environmental conditions. BQA guidelines are designed to make certain all beef consumers can take pride in what they purchase – and can trust and have confidence in the entire beef industry.

Certified Angus Beef Label Definition:

USDA graders inspect black-hided cattle (typical of the Angus breed) and give it a grade. All beef considered for the brand must grade in the top two thirds of Choice or Prime.

Grass-Fed Label Definition:

This label indicates that the animal was fed only grass and forage.

No Hormones Administered Definition:

The term "no hormones administered" may be approved for use on the label of beef products if sufficient documentation is provided to the United States Department of Agriculture by the beef producer showing no hormones have been used in raising the animals.

Now, please take time to carefully read the following instructions before proceeding.

Imagine you are in your usual grocery store and considering the purchase of boneless ribeye beef steaks. In the following screens you will see 12 choice scenarios (decision situations). Each decision situation includes a description of different product features. All features of the product in each decision situation are identical except that they vary in their price, and whether it is Tennessee Certified Beef, Master Quality Raised Beef, Certified Angus Beef, grass-fed or no hormones administered. In each decision situation, please indicate the decision you would make based on your own preferences. Specifically, in each choice scenario that will be visible to you on the screen, you are asked which product you would CHOOSE to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision and select the decision that you would make based on your own preferences.

IMPORTANT:

CHOOSE one of the options on each page. Or you may choose NOT TO PURCHASE either product. Assume that the options on each page are the only ones available. Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g., a lower price but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice scenario that you prefer most, based on its characteristics.

The experience from previous similar surveys is that people often state a higher willingness to pay than what one is actually willing to pay for the good. For instance, a recent study asked people whether they would purchase a new food product similar to the one you are about to be asked about. This purchase was hypothetical (as it will be for you) in that no one actually had to pay money when they indicated a willingness to purchase. In the study, 80% of people said they would buy the new product, but when a grocery store actually stocked the product, only 43% of people actually bought the new product when they had to pay for it. This difference (43% vs. 80%) is what we refer to as hypothetical bias.

Accordingly, it is important that you make each of your upcoming selections like you would if you were actually facing these exact choices in a store, i.e., noting that buying a product means that you would have less money available for other purchases.

Ground Beef Block 1

Q1> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ Neither

Q2> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $1.99 per pound
- ✓ Certified Angus Beef

- ✓ Neither

Q3> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ No hormones administered

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ Neither

Q4> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $1.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q5> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $1.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q6> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $2.99 per pound
- ✓ No hormones administered

- ✓ Neither

Q7> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound
- ✓ No hormones administered

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Grass-fed

- ✓ Neither

Q8> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Grass-fed

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ Neither

Q9> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q10> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $3.99 per pound
- ✓ Master Quality Raised Beef

- ✓ Neither

Q11> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $4.99 per pound
- ✓ No hormones administered

- ✓ Neither

Q12> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $3.99 per pound
- ✓ No hormones administered

- ✓ Neither

Ground Beef Block 2

Q1> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q2> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $3.99 per pound
- ✓ Master Quality Raised Beef

- ✓ Neither

Q3> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Certified Angus Beef

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef

- ✓ Neither

Q4> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound
- ✓ No hormones administered

- ✓ $1.99 per pound
- ✓ Tennessee Certified Beef

- ✓ Neither

Q5> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ $4.99 per pound
- ✓ Grass-fed

- ✓ Neither

Q6> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $2.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q7> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $2.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Certified Angus Beef

- ✓ Neither

Q8> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $1.99 per pound

- ✓ $4.99 per pound
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ Neither

Q9> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $3.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ No hormones administered

- ✓ $1.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q10> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $2.99 per pound

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ No hormones administered

- ✓ Neither

Q11> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ $2.99 per pound
- ✓ Master Quality Raised Beef
- ✓ Grass-fed

- ✓ Neither

Q12> Assume you are in the grocery store and you wish to purchase a package of ground beef (85% lean/15% fat) that is USDA Choice. Which of the following products presented below do you prefer? Please choose one of the two alternatives or choose the neither option.

- ✓ $4.99 per pound
- ✓ Tennessee Certified Beef

- ✓ $1.99 per pound
- ✓ Certified Angus Beef

- ✓ Neither

Demographics & Follow-up Questions

Q18> To what extent do you believe that your answers will… (check one box per question)

	Not at all	Very little	Little	Somewhat	Much	Very Much
be taken into consideration by public authorities?						
be taken into consideration by food policy makers?						
be used to analyze the feasibility of Tennessee Certified Beef?						
have a direct impact on the availability of Tennessee Certified Beef products?						
have an impact on the decision to implement a Tennessee Certified Beef Program?						
have an impact on the Tennessee beef industry?						

Q19> When making your choices for the beef products, which of these attributes factored into your decision?

- o Price
- o Tennessee Certified Beef
- o Grass-fed
- o Certified Angus Beef
- o Master Quality Raised Beef
- o No hormones administered

Q20> If you chose the "neither" option on any of the decision scenarios, why did you do so?

- o I never chose the neither option
- o I raise my own beef
- o I don't believe any of the programs are effective
- o I trust beef products from major beef producing states more
- o I don't believe Tennessee Certified Beef would be better quality
- o I am not willing to pay the prices shown
- o I believe that certification programs like these will add to stricter regulations
- o I can't afford to pay more for beef than I currently do
- o Other: Please describe _____

Q21> How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means: 'not at all willing to take risks' and the value 10 means: 'very willing to take risks':

	Not at all willing to take risks 0	1	2	3	4	5	6	7	8	9	Very willing to take risks 10
Risk Level											

Q22> Please indicate how much you agree or disagree with the following statements when thinking about your health (1=strongly disagree to 5=strongly agree).

	Strongly Disagree 1	2	3	4	Strongly Agree 5
I am optimistic about the safety of food products.					
I am confident that food products are safe.					
I am satisfied with the safety of food products.					
Generally, food products are safe.					
I worry about the safety of food.					
I feel uncomfortable regarding the safety of food.					
As a result of the occurrence of food safety incidents, I am suspicious about certain food products.					

Q23> Please indicate how likely you are to consume the following products (1=Not at all Likely to 5=Extremely Likely).

	Not at all likely 1	2	3	4	Extremely likely 5
Tennessee Certified Beef					
Certified Angus Beef					
Grass-fed Beef					
Master Quality Raised Beef					
Beef with no hormones administered					

Q24> Please state how much you agree or disagree with the following statements (1=disagree strongly, 5=strongly agree).

	Strongly Disagree 1	2	3	4	Strongly Agree 5
When tasting local food, I have an expectation that it is exciting.					
Eating local food provides me personal satisfaction.					
Local food contains a lot of fresh ingredients produced in a local area.					
Eating local food keeps me healthy.					
Local food is nutritious.					
I like to talk to everybody about my local food experiences.					
I like to take pictures of local food to show friends.					
Experiencing local food enriches me intellectually.					

Q25> Please state how much you agree or disagree with the following statements (1=disagree strongly, 5=strongly agree).

	Strongly Disagree 1	2	3	4	Strongly Agree 5
Local food has to be transported shorter distances, so it is better for the environment.					
Local foods make me feel as if I am helping the local economy.					
Local foods make me feel as if I am supporting farmers in my state.					
Local foods from within the state are fresher than out-of-state foods.					
I know more about where local foods come from, so I know they are safer.					
I believe local foods are of higher quality than non-local foods.					
Purchasing local foods reduces my carbon footprint.					

Q26> Please place a check mark indicating your level of agreement or disagreement.

	Strongly Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Neither Agree nor Disagree 4	Slightly Agree 5	Moderately Agree 6	Strongly Agree 7
I prefer to learn visually							
I prefer to learn verbally							
I am a visual learner							
I am a verbal learner							
I am good at learning from labeled pictures, illustrations, graphs, maps, and animations							
I am good at learning from printed text							

Q27> Please rate the quality of the following Tennessee Certified Beef labels that could appear on beef on a scale from 1=poor 5=excellent.

	Poor 1	Fair 2	Good 3	Very Good 4	Excellent 5

Now we will ask you questions about yourself and your beef consumption patterns.

Q28> Where are you most likely to purchase your beef?

- o Grocery Store
- o Farmer's Market
- o From a Beef Farmer
- o Specialty Food Store
- o Butcher Shop
- o Other: Please Describe_____

Q29> Do you do most of your shopping in a metropolitan area?

- o Yes
- o No

Q30> How often do you usually consume the following products?

	Daily	One or more times a week	Every two weeks	Once a month	A few times a year	Never
Beef steaks						
Ground Beef						
Boneless ribeye beef steaks						
Local beef						
Local boneless ribeye beef steaks						
Certified Angus Beef						
Grass-fed beef						
Tennessee produced beef						
Beef with no hormones administered						

Participants who had the steak choice sets saw these questions:

For the next questions, keep in mind that the average market price of boneless ribeye beef steaks ranges from about $5.99 to $11.99 ($/lbs).

Q31> How much do you usually pay per pound for a boneless ribeye beef steak ($/lbs)? _____

Q32> What are you willing to pay for a USDA Choice boneless ribeye beef steak ($/lbs)? _____

Q33> What are you willing to pay for a USDA Choice boneless ribeye beef steak that is Tennessee Certified Beef ($/lbs)? _____

Q34> What are you willing to pay for a USDA Choice boneless ribeye beef steak that is Certified Angus Beef ($/lbs)? _____

Q35> What are you willing to pay for a USDA Choice boneless ribeye beef steak that is grass-fed ($/lbs)? _____

Q36> What are you willing to pay for a USDA Choice boneless ribeye beef steak that is Master Quality Raised Beef ($/lbs)? _____

Q37> What are you willing to pay for a USDA Choice boneless ribeye beef steak that has no hormones administered ($/lbs)? _____

Participants who had the ground beef choice sets saw these questions:

For the next questions, keep in mind that the average market price of ground beef ranges from about $1.99 to $4.99 ($/lbs).

Q31> How much do you usually pay per pound for ground beef ($/lbs)?_____

Q32> What are you willing to pay for USDA Choice ground beef ($/lbs)?_____

Q33> What are you willing to pay for USDA Choice ground beef that is Tennessee Certified Beef ($/lbs)? _____

Q34> What are you willing to pay for USDA Choice ground beef that is Certified Angus Beef ($/lbs)? _____

Q35> What are you willing to pay for USDA Choice ground beef that is grass-fed ($/lbs)? _____

Q36> What are you willing to pay for USDA Choice ground beef that is Master Quality Raised Beef ($/lbs)? _____

Q37> What are you willing to pay for USDA Choice ground beef that has no hormones administered ($/lbs)? _____

This is the last part of the survey. We would like to ask you for some background information about you, as it is a critical part of our analysis. This is an anonymous survey and your name is not linked to the responses. In addition, all of this information will be treated as confidential. Results of the survey will only be used in aggregate form and only for research purposes.

Q38> What is your educational background? Mark the box next to the highest level of education you have completed.

- o High School Diploma or Equivalent
- o Some College
- o Technical School Diploma
- o Associate's Degree
- o Bachelor's Degree
- o Master's Degree
- o Doctorate
- o Other

Q39> What is your race?

- o White
- o Hispanic
- o Native American
- o African American
- o Asian/Pacific Islander
- o Other

Q40> How many individuals live in your household, including yourself? Please do not include roommates who are not a part of your food expenditure. _____

Q41> How much does your household spend on beef per year ($/week)? _____

Q42> Are children under the age of 12 present in the household?

- o Yes
- o No

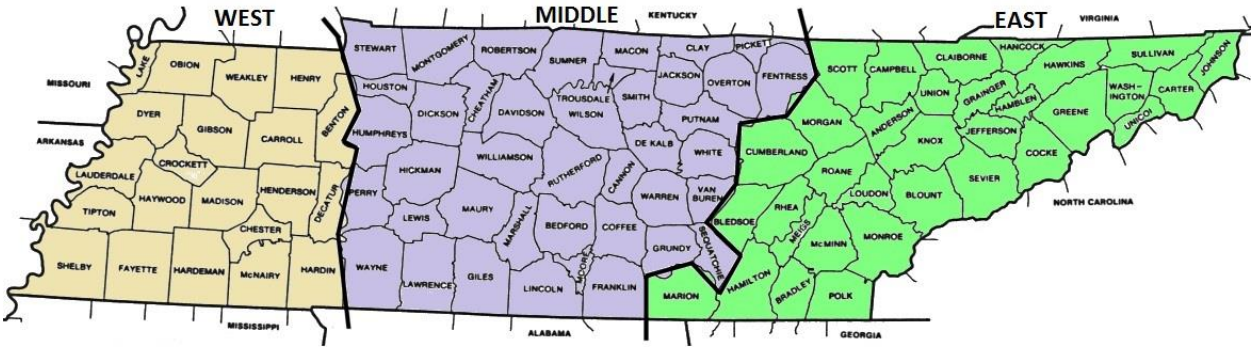
Q43> Are you a student?

- o Yes, Undergraduate
- o Yes, Graduate
- o No

Q44> What is your political affiliation?

- Democrat
- Republican
- Libertarian
- Tea Party
- Other

Please reference the map below to answer the next two questions.



Q45> Where in Tennessee do you live?

- East Tennessee
- Middle Tennessee
- West Tennessee

If participants chose West Tennessee on question 45, then they saw this question.
SubQ45> In which county in West Tennessee do you reside?

- Benton
- Carroll
- Chester
- Crockett
- Decatur
- Dyer
- Fayette
- Gibson
- Hardeman
- Hardin
- Haywood
- Henderson
- Henry
- Lake
- Lauderdale
- Madison
- McNairy
- Obion
- Shelby
- Tipton
- Weakley

If participants chose Middle Tennessee on question 45, then they saw this question.
SubQ45> In which county in Middle Tennessee do you reside?

- Bedford
- Cannon
- Cheatham
- Clay
- Coffee
- Davidson
- Dekalb
- Dickson
- Franklin
- Giles
- Grundy
- Hickman
- Houston
- Humphreys
- Jackson
- Lawrence
- Lewis
- Lincoln
- Marshall
- Maury
- Montgomery
- Moore
- Overton
- Pentress
- Perry
- Pickett
- Putnam
- Robertson
- Rutherford
- Sequatchie
- Smith
- Stewart
- Sumner
- Trousdale
- Van Buren
- Warren
- Wayne
- White
- Williamson
- Wilson

If participants chose East Tennessee on question 45, then they saw this question.
SubQ45> In which county in East Tennessee do you reside?

- Anderson
- Bledsoe
- Blount
- Bradley
- Campbell
- Carter
- Claiborne
- Cocke
- Cumberland
- Grainger
- Greene
- Hamblen
- Hamilton
- Hancock
- Hawkins
- Jefferson
- Johnson
- Knox
- Loudon
- McMinn
- Marion
- Meigs
- Monroe
- Morgan
- Polk
- Rhea
- Roane
- Scott
- Sevier
- Sullivan
- Unicoi
- Union
- Washington

Q46> What type of region do you live in?

- City Center (refers to locations in the inner city of the metropolitan area)
- Suburban (location in bedroom communities surrounding the metropolitan area or in the urban fringe just beyond these communities but still within commuting distance of the urban center)
- Rural (areas beyond the suburban ring of an urban center)

Q47> Do you consider your roots to be urban or rural?

- Rural
- Urban
- Suburban

Q48> Do you have a farm background?

- Yes
- No

Q49> Please indicate your projected 2016 annual household income before taxes:

- Less than $10,000
- $10,000 to $19,999
- $20,000 to $29,999
- $30,000 to $39,999
- $40,000 to $49,999
- $50,000 to $59,999
- $60,000 to $69,999
- $70,000 to $79,999
- $80,000 to $89,999
- $90,000 to $99,999
- $100,000 to $149,999
- $150,000 or more

Thank You! If you have any comments regarding this survey, please enter them in the box.

VITA

Meagan Gayle Merritt was born Meagan Gayle Thomas in Sevierville, TN in 1985 to two wonderful parents, Ray and Beth Thomas. In 2003, she graduated from Gatlinburg Pittman High School, in Gatlinburg, Tennessee, where she also met her future husband Chris Merritt. Later that year, she gave birth to a beautiful baby boy, Nathan Merritt. In 2004, her fiancée joined the United States Army as a Combat Medic and they got married in July 2004. In 2009, she joined the United States Army as a Signals Collector Analyst. In 2010, she attended Walters State Community College and in 2013, she graduated with an Associate of Science degree in Animal Science with an emphasis in Pre-Veterinary Medicine. Later that year, she joined the University of Tennessee, Knoxville to get her Bachelor of Science degree in Animal Science with an emphasis in Bioscience. She graduated with that degree in 2015. She joined the graduate program in August of 2015 in order to study Agricultural and Resource Economics at the University of Tennessee, Knoxville and also became a Graduate Research Assistant under Dr. Andrew Griffith and is expected to graduate in May of 2017.