EVALUATION OF THE OKLAHOMA BEEF COOKING SCHOOL FOR YOUTH (OBCSY)

By

SWEE HWA KONG

Bachelor of Science in Nutritional Sciences

Oklahoma State University

Stillwater, OK

2005

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May, 2007

EVALUATION OF THE OKLAHOMA BEEF

COOKING SCHOOL FOR YOUTHS (OBCSY)

Thesis Approved:

Barbara Brown

Thesis Adviser

Stephany Parker

Janice Hermann

A. Gordon Emslie

Dean of the Graduate College

ACKNOWLEDGMENTS

This thesis has taught me that no one accomplishes much alone. I would like to extend my gratitude to those to whom I owe so much.

I would like to thank my major advisor Barbara Brown for her patience, guidance and encouragement during these two years. I would also like to express my appreciation to my other committee members Stephany Parker and Janice Hermann for their help and support.

My father and other family members, were such a blessing to me while I was in depression, I am not sure I would have managed quite as well as I did had he not been around. I am forever grateful for their patience, encouragement, for believing in me; not to mention supporting me financially whenever the need arose. I thank God for the role they have played in shaping my life and my education.

A special thank you to my fiance Eddie Sue for supporting me emotionally and being patient throughout my graduate program.

The friends I made in US greatly enriched my life with their support and companionship. I thank Amy Pruitt and her parents (Bobby Pruitt and Susan Pruitt) for opening their home and heart to me. I thank God for linking me up with you all. I will continue to cherish our friendship.

God bless all of you who have touched my life in so many ways and may he reward you abundantly for all that you have invested in my life.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figures Page

ABBREVIATIONS

ADA	American Dietetic Association
BRFSS	US behavioral Risk Factor Surveillance System
CDC	Center of Disease Control and Prevention
CDT	Cognitive Developmental theory
CLA	Conjugated Linolenic acid
DGA's	Dietary Guidelines for American's
FDA	Food and Drug Administration
FSIS	Food Safety and Inspection Service
HDL	High Density Lipoprotein
HHS	US Department of Health and Human Services
LDL	Low Density Lipoprotein
NHANES	National Health and Nutrition Examination Survey
OBCSY	Oklahoma Beef Cooking School for Youth
OCES	Oklahoma Cooperative Extension Service
SCT	Social Cognitive Theory
SLT	Social Learning Theory
USDA	US Department of Agricultural
VA	Vaccenic acid
ZIP	Zinc Iron Protein

CHAPTER I

INTRODUCTION

Poor nutrition during childhood can lead to lifelong health problems, including overweight and obesity, high blood pressure, high cholesterol, Type II diabetes mellitus, gallbladder disease, joint problems, depression, and anxiety (Jackson et al., 2002). Unhealthy eating habits during childhood may interfere with optimal growth and development while setting the stage for poor eating habits during adolescence and adulthood.

Childhood obesity is the most common nutritional problem among children in the United State (U.S.). It is now considered a serious health hazard and a disease of epidemic proportion. Today, nine million children in the U.S. are overweight; triple the number in 1980 (Ogden et al., 2002). The prevalence of overweight children in the U.S and many other areas of the world have increased dramatically over the past several decades. This increase has been found among children of all age groups, genders, and ethnic groups (Ogden et al., 2002).

There is a significant body of literature in the area of determinants of healthy eating in children and youth, yet very little is known about how children think about nutrition and its relationship to health. Among individual determinants, food preference was consistently identified as an important predictor of healthy eating. While there is an association between knowledge and behavior, there is a need to access the ability of

children to identify appropriate foods needed to meet dietary guidelines. (Taylor et al., 2005). The relation between food skills (including food selection and preparation) and healthy eating in both children and parents should be examined. Due to the changes in socio-economic status and the increase in the preparation of convenience food at home, it is important to identify means by which children will consistently acquire food-related skills and use them to make healthy food choices. Health concepts and beliefs develop in the early stages of life and unhealthy eating behavior can carry over into adulthood (Corwin et al., 1999). The dietary habits children establish during childhood and adolescence may significantly influence the likelihood of the child developing particular disease in later life (Variyam et al., 1999). Young children are cognitively ready to learn more about food, nutrition and health than previously thought. Studies show effective nutrition programs can teach children to eat healthier. Children learn how to choose healthy diet from experience; they are not born with the ability to do so. Thus greater efforts to educate children about nutrition and health are recommended. These habits developed in childhood are hoped to last throughout their lives and with the right guidance and nutrition education, childhood may be a time of openness to modifying food choices. Improvement in health and well being for all children, both immediate and long term, is the desired outcome of addressing childhood overweight and obesity.

Americans continue to look for ways to live longer and healthier lives. Despite the increased concerns many continue to consume inappropriate diets. Many studies have suggested that a variety of foods should be included as no single food item contains all of the essential nutrients needed for good health. In January 2005, the United States Department of Health and Human Services (HSS) and United Department of

Agricultural released the sixth edition of the Dietary Guidelines for American's (DGA's) (U.S. Dept of Health and Human Services & Dept of Agriculture, 2005; USDA 2005b). Variety is symbolized by the six color bands representing five food groups of the pyramid and oils (U.S. Dept of Health and Human Services & Dept of Agriculture, 2005b). This suggested foods from all groups are needed each day for good health. A key recommendation of USDA's Mypyramid is to choose food rich in essential nutrients from all food groups. To get the benefits of nutrient rich foods, choose foods from the base of the pyramid from each food group. The base is wider to indicate nutrient rich foods that provide the most nutrients with the most nutrients but fewer calories, solid fats and added sugars (U.S. Dept of Health and Human Services & Dept of Agriculture, 2005b). For example, in the grain group, whole wheat, high fiber foods are represented at the base while highly refined grains, those with added sugar and fat, are represented at the top of the pyramid.

In comparison with other meat intake, beef consumption is decreasing, fell 26 percent between 1977 and 1997, while chicken consumption rose 75 percent, turkey 101 percent, and fish and shellfish 15 percent (Table 1) (Judy et al., 1998) (Figure 19) One of the reasons for this is that some people have the misconception that beef is not a nutritious food that is safe to eat. Other factors in the decreasing per capita consumption include lack of knowledge on how to prepare beef well, changes in socio-economic and culture which have resulted in an increasing number of women employed outside the home, single parent families (U.S. Census Bureau, 2005) which will result in parents who are busier and less likely to spend time with their families in the kitchen. Anti-beef activists have also played a role in changing the consumption trends. Perhaps one of the

most popular campaigns is “Beyond Beef”. This coalition worked to encourage a decrease in consumption of beef among American by 50 percent (Judy et al., 1998). Many people concern themselves with environmental and ethical issues behind beef production. The myths and misconceptions about beef are an example of how fallible information can jeopardize nutritional status. Insufficient education and knowledge may predispose people to make poor food choices. Additionally, inappropriate educational messages from media, extremist groups, fad diets, and biased educators prevent consumers from receiving the information they need to implement healthful food choices into their daily routines.

Historically beef has been found to contain fat and cholesterol levels that exceeded those of other protein foods. Thus, many people currently believe that in order to lower lipid levels, they must exclude all red meat (Judy et al., 1998). Rather than excluding meat, consumers should focus on the selection of leaner cuts, controlling portion size, and reducing the consumption of other high fat food. Today’s beef is lower in fat and cholesterol than ever before (Appendix A). Healthy preparation methods helped to create a place for beef in the American diet. Beef can be an instrumental part of the diet providing protein as well as various minerals and vitamins. National Cattlemen’s Beef Board (2005) described lean cuts of beef as a nutrient dense food, providing good nutritional return for the calories it provides. It is important that consumers are aware of the benefits of beef so that it can be appropriately implemented into daily meal plans.

According to Clark (2004), latchkey children are common among those who live in single households or two-working parents. Everyday in the U.S. “Twenty four million school-age youth are in-need of programs, and about seven million children five to

fourteen years old are left unsupervised while their parents are at work or away for other reasons" (Clark et al., 2004). By necessity, these children need basic knowledge and skills in food preparation, sanitation, kitchen safety and nutrition. Cooking is a skill that will be helpful to children throughout their lives. It is a necessary part of growing up and developing independence. There are three types of thinking skills involved in cooking that are reinforced in the kitchen: problem solving, fluent-thinking, and flexible thinking (Church, 2006). When children with cooking skills move away from home, they are more able to eat a variety of nutritious food, are better prepared to stay within a food budget, and know how to minimize the risk of food borne illness (Oogarah-Pratap et al., 2004).

The Oklahoma Cooperative Extension Service (OCES) professionals act as a liaison between Oklahoma State University OSU and the people in all 77 Oklahoma counties. The mission of OCES is to disseminate information to the people of Oklahoma and encourage the adoption of research-generated knowledge. Extension Educators provide research-based information in the areas of agriculture, family and consumer sciences, 4-H youth development and community and rural development. OCES developed cooking classes to provide education on basic beef preparation skills, food safety practices and nutrition related to beef. County Educators were trained on the Oklahoma Beef Cooking School for Youth (OBCSY) curriculum and program materials needed to conduct county-based schools. Program materials included PowerPoint presentations, handouts, recipes with lists of food and supplies needed, promotion tools, and evaluation questionnaires for participants. This was a one-time intervention program.

Research Objectives and Purpose

The Oklahoma Beef Cooking School for Youth (OBCSY) was developed to help children learn and practice skills associated with buying and preparing food using beef as the source of protein and to help them make nutritious food choices. The OBCSY was funded by a grant from The Oklahoma Beef Council from their $1-per-head check off program. The curriculum offered hands-on experience where the children learned food preparation skills, the economics of buying beef for the family, the nutrition contributions of beef to diet, good food safety practices, information on careers associated with the beef industry and facts about beef animals and the beef industry. Through cooking, participants used psychomotor skills such as reading, talking, math skills, science, nutrition, thinking and social skills (Church, 2006). The curriculum of OBCSY focused on the nutritional contribution of beef to a healthy diet, ways to stay safe in the kitchen and how to cook great food.

Participants learned facts about beef, including the 12 cuts of beef that meet the U.S. governments labeling guidelines for lean or extra lean and that 95% lean ground beef is higher in many essential micronutrients and can be lower in fat and calories than ground turkey. Through this curriculum, the children learned information such as the importance of nutrients including protein, zinc, and iron associated with beef and a healthy diet. Participants worked in teams to prepare user-friendly recipes and had the opportunity to taste and evaluate food they had prepared at the end of the session.

The purpose of this study was to evaluate the impact of participation in the OBCSY: to determine if the cooking school met the goals of helping children to increase

their understanding of how beef can fit into a healthy diet, how to purchase beef, nutritious methods of preparing beef and how to reduce their risk of foodborne illness. The research objectives were:

1. To evaluate the effect of participation in OBCSY on the frequency of beef as a food choice by children who participated in OBCSY.
2. To evaluate the effect of OBCSY on the confidence of cooking beef in children who participated in OBCSY.
3. To evaluate the effect of OBCSY on good food safety practices by children who participated
4. To evaluate the effect of participation in OBCSY on the portion size/serving of beef children anticipate they will eat after participation in OBCSY.
5. To evaluate the effect of participation in OBCSY on taking into consideration of the price per serving during the purchase of beef by children who participated in OBCSY.
6. To evaluate the effect of participation in OBCSY on the perceptions of contribution of beef to a nutritious diet by children who participated in OBCSY.
7. To evaluate the effect of participation in OBCSY on the probability of cooking beef as one of the central foods at home by children who participated in OBCSY.

Null Hypotheses

Ho1: There will be no difference in the frequency of beef an anticipated food choice for children after they had participated in the OBCSY.

Ho2: There will be no difference in the confidence of children in the ability to prepare beef recipes after they had participated in the OBCSY.

Assumptions

The basic assumption associated with this study was that participants completed the questionnaire to the best of their ability and answered questions based on their actual behavior rather than the perceived "right" answer. The researcher assumed that the test administrators (OCES County Educators) all gave the questionnaire in the same manor and provided ample time for thought. For example, the instructions were read and explained fully at each OBCSY site.

Limitations

The limitations of this study are:

1. There are no pretest-posttest evaluations available for data comparison at the end of the program.
2. This is a one-time intervention program where long term effects are unable to be testified.
3. There is no control group or treatment group as a baseline data.

CHAPTER II

REVIEW OF LITERATURE

Overview

Good nutrition and physical activity are keys to good health and essential for the healthy growth and development of children and adolescents. Major causes of morbidity and mortality in the United States are related to poor diet and a sedentary lifestyle. Diseases linked to poor diet include cardiovascular disease, hypertension, dyslipidemia, type 2 diabetes, overweight and obesity, osteoporosis, constipation, diverticular disease, iron deficiency anemia, oral disease, malnutrition, and some cancers.

Poor diet and physical inactivity are the most important factors contributing to the increase in overweight and obesity in this country. In 1999-2002, data shows that 65% of U.S. adults were overweight and 30% of adults were obese (USDA, 2005c). Dramatic increases in the prevalence of overweight have occurred in children (16%) and adolescents (aged six to 19 years) of both sexes (1999-2002). In order to reverse this trend, many Americans need to consume fewer calories, be more active, and make wiser choices within and among food groups (USDA, 2005c).

Studies show that following a diet that complies with the dietary guidelines may reduce the risk of chronic disease such as lower risk of mortality among individuals age 45 years and older in the United States. A basic element of the dietary guidelines is that nutrient needs should be met primarily through consuming both natural food and fortified

foods. Another important element of the dietary guidelines is the need to increase food safety awareness in order to reduces risk of foodborne illness.

Overweight and Obesity

Childhood obesity has been defined in various ways such as by absolute weight for height percentiles, percentiles of ideal body weight, triceps skin folds and body mass index (BMI). BMI is an anthropometric index of weight and height recommended for both children and adults. However, Center of Disease Control and Prevention (CDC) uses the term overweight rather than obesity in children.

It is not difficult to find statistics regarding obesity in America. As mentioned in Ogden et al. (2002), obesity is prevalent in both genders, ages of all groups and ethnicity. Currently in the U.S. about ten percent of children age two to six and 15% of children ages six to 19 are considered overweight (Ogden et al., 2002). Estimation of the number of obese American adults rose from 23.7% in 2003 to 24.5% in 2004. Results from the 2003-2004 National Health and Nutrition Examination Survey (NHANES) indicate that an estimated 17% of children and adolescents of ages 2-19 years are overweight (Ogden et al., 2002).

In general, obesity results from an imbalance between energy intake and energy output. When energy intake exceeds energy expenditure, weight increases. In contrast, weight is lost when energy expenditure exceeds energy intake. The factors that appears to contribute to this imbalance among children include economic, social, behavioral, cultural, diet, psychological and genetic factors (Lynn-Garbe, 2005). The majority of

today's children consume excessive amount of foods high in fat. Researchers have implicated TV viewing as a leading factor in childhood overweight. The reason may be due to an increase in energy intake and accommodate by decreased energy expenditure during viewing (Lynn-Garbe, 2005). The physically active time is substituted by viewing TV and other screen time. Argas et al. (2004) determined that the strongest risk factor for childhood obesity was prenatal overweight and the second risk factor is lack of parental concern about their children's weight. A persistent tantrum over food during childhood is another risk factor. Parents influence their children's eating patterns not only through the foods that they make available to them but also through their child-feeding strategies. Investigators argue that these strategies can be coercive and over controlling and it can be counterproductive to the development of a child's ability to self-regulate (Satter, 2000).

Obesity in childhood, especially in adolescence is a key predictor of obesity in adulthood. The adverse health effects resulting from overweight include short-term consequences during childhood and long term consequences that develops in adulthood. A common short-term consequence during childhood is psychological problems. Overweight children tend to have a poor relationship with family members and peers, low self-esteem and higher prevalence of depression (Welch, 2005). According to Russell (2005) overweight during childhood and adolescence might have an adverse impact on social economic standing in adulthood. Those who were overweight during childhood and adolescence tend to have lower earnings, are significantly more likely to be in poverty. Overweight adults have a high prevalence of eating disorder, especially binge eating. In addition childhood weight problems lead to lifelong health problems, including

high blood pressure, high cholesterol levels, Type II diabetes mellitus, gallbladder disease, joint problems, depression, and anxiety (Jackson et al., 2002).

Overweight children are at greater risk of becoming overweight adults that those who are normal weight during childhood. The direct obesity cost is associated with a 36% increase in clinical and hospital costs and a 77% increase in medication costs. Obesity carried a $75 billion price tag in medical expenses in 2003. According to the state legislatures (State legislature, 2005) expenditures caused by obesity reached up to $87 million in Wyoming, which include $15 million in Medicare expenditures, $23 million in Medicaid, $7.7 billion in California, with $1.7 billion each in Medicare and Medicaid expenditures, and $ 8.5 million in Oklahoma, with $2.3 million in Medicare and $ 1.6 million in Medicaid.

There is great uncertainty about how to treat childhood overweight. Both familial-based and evidence-based approaches have been taken into consideration. According to Golan et al. (2001), a conceptual model is described for a familial approach to the treatment of young obese children with the parents as the sole agent of change, that is, change delivered through the parents (instead of directly to the obese children) emphasizing a healthy lifestyles and not weight reduction. The study proposed that parents need to be the main agents of change. The home and family environment are major factors affecting the child's knowledge, belief, attitudes and practices regarding food and eating habits. The evidence-based approach however uses a client-centered approach and behavioral change techniques to increase and maintain the motivation for lifestyle changes. This approach focuses on increasing physical activity, reducing sedentary behavior and changing diet habits.

Once a child has become obese, treatment is more difficult and the condition usually becomes a lifelong problem. Therefore, prevention is the most effective treatment. Interventions with young children appear to be more effective than with older children because they have less time to develop poor eating and exercise habits, and the parents have greater influence over their lifestyles. Young children are capable of learning to like and accept a wide variety of foods. Understanding the contribution of early learning and experiences to the formation of food acceptance patterns can help foster development of healthy eating habits. (Gable & Lutz, 2001) As suggested earlier, eating habits are established in childhood and persist into adulthood. Kelder's et al. (1994) findings suggest that eating patterns may become resistant to changes as early as the sixth grade and early exposure to a wide variety of food is a critical step to the development of food acceptance patterns. Children do not come to this world with the ability to choose nutritious foods that provide a balance diet. Learning what and how to eat begins at birth. Learned food preferences and adoption of nutritional attitude influence eating behavior that continues into adulthood. Prevention of childhood obesity during infancy can be done trough a positive feeding relationship between the parents and the baby. This requires that caretakers learn about hunger and satiety clues. Later in the toddler years, growth slows down significantly and the child's food intake becomes erratic and unpredictable. At this time, it requires caretakers to realize when the child wants to eat and how much they want to eat. The role of the adult is to prepare the food and the children will decide when, how much and whether they wanted to eat (Satter, 2000). However physical activities should be encouraged. School age children have a growing sense of independence and take pride in their achievements. They are influenced

by the media and have more access to junk foods and no longer eat all of their meals at home. Therefore caretakers need to limit high calorie food availability at home and provide lots of fruits and vegetables. Children should be taught not to eat in front of the TV and ways to reduce stress besides eating and information on benefits of increased physical activity as it relates to weight control.

It is unlikely that any single approach will be practical in all health care settings and in all circumstances, so prevention is a top priority.

Role of Beef in Diet

The American diet has changed considerably over the last few decades. Beef consumption for example fell 26% between 1977 and 1997, while chicken consumption rose 75%, turkey 101% and fish and shellfish 15 % (Judy et al, 1998)

Factors responsible for the changes in U.S. consumption pattern in last 20 plus years include changes in relative prices, an increase in real disposable income and more food assistance for the poor. Introduction of more convenience foods contributed to the shift in consumption, along with expanded advertising programs and increases in nutrient enrichment standards and food fortification. Socioeconomic trends also drove changes in food choices including smaller households, more single parent households, an increasingly aging population and an increase in ethnicity diversity (Godwin, 2005).

Per capita beef consumption dropped significantly in the late 1970s, remained flat in the early 1980s and rose to 63 pounds in 2004. Over the period from 1980 to 2004, per capita meat consumption increased steadily in U.S. Consumption per person of all meats in 1980 was 190 pounds (Judy, 1998). Per capita beef reached 18.6 pounds per person in

2004. Per capita beef consumption increased slightly in the early 1990s to 67.5 pounds per person, to 65.8 pounds by 2004 (USDA, 2005a).

Although per capita beef consumption remained roughly three-fifths of the share of red meat consumption during the last quarter century, beef consumption declined on average 18% from 114.1 to 94.1 pounds from 1970 to 2004 (USDA, 2005a). During the same period, pork consumption fell 13% from 72.1 pounds to 63 pounds but increased 5% to 66 pounds in 2004. In contrast, chicken consumption increased 60% from 40.1 pounds in 1970 to 99 pounds (USDA, 2005a). The consumption of chicken, turkey, fish and beans however increased, reflecting heath conscious decision marking. Market research studies identified consumer attitude changes toward environmental issue regarding food production and safety. Consumers sought more information from food labeling to guide decision making about their food choices (King, et al., 2000).

Protein from both animal and vegetable sources is an important part of the US diet. Consumers who tried to eat lower calorie diets to meet nutrient needs without excess calories found a need to reduce protein and meat servings. Animal foods may also be significant sources of saturated fat and cholesterol. Yet the fat content is an integral part of the flavor and texture of some meats.

U.S. food consumers are choosing leaner meat, fish and poultry. Some meat producers responded to the market demand for leaner products. Since the 80s the average cut of beef and pork has about 30% less fat. Producers are breeding leaner herds and taking young (leaner) animals to market. As a result, the amount of fat in American diet contributed by meat declined approximately ten percent over the past 25 years (King, et al., 2000).

Children: Missing Nutrients

Research shows that American children are missing needed nutrients. Even fit-looking children may have hidden deficiencies because it can take years for the damage to show up. Five of the most common missing nutrients in children's diet are calcium, iron, potassium, fiber and vitamin E (Landau, 2005). Forty four percent of boys and 58% of girls in the age of 6 to 11 do not get enough calcium (Landau, 2005). This may be secondary to the fact that soda and juice are replacing milk in most American children's diets. Lack of calcium in diets increases their risk of osteoporosis in later life. Once infants are weaned from breast milk or formula, they often do not get enough iron from food. Seven percent of 1-2 year olds and five percent of 3-5 year olds are deficient in iron. An iron deficiency can lead to anemia, causing fatigue, decreased immunity and negatively affect children's performance in school. The USDA reported that children are only getting two thirds of their daily requirement of potassium. Potassium is essential for muscle contraction, keeps the nervous working properly and aids in managing blood pressure. The fourth missing nutrient is fiber; not technically a nutrient, is vital to good health. Fiber keeps blood glucose from spiking, can help with appetite and weight control and also helps lower cholesterol. The last missing nutrient is vitamin E. The majority of six to eight year old children are deficient in this vitamin (Landau, 2005). Vitamin E helps the nervous function, protects against heart disease and also plays a role in immune function. However, beef is not a primary source of either fiber or vitamin E. Reviewing the common nutrient deficiency in children, it is fairly easy to examine how incorporating beef into American children's diet can be one of the potential solutions.

Beef Nutritional Profile

Fifty different nutrients are essential to health and no single food or food group contains all of these nutrients. Combining a balanced and varied diet with daily physical activity is the key to maintain a healthy lifestyle.

Beef is an excellent source of ten essential nutrients. One 3-ounce serving of beef is an excellent source of five essential nutrients (protein, zinc, vitamin B12, selenium and phosphorus) and a good source of five essential nutrients (niacin, vitamin B6, iron, riboflavin and choline) (USDA, 2002; Appendix B). A recent study showed that the key nutrients in beef may play a positive role in some of today's health concerns, including obesity, overweight, hearth health, bone health and brain functioning.

Recognizing beef as one of the excellent sources of protein, iron and zinc, the Cattlemen's Beef Board, National Cattlemen's Beef Association had developed a nutrition education program (ZIP4Tweens) for youth. This program encourages "tweens" (children ages 10 to 13) to eat a balanced diet for life long good health. Getting enough zinc, iron and protein (ZIP) is essential for optimal heath and maximal intellectual attainment. (Cattleman's Beef Board, 2007).

Protein

Protein is the building block for all body tissue including muscles, organs and bones. Protein is essential to metabolism regulation and can be used as a source of energy. In addition, protein enhances body's immune response (Waylett et al, 1999). There are at least 18 different amino acids (AA) which serve as building blocks of

protein. The body is able to synthesize nine of them. Beef is considered a complete protein because it contains all nine of the essential AA needed by human body.

Iron

Iron can be differentiated into two forms: heme and non-heme iron. Iron is an essential nutrient that transports oxygen to body tissues. According to CDC, iron deficiency is still the most prevalence nutritional deficiencies in U.S and world wide. CSFII (1998) shows that 84% of the females aged 20 to 49 and almost 62% of all females aged 20 or under failed to meet the recommended dietary allowance for iron. (National Beef Council Association, 2002; Appendix C) Iron plays a significant role in neuropsychological performance, cognitive development, intellectual performance, pregnancy outcome, immune defense and work performance. Iron deficiency in pregnancy increases the risk of pre-term delivery and low birth weight babies. Adequate iron intake is crucial to a child's cognitive development and ability (Figure 20). Meat group foods are major source of bioavailability iron in diet, particularly red meat. Beef is the major source of iron and zinc for U.S. children aged two to 18 years and for adults. For both children and adults, beef is the third leading food source of iron in America's diet after iron-enriched cereals and breads (Cotton et al., 2004). However, the iron found in meat (heme iron) is two to three times better absorbed than the non-heme iron found in plant products.

Zinc

Zinc is a component of nearly 100 enzymes in the body. Zinc plays a critical role in growth and development maintenance of the body's immune system, resistance to infection, wound healing, taste acuity and appetite control. In children, zinc deficiencies can cause detrimental effects on the brain especially the attention span. Zinc is also an essential nutrient for reproductive health in both men and women. Maternal zinc deficiency will not only affects pregnancy outcome and fetal development, it also will increase the risk of complication at delivery (King, 2000). In men, zinc deficiency can result in infertility secondary to decrease in sperm count and motility (Koca et al., 2003). Studies show that about 49% women over the age of 20 and 41% of men over the age of 20 do not meet their dietary needs for zinc (Table 2; Appendix C). Beef can be a healthier solution compared to other supplementation. Beef is the number one food source of zinc in American diet (Figure 21). Zinc is readily available from red meat, such as beef. The bioavailability of zinc found in beef was found to be four times greater than that from cereals (Zheng et al., 1993).

B-Vitamins

In general, B-vitamins help the body use energy and regulate many of chemical reactions necessary to promote growth and maintain health. The family of B vitamins includes thiamin, riboflavin, niacin, vitamin B6, vitamin B 12, folate, panthothenic acid and biotin. In American diets, beef is the number one food source of B12, the number three food source of B6 and niacin and the fourth of riboflavin (Cotton, 2004). Thiamin (B1) functions in the metabolism of carbohydrates and branch chain amino acids,

promotes appetite, and contributes to normal nervous system function. Riboflavin (B2) functions as a coenzyme in the production of energy within body cells and supports normal cell division and healthy skin. Niacin functions as a coenzyme in fat synthesis, tissue respiration and the utilization of carbohydrate; promotes healthy skin, nerves and digestive system; and fosters normal appetite. Vitamin B6 functions as a coenzyme in the metabolism of amino acids and fatty acids. This vitamin helps convert tryptophan to niacin. Vitamin B6 influences cognitive development, immune function, and the activity of steroid hormones. Vitamin B12, which is found only in animal products, is very important in maintaining normal nervous system functioning and helps build genetic material. This vitamin also assists in the maintenance of normal red blood cell formation. Folate functions as a coenzyme in the metabolism of nucleic acid and amino acids and reduces the risk neural tube defects that can cause infant mortality. Deficiencies in vitamins such as folate, vitamin B6, vitamin B12 and riboflavin may increase blood levels of homocysteine. Elevated levels of homocysteine level have been reported as independent risk factor for cardiovascular disease and stroke. An adequate intake of folate, vitamin B6 and B12 have been shown to reduce levels of homocycteine and may protect against heart disease.

Selenium

Selenium is an essential nutrient for humans. It is a well-known antioxidant that may reduce the risk of certain types of cancer and heart disease as well as enhance the body's ability to fight infections (Holben, 1999). The richest dietary sources of selenium are animal foods such as organ, meats, poultry, seafood, cereals and grains. The selenium

content of food varies and depends on the amount of selenium available in the soil where animals are raised and plants are grown. The amount of selenium content in food does not necessarily represent the amount actually absorbed and utilized by the body. Ground beef not only is an excellent source if dietary selenium but it is also highly bioavailable. Beef is the number two source of selenium in America's diet (Cotton et al., 2004).

Dietary Fat

According to American Dietetic Association, fats are an important part of the diet because they provide energy storage, transport fat-soluble vitamins and insulate body tissues. Many people believed the majority of fatty acids in beef are saturated. What people do not realized is that half of the fatty acids in beef are monounsaturated fatty acids, the same kind found in olive oil. Most experts believe that monounsaturated fatty acids can lower blood cholesterol and reduce risk of heart disease. A 3-ounce serving of cooked beef contains more monounsaturated fatty acids that saturated fatty acid. (Appendix D)

About one third of the saturated fatty acid in beef is stearic acid, which has been shown to have neutral effects on blood cholesterol levels in humans (National Cattlemen Board, 2003). ADA recommended that healthy adults should consume no more than 30% of total calories from fat, with seven to ten percent from saturated fat, 10-15% from monounsaturated fat and about 10% from polyunsaturated fat. It is very important to understand that one cannot single out food for one fatty acid because dietary fats are not created equal and all food with fats contain multiple fatty acids.

Lean Beef

Lean beef can easily fit into a heart healthy diet. Calorie for calorie, beef is one of the most naturally nutrient dense foods. A 3-ounce serving of lean beef contributes less than 10% of the calories in a 2000 calorie diet (USDA 2002). According to the most recent version of USDA report, today's beef is 20% leaner than it was 14 years ago (USDA, 2004). About 29 cuts of beef meet government guideline for lean, which means each has less than 10g of total fat, 4.5g or less of saturated fat and less than 95mg of cholesterol per serving (USDA 2004). (Appendix E).

Trans Fat

Trans fatty acids also known as trans fat, are a group of fatty acids with unique shapes and properties. They are found mainly in processed food containing partially hydrogenated vegetable oil. Trans fatty acids also occur naturally in some animal and plant products, like beef, dairy foods, pomegranates, peas and cabbages. Man made trans fat differ from natural trans fat, resulting in different health effects. Man made trans fat is a concern because it raises low-density lipoprotein (LDL) and also lowers the high-density lipoprotein (HDL), therefore increasing the risk of heart disease. The natural occurring trans fat of animal origin does not increase the risk of heart disease (Ritzenthaler, 2001).

Two naturally occurring fatty acids from animal origin that appear to have beneficial health effects are conjugated linolenic acids (CLA) and vaccenic acid (VA). Conjugated linolenic acid has received attention as a possible anticarcinogen, protecting

against heart disease and obesity. The major dietary sources of CLA are from ruminant animal source, with about 70% from dairy products and 25% from red meat (Ritzenthaler, 2001). The American Dietetic Association issued a position paper on functional food that identifies CLA as a component in dairy products and red meat that may beneficially alter cancer carcinogenesis (ADA, 1999).

Vaccenic acid (VA), is a naturally occurring trans fatty acid that may have beneficial health effects, can also be found in foods from ruminant animal sources, particularly red meat and dairy products. Increased VA levels are shown to increase tissue concentration of CLA (Adolf et al., 1998; Banni et al., 2001).

The bottom line is that all trans fatty acids are not alike. There is enormous potential for confusion if education about trans fat is over simplified and consumers assume all trans fat act the same way. Ultimately, it is essential to recognize that the structural differences among the various trans fatty acids result in different health effects.

Economics of Beef

The U.S. beef industry is made up of more than one million business, farms, and ranches conducting business in all states (Cattlemen's Beef Board, 2005). There are approximately 800,000 ranchers and cattlemen in the U.S., conducting business and contributing economically to nearly every county in the nation. In 2005, U.S. cash receipts from cattle calves was approximately $48.5 billion (BSE info.org, 2007). As of January 2006, there were 97.1 million cattle in the U.S., one percent more than 2005 (24.6 pounds). Consumer demand for beef increased modestly as measured by a combination of beef consumption and consumer spending (Robbin, 2007). The demand

for beef has increased 25% in the last six years (Cattlemen's Beef Board, 2004). Consumer beef spending has grown $25 billion compared to the 1990s. According to the Cattlemen's Beef Board (2004), in 2005 consumer spending was a record high of $71 billion and the per capita spending for beef for retail and foodservice increased to $240 in 2004.

In response to the increase demand from consumers, the beef industry developed alternatives that not only would meet the market demand but also the expectations of consumers. Consumers wanted convenience with the food they consume and prepare (Cattlemen's Beef Board, 2004). Convenience packaging was one of the ways used to make consuming beef easier. Pre-packaged, pre-seasoned cooked meats, such as beef roast and frozen dinners including meat mixtures appealed to busy consumers. Much of this convenience food was packed in small portions for single or dual households. These products were ready-to-eat require minimum of cooking times. As a result of this, consumers pay more for convenience food versus unprocessed forms because of highly invested marketing costs.

Although a great number of Americans eat more food away from home and consume more processed foods, consumers' attitudes changed toward environment and health issues (King, 2000). Consumers seek more information from food labeling to guide decision making about their food choices.

Food Safety

Background

The nature of foodborne illness has changed dramatically in US over the last century. Foodborne illnesses are known to contribute to both human morbidity and mortality and health care costs. Foodborne illnesses are defined as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food. A foodborne disease outbreak happens when two or more people experience a similar illness after ingestion of a common food (Bean & Griffin, 1990; McCabe-Sellers& Beattie, 2004). More than 75% of foodborne illness deaths are caused by just three pathogens: *salmonella, listeria,* and *toxoplasma*. Ten years ago, foodborne illness was considered a minor public health issue or simply an issue for developing countries with poor standards of sanitation and safety. However, there has been significance growth in the international trade of food, making it an issue of global concern. Foodborne illness is considered as one of the top priority issues for government, producers, the food industry and consumers. Governments all over the world are intensifying their efforts to improve food safety. The Centers for Disease Control and Prevention (CDC) released the most complete estimate to date on the incidence of foodborne disease in the United State. Diseases associated with food are estimated to cause 6 to 76 millions illness, 325,000 hospitalizations, and 9000 deaths annually in the U.S. (Glavin, 2003). Unknown agents account for approximately 81% of foodborne illness and hospitalization and 64% of deaths (CDC, 2005). The CDC estimates that the major causes of foodborne illness are *Campylobacter, Listeria, Salmonella, Shigella, and E.coli O157:H7* (CDC, 2005). CDC

further reported that 79% of foodborne illnesses were bacterial and caused by improper holding temperatures and poor personal hygiene of food handlers.

Why is food safety a concern?

Food safety has been defined as a condition and measures that are necessary during the production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, wholesome and fit for human consumption (Knight et al., 2003). Food safety concerns have increased dramatically among the public and quickly become an international health crisis. It is estimated that 3.3 to 12.3 million cases of food poisoning each year are caused by seven of the most prevalent food pathogens (CDC, 1999). Food safety concerns can be grouped into concern as a result of the use of biotechnology, residues, unhealthy eating habits and natural contaminants. Public risk perceptions are influenced by psychological factors such as ethical, concerns, trust, distrust and perceptions of social exclusion from risk management (Meer et al, 2000). Foodborne illnesses will become more of a problem in years to come. This is due to factors including the emerging pathogens, improper food preparation, storage and distribution practices, insufficient training in retail employees, increased demand for new products, changes in retail practices and society household patterns of shopping and eating and, increases in the number of susceptible populations such as the elderly, young, and immuno-compromised (Buzby, 1997).

Besides the role in health, foodborne illnesses are also an important cause of reduction in economic productivity causing pain and suffering, increased medical costs, income loss due to absence from work, loss of leisure time and reduced individual

productivity (Knight et al., 2003). The burden of foodborne disease is not limited to developed countries. In the U.S. the CDC estimated that in industrialized countries, as much as 1/3 of the populations suffer a foodborne illness each year (WHO, 2002). The financial cost of foodborne illness can be considerable and should not be neglected. Research by Buzby and Robert (1997) commented that seven foodborne pathogens found in animal products cost the U.S. an estimated $6.5 to $34.9 billion each year. The annual cost of health care caused by foodborne illness is estimated to be $9.3 to $23 billion (Meer& Misner,2000; Riswadkar,2000; Barth,2001, U.S Department of Health and Human Services [HHS], 2004). Hospitalization costs are estimated to be $3 million per year and the cost of lost productivity is estimated around $20 to $40 billion per year (HHS, 2004). Food safety systems need to be designed to protect consumers from the emergence and reemergence of pathogens. As foodborne illnesses are preventable, these are costs that are potentially avoidable.

Food Safety at Home and Consumer Roles

It has been demonstrated that 21% of foodborne infections occur in the household (CDC, 2005). Many people are unaware that the home is a likely place for microbiological food risk. Instead they believe that the responsibility lies with the food manufacturer and restaurants. WHO (1992) estimated that the home is one of the most frequent places for acquiring foodborne illness events. Borneff et al. (2001) reported that illness from food consumed in private home is three times more frequent than food consumed in cafeterias. (Knight et al., 2003) Nevertheless, this percentage is likely to be much larger since most of the home outbreaks are unreported. Along with producers and

commercial food manufacturers, consumers also play a critical role in the strategies to prevent foodborne illness. Consumers signify the final step in the food preparation process as it is considered the final line of defense.

We live in a microbial world, and there are many opportunities for food to become contaminated as it is produced and prepared. Meat and poultry become contaminated during slaughter by contact with small amounts of intestinal content. Similarly, fresh fruits and vegetables can become contaminated during production or if washed or irrigated with water that is contaminated with animal manure or human sewage. Later in food processing, other foodborne microbes can be introduced from an infected human who handles the food, or by cross contamination on from some other raw agricultural product. For example, hepatitis A virus can be introduced by unwashed hands of food handlers who are themselves infected. In the kitchen microbes can be transferred from one food to another food through the use of the same knives, same cutting board or other utensils when handling more than one food. A food that is fully cooked can become re-contaminated if it touches other raw foods or drippings from raw that contain pathogens. The way food is handled after it is contaminated can also make difference in whether or not an outbreak occurs. Many bacteria microbes need to multiply to a larger number before enough are present in food to cause disease. Foe example, a slightly contaminated food, when it is left overnight, can be highly infectious by the next day.

Mishandled food at home is the cause of many foodborne outbreaks. The importance of the home as a point of origin for foodborne disease had prompted a strong interest in conducting survey seeking to identify consumer's food safety knowledge (Collins, 2000). Studies of the result show that more than the half of the population had

some knowledge about food safety. A survey conducted by Food and Drug administration (FDA) and Food Safety and Inspection Service (FSIS) that assessed consumer knowledge on microbes found an increasing of awareness of the role of microbes in foodborne illness.

Food safety behaviors have also been analyzed either through direct observation or consumer self report. Results show a significant prevalence of food preparation/consumption practices linked with foodborne illness. The U.S Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in eight states identified the following risky food handling and consumption behavior: 1) 19% not washing hands and cutting board with soap and water after handling raw meat or chicken 2) 50% eat undercooked eggs 3) 20% eat pink hamburgers and 4) 8% eat raw oysters. Positive changes in self-reported behaviors do not confirm true improvement. It takes longer for consumers to change their actual food handling behavior than their knowledge and behavior (Roosen, 2004).

A few simple precautions consumers can do to protect themselves and reduce the risk of foodborne disease are cook, separate, chill, and clean. The FightBAC! campaign (partnership for food safety education), developed a series of research and education programs to increase awareness of food safety foodborne illness associate with food. FightBAC! is a four point campaign consisting of: clean, separate, chill and cook (www.fightbac.org). These can be further elaborated as follows:

Cook: Consumers are encouraged to cook meat, poultry and eggs thoroughly. Using a thermometer to measure the internal temperature of meat is a good way to be

sure that it is cooked sufficiently to kill bacteria. For example, ground beef should be cook to an internal temperature of 160^0 F.

Separation: Separation emphasizes the important of not cross contaminating one food with another. Avoid cross contaminating foods by washing hands, utensil and cutting boards before, between and after they have been in contact with raw meat and poultry. Put cooked meat on a clean platter rather than back on one that held the raw meat.

Chill: Refrigerated leftovers because bacteria can grow quickly at room temperature. Food should be refrigerated if it is not going to be eaten in 2 hours. Large volumes of food should be divided into several shallow containers for refrigeration to accelerate the cooling process.

Clean: Wash produce before consuming them. Rinse fresh fruit and vegetables in tap water to remove visible dirt and grime. Wash hands with hot soapy water before and after preparing food. Do not prepare food if you have a diarrhea illness.

HACCP adds a fifth element: report. It encourages consumers to report suspected foodborne illness to the local health department to aid in improving the food safety system.

Foodborne illness is preventable, though there is no simple one-step prevention, such as using vaccine. Consumers can promote general food safety with their dollars, by purchasing food that had been processed for safety. For example, buying pasteurized milk rather than raw un-pasteurized milk can prevent an enormous number of foodborne diseases everyday. This highlights the needs for greater consumer education regarding safe food handling in the domestic environment. Multiple food safety responsibilities lie

with the consumer who must be aware of the level of safety associated with the foods they purchase.

Food Nutrition Education of Children

Theoretical approach

Developmental theory suggests that children learn from experiences based on Bronfenbrenner's theory of ecological development, the person's evolving conception of the ecological environment and his relations to it (Bronfenbrenner, 1979). Bronfenbrenner hypothesized that the best mechanism for children to learn is through their awareness and active involvement in their physical and social environments. Children's perceptions of their experience are related to their learning process (Matheson et al, 2002). Based on this hypothesis, many researchers assume that most preschool children's food and nutrition knowledge is acquired through direct experiences with food from their home, not through formal instruction. Matheson (2002) reported that the child's perception shapes his or her behavior and with prior empirical work indicating that the eating context is important in shaping the child's food behavior (Birch et al., 1980, Drucker et al., 1999, Kleges et al., 1991, & Matheson et al., 2002). These findings can be used when planning nutrition intervention programs for preschool children.

As mentioned previously, Piaget's cognitive development theory emphasized an aged-appropriate instructional approach based on the cognitive characteristic of developmental stages. These characteristic includes the reliance on information from the sense, need of hands for manipulation, and inability to understand abstract concepts and long term causality (Auld et al., 1998). Knowledge is actively constructed based on

experiences not from passively learned. In addition, research shows that young children's food preferences and food acceptance are strongly influenced by associative conditioning from their direct experience with food (Birch, 1979, Birch et al., 1982, Birch et al., 1998).

Social Cognitive theory (SCT) considers the importance of environmental, individual, and behavioral factors in influencing health behaviors. SCT is one of the most frequently cited theories in nutrition education (Contento, 1995). Cognitive knowledge is seen as one element that will affect eating behavior. The SCT suggests that behavior changes result from an increased strength of the perceived relationship between behavior and its consequences. One's ability to perform a behavior is a major element in developing an expectation (Bandura, 2000).

According to Novak (1997) nutrition education programs should be built based on children's past experiences instead of teaching concepts not relevant to the children's everyday experiences. Therefore, nutrition education based on children's day to day experiences with food rather than on their understanding of food groups may be more effective in shaping their behavior.

It is suggested that nutrition intervention should be designed to be tied to behavioral change theories, considering the children's readiness to learn, and was structured to be accepted by the school and the teachers. As seen in Auld's et al. (1998) research, the developmental theory is translated into classroom activities through the making and eating of food (reliance on senses, experience and the attainment of skills), focusing on how the food tastes rather than how it affects disease state later (present instead of future), emphasizing food instead of nutrients (reliance on concrete instead of abstract).

The application of both CDT and SLT in design and evaluation of nutrition education material for children is very important.

Transtheoritical Model/ Stage of Change

The transtheoritical model, more commonly known as "Stage of Change Model," has been established as the basic for intervention across numerous behaviors (Robert, 2006). It is based on the premise that individuals are at varies stages of readiness to change, from no interest or motivation to engaging in change, over period of time. Five stages are used to classify position along the readiness to change continuum: precontemplation (no interest in change), contemplation (want to make a chance at some point in the future), preparation (getting ready to change), action (actively engaging in change), and maintenance (have been actively engaging change over an extended period of time).

Determining readiness to change is crucial in deciding the approach to interventions. The transtheoritical model is a model that has been adopted by WIC to client's movement toward positive health and positive parent-child feeding behaviors (Robert, 2006). One of the nutrition education programs-wichealth.org, a stage of change based program has been launched and evaluated for its impact. The result indicated this program is effective and support to positive behavior change associate with feeding relationship.

The OBCSY self- check evaluation was developed based on the transtheoritical model. The checklist allowed the evaluation of children at a wide variety of positions on

the stages of change model to determine the readiness of the participants to change current behaviors of beef consumption and food safety related issues.

Children's attitude toward eating

Children are not born with the ability to choose nutritious foods that provides a balanced diet and the ability to equalize food intake with physical activity. Like most behaviors, children's food and nutrition related attitudes and behavior patterns were developed during the preschool years and continue to change somewhat throughout life (Young et al., 2003). There is evidence that dietary patterns established at age of three and four track into later childhood (Singer et al., 1995).

An increased understanding of the early development and interaction of these factors is particularly important for three key reasons: food preferences and habits are often established in childhood and continue through adulthood (Kelder et al., 1994), nutrition influences established in childhood can have long-term effects (Solomon & Kington et al., 2002), and childhood may be a time of openness to modify food choices (Gibson et al., 1998). Kelder et al. findings suggested that eating patterns may become resistant to change as early as the sixth grade and early exposure to a wide variety of food is a critical step to the development of food acceptance patterns.

Parents and child care providers can influence dietary patterns of young children by exposing them to a variety of healthy food in a pleasant environment and by modeling appropriate food related behaviors (Birch, 1998; Tibbs et al., 2001).

Parental influence

Parents influence many aspects of children's lives including food behaviors. According to the social cognitive theory, children's behaviors are partially learned by observing role models (Bandura, 1997). Parents may influence children's food intake through the purchase and preparation of food. Parents also influence children's behavior through their own nutrition knowledge, by monitoring children's food choice and through their own food preferences (Oscarson, 1999). Borah-Giddens and Falciglia (1993) conducted a meta-analysis of previously published research to determine the relationship between parents' and children's food preferences. They found a positive co-relationship indicating that parental food preferences affected children's but not significant in predicting children's food preferences. Evidence suggested that children learned to like the food they frequently ate (Birch & Marlin, 1982). However changes in food acceptance develop slowly and children may need as many as eight to 15 exposures before clear acceptance is observed (Birch& Marlin, 1982; Birch et al., 1995; Satter, 2000; Skinner et al., 2002; Young et al., 2003).

Trying to control a child's eating habits is counterproductive (Fisher et al., 2002). By allowing children to make decisions about what to eat and how much to eat, parents empower their children to have self-regulation of their eating habits (Satter, 2000). According to Satter, the parent's job is to offer a variety of food, plan and assemble meals, and ensure that meals and snacks are served in a timely manner. The child's responsibility from there is to decide what to eat, how much and even whether to eat or not.

Because the importance of parents in the development of children's food behaviors has been recognized parent education components have been added to nutrition education programs. Nutrition information has been provided to parents in a variety of formats. Parents' involvement in at home curriculum has been found to have a great effect on changes in both parents and school-age children's food behaviors than a school only curriculum (Crockett et al., 1989).

Many children in childcare and after school care facilities have food experiences that are not directly influenced by parents. In an opinion survey conducted by Wright and Radcliffe (1992), parents indicated that both the home and the child care center has an impact on children's food behaviors. Although childcare teachers were aware of the importance of nutrition, their knowledge was limited. The literature suggested several factors that were important to facilitate the development of healthy eating behavior in young children in childcare settings. Justified factors include developmentally and culturally appropriate information for the children, people who model healthy eating behaviors, parental involvement and educational materials for the child care provider and parents (Oscarson, 1999).

Healthy eating habits are more likely to develop when childcare providers and parents collaborate to model healthful food behaviors and practice healthful child-feeding practices.

CHAPTER III

METHODOLOGY

Introduction

The purpose of the Oklahoma Beef Cooking School for Youth was to offer hands-on experience where children had the opportunity to learn food preparation skills, about the economics of buying beef for the family, the contributions of beef to the diet, good food safety practices and about careers associated with beef industry. Also part of this project was an evaluation of whether or not participants anticipated making changes in the frequency or amount of beef they would eat in the future, if they were confident of their ability to cook recipes containing beef, whether they would use a thermometer to determine doneness when cooking beef or pack a cold source in sack lunches and if they would use price per serving when buying beef.

The objective of this study was to determine the effectiveness of the project in meeting the goals of helping children increase their understanding of how beef fits into a healthy diet, how to buy and cook beef and decrease the risk of foodborne illness.

Curriculum

The curriculum was developed as the youth component of the Oklahoma Beef Cooking School, a hands-on adult program. Unlike the adult component which was developed as a series of lessons the youth component was a one time event. The target audience was 10 to 18-year-old children (grades three through 12) who enrolled in OBCSY at their county Cooperative Extension office. Participation also required a signed parental consent form for each child (Appendix F).

The curriculum was designed to use hands-on, participatory learning by having the children work through a series of six learning stations which presented information on food preparation skills, economics of beef, nutrition, food safety, the beef industry, and careers associated with beef. Each learning station was presented in a game format to make the learning experience fun. Stations were manned by volunteers who were trained before each OBCSY to assist with learning stations and cooking groups. After all participants had completed all learning stations the children spent time learning kitchen safety and reviewing the information from the stations via a short PowerPoint presentation. That was followed by division of the participants into small groups and the actual preparation of tested recipes containing beef as the primary protein. Recipes were chosen for their nutritional contributions, availability of affordable ingredients, potential for teaching basic cooking skills, their appeal to the target audience and their inclusion of beef. More recipes were included in the curriculum than were needed for one cooking school to allow individual counties some freedom of choice and to accommodate the lack of availability of some ingredients during changing seasons. All recipes were tested by young cooks who fit the projected target audience profile before inclusion in the

curriculum. The trained volunteers assisted each group as they prepared their assigned recipe. When completed the prepared dishes were brought to a center point for discussion and sampling.

After all cooking activities were completed participants were asked to complete the Oklahoma Beef Cooking School for Youth Self Check form (Appendix G) which served as the evaluation tool. Students were read an informed consent script (Appendix H) prior to their completion of the Self Check form. The script told students that participation in the Self Check was voluntary. If at any time they wanted to stop they were to just put down their pencil and wait quietly until others were finished.

In addition to materials used during the OBCSY event a supplemental packet of materials was distributed to each participant that included the recipes used at the school, activities that could be worked on if children completed their round of learning stations or cooking before others, and information to reinforce information presented at the school.

The curriculum included a series of media announcements for print and electronic media as well as flyers. All were to be used to promote enrollment in the county OBCSY.

Oklahoma Cooperative Extension Service County Educators in Family Consumer Sciences and 4-H Youth were trained on the content of the curriculum, the operation of a school and evaluation procedures. Each trained educator received a compact disc that included the PowerPoint presentations, handouts, recipes, evaluation questionnaires for the children, and promotional tools. Four sets of learning station materials (game boards and pieces) were distributed, one to each district office, for Educators to access when needed. Cooking equipment and tools were also available at each district office. Trained educators were given the opportunity to apply for a grant through OCES to cover the cost

of food and supplies needed to offer an OBCSY. From those applications 37 county grants were awarded for amounts between $320 and $400. Each grant was issued the challenge of reaching at least 50 youth.

This study was approved by the Institutional Review Board (IRB) for non-human subjects research at Oklahoma State University. Data being used is archival and de-identified (Appendix I).

Subject Recruitment

Children in grades 3 to 12 (ages 8-18) participated in this study. Participation was voluntary and no material incentive was provided to participants. Subjects were recruited through contact at 4-H meetings and via promotional materials prepared for the school. Subjects were instructed to contact their local county Extension Office if they were interested in participating in the OBCSY. There was no cost to participate in a school.

Experimental Study

Data were collected at the end of each OBCSY using the Self Check tool (Appendix G). The Self Check tool consisted of eight multiple choice questions and one open-ended question about what the participant learned the day of the school. Responses to the multiple choice questions included "more often, the same, less often," or similar responses with the exception of on question one the serving size of beef the participant expected to choose in the future. Responses for that question were "3 ounces, 4 ounces, or 5 or more ounces." There was no pretest or follow-up of participants. A total of 1,055 children completed usable questionnaires.

Statistical Analysis

Data were analyzed using the Statistical Analysis System (SAS) for windows, version 8 (SAS Inst. Inc., Cary NC) frequency and Chi Square procedures. Significant level was set at $P<0.05$. Each response to the checklist was assigned a score. "Most of the time/ for sure/yes" had a score of 3, "may be/the same" had a score of 2, and "less/no" had a score of 1. Chi Square analyses were conducted to examine the bivariate association of teaching the curriculum with comparison to genders and grades.

CHAPTER IV

RESULTS AND DISCUSSIONS

Results

Demographics characteristic

The demographic characteristics of the OBCSY participants are shown in Figure 1. One thousand fifty-five children completed usable questionnaires. The number of respondents varied for different questions because all participants did not answer every question and some participants selected two answers for a question and thus were not used for analysis. Sixty-six percent of participants were girls and 34% were boys. The grade level of participants ranged from kindergarten through twelfth grade. The majority of the participants were in grades four (17%), five (19%), six (16%), and seven (10%).

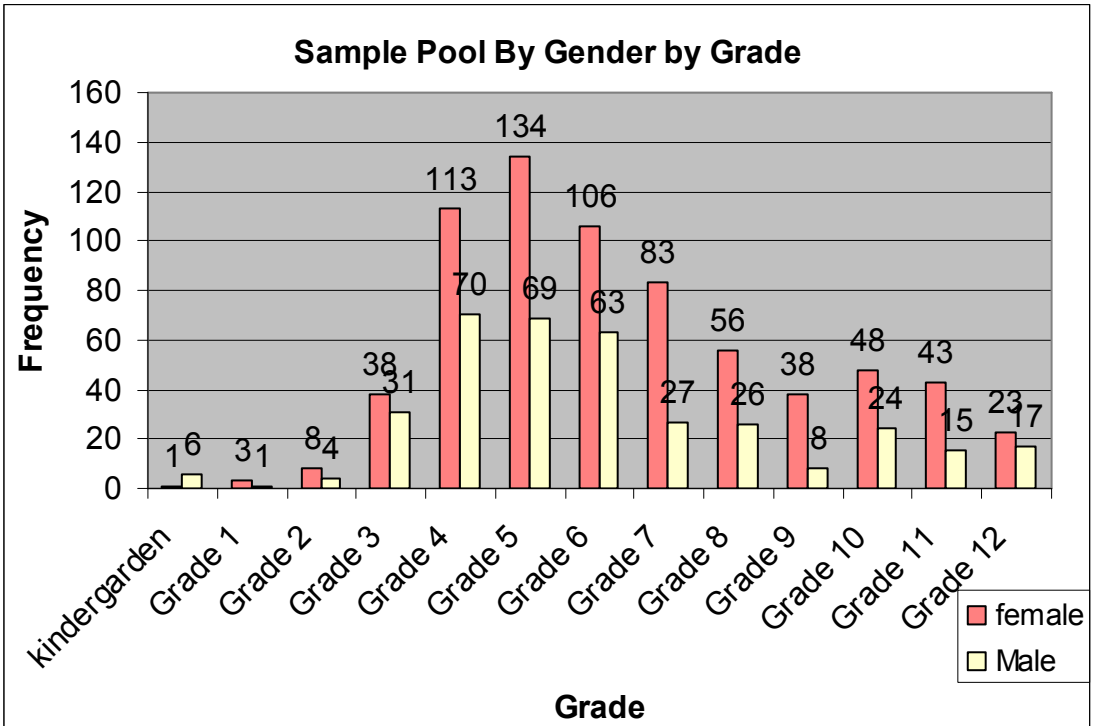


Figure 1: The Demograpic characteristic of the OBCSY participants by grade and gender.

Responses to questionnaire by gender

Question 1: Do you plan to eat beef:

____ *More often* _____ *the same* _____ *less often* *(Figure 2)*

One thousand sixty one participants responded to this question. Sixty percent of respondents were girls and 34% were boys. Overall, 42% of respondents indicated they would increase their beef intake (B=169, G=274). Fifty-four percent of respondents indicated they did not plan to change their frequency of eating beef (B=186, G=387). Four percent of participants responded they would eat beef less often (B=8, G=37). There was no significant difference in the distribution between boys and girls (P=0.059). The

percentages used for each group were based on the total sample of those who responded to this question.

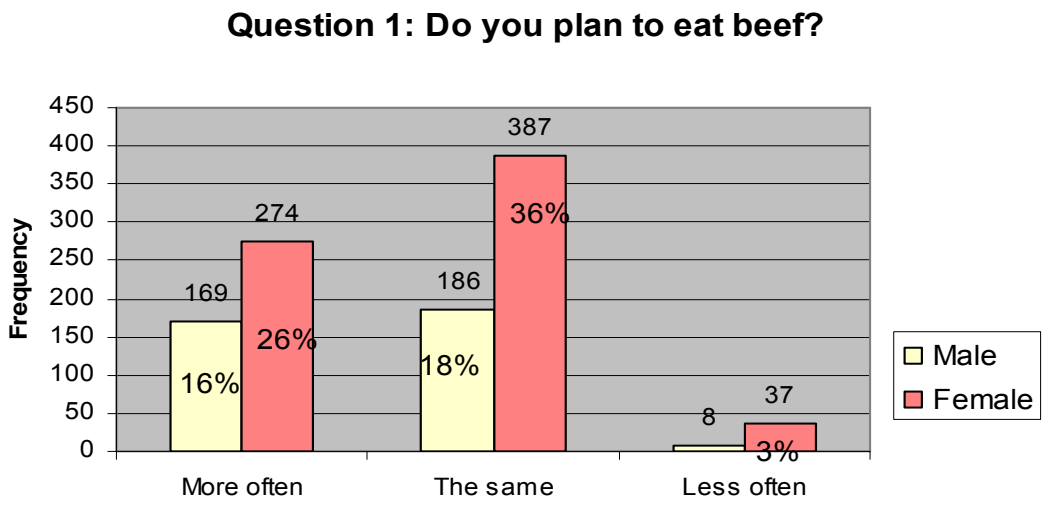


Figure 2: The responses from the OBCSY participants regarding their plan to eat beef. The percentages used for each group were based on the total sample of those who responded to the question.

Question 2: How confident are you that you can cook beef recipes:

____ More _____ the same _____ less (Figure 3)

There were a total of 1057 responses to question two. Sixty-six percent of respondents were girls and 34% were boys. For all responses, 69% indicated they were more confident of their ability to cook beef recipes (B=230, G=494), 28% responded no change in their confidence in their ability to cook beef recipes (B=114, G=180), and approximately four percent of respondents indicated they had decreased confidence in their ability to cook beef recipes (B=16, G=23). There was no significant difference in the distribution between boys and girls (P=0.1802). The percentages used for each group were based on the total sample of those who responded to this question.

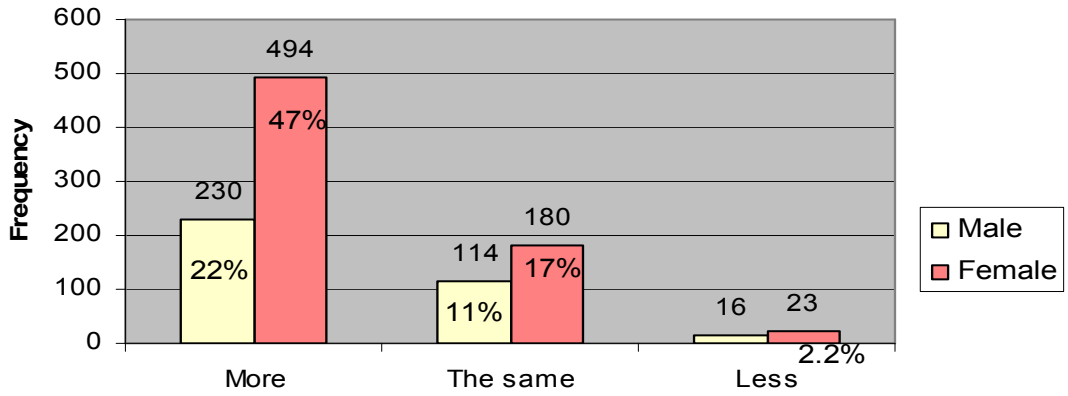


Figure 3: The responses from the OBCSY participants regarding their confidence in cooking beef recipes. The percentages used for each group were based on the total sample of those who responded to the question.

Question 3: Next time you cook beef will you use thermometer to tell when it is done:

_____for sure _____ may be _____ probably not (Figure4)

There were a total of 1054 responses to question three. Thirty-four percent of those who responded were boys and 66% were girls. Among the respondents, 34% indicated they were confident they would use a thermometer to measure the doneness of the beef (B=124, G=235), 43% responded they would consider using a thermometer to ensure the doneness of the beef (B=157, G=296), and 23% responded they would probably not use a thermometer to measure the doneness of the beef (B=78, G=164). There was no significant difference in the distribution between boys and girls (P=0.7788). The percentages used for each group were based on the total sample of those who responded to this question.

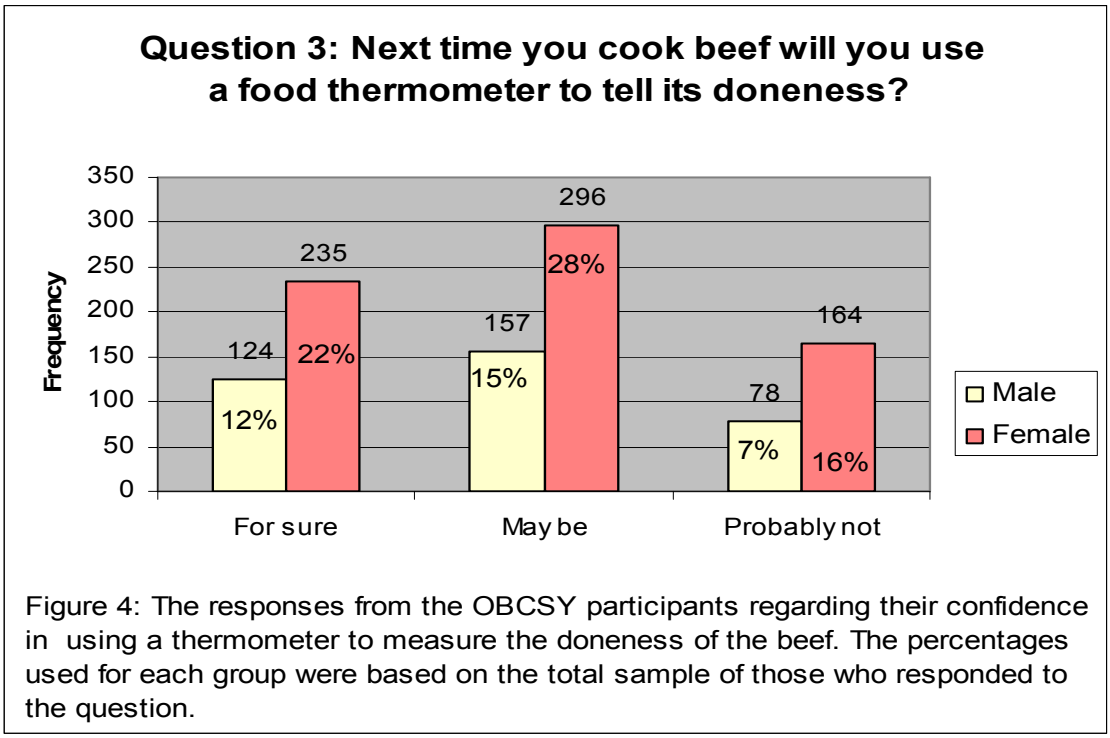


Figure 4: The responses from the OBCSY participants regarding their confidence in using a thermometer to measure the doneness of the beef. The percentages used for each group were based on the total sample of those who responded to the question.

Question 4: Will you pack a cold source in the bag next time you take a beef sandwich in a sack lunch: _____ Yes ____maybe ____No (Figure 5)

There were a total of 1054 responses to question four. Sixty-six percent of those who responded were girls and 34% were boys. Sixty-two percent of respondents indicated they would use a cold source in the bag (B=226, G=437), 26% responded they would consider using a cold source in the bag (B=93, G=176), and 12% indicated they would not pack a cold source in the bag (B=42, G=83). There was no significant difference in the distribution between boys and girls (P=0.7705). The percentages used for each group were based on the total sample of those who responded to this question.

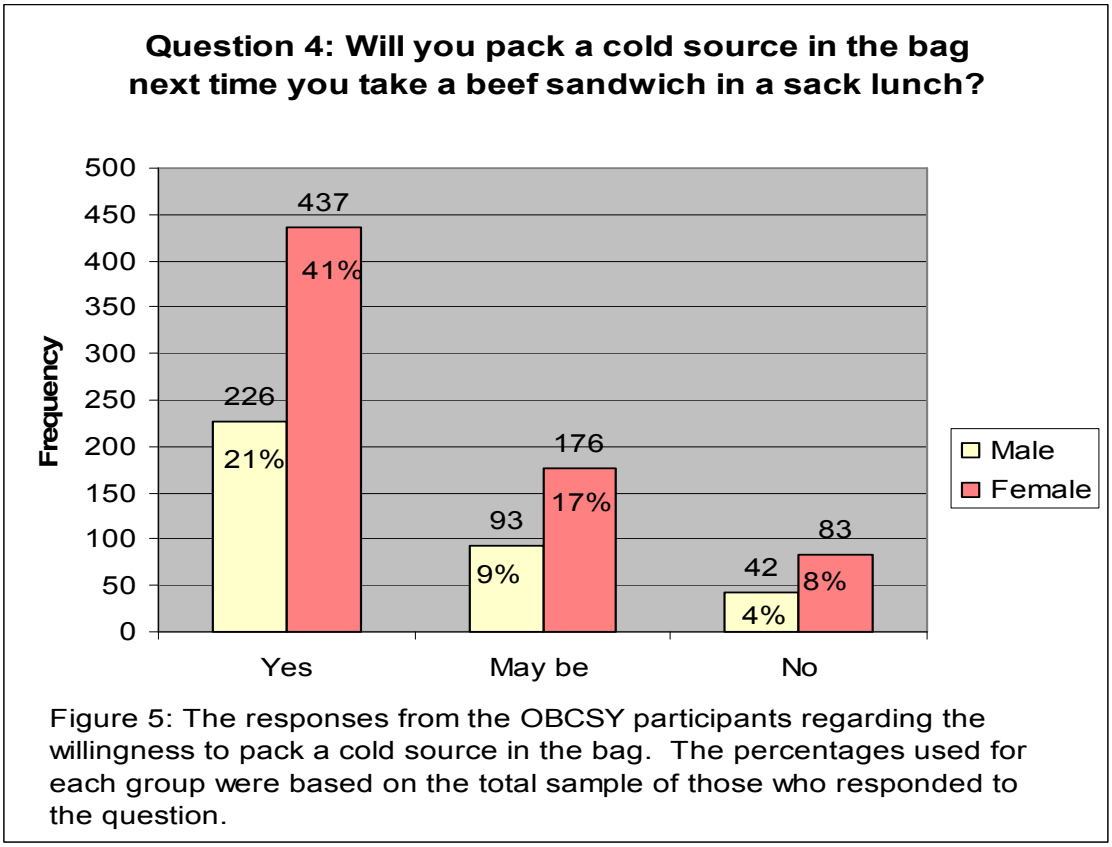


Figure 5: The responses from the OBCSY participants regarding the willingness to pack a cold source in the bag. The percentages used for each group were based on the total sample of those who responded to the question.

Question 5: How big a serving of beef will you usually eat from now on:

_____ *3 oz* _____ *4 oz* _____ *5 oz* *(Figure 6)*

There were a total of 1058 responses to this question. Sixty-six percent of participants were girls and 34% were boys. Sixty-eight percent responded they would eat a 3 ounce serving of beef (B=211, G=505), 17% responded they would eat a 4 ounce serving of beef (B=67, G=118), and 15% responded they would eat a 5 ounce serving of beef (B=84, G=73). There was a significant difference in the distribution between boys and girls (P=0.003). The percentages used for each group were based on the total sample of those who responded to this question.

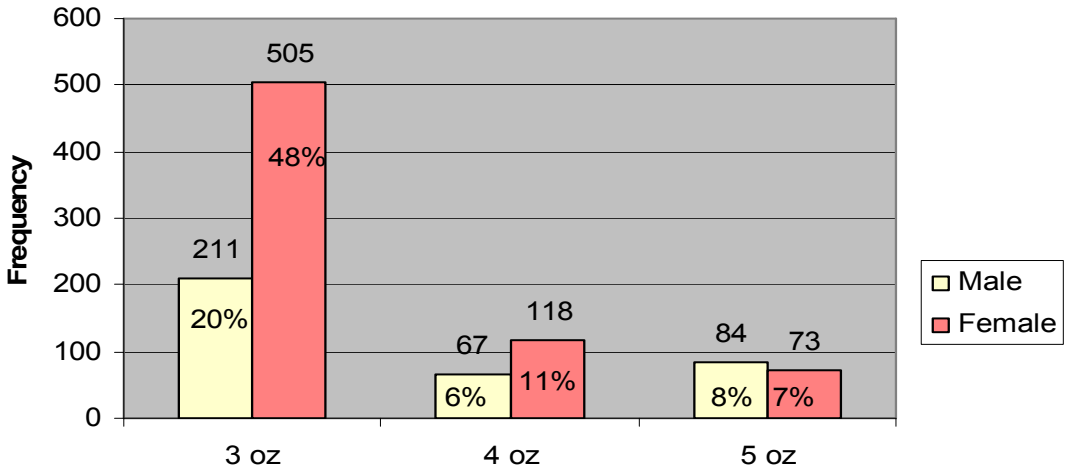


Figure 6: The responses of the OBCSY participants regarding the serving size of beef they are going to eat from now on. The percentage used for each group were based on the total sample of those who responded to the question.

Question 6: When you help your family to buy beef will you consider price per serving:

_____Yes _____ Maybe _____ No (Figure 7)

One thousand sixty-one children responded to this question. Sixty-six percent of those who responded were girls and 34% were boys. Forty-eight percent of participants responded they would consider price per serving when helping to make beef purchases (B=192, G=313), 39% responded they might consider price per serving (B=120, G=295), and 13% responded they would not consider price per serving (B=51, G=90). There was a significant difference in the distribution between boys and girls (P=0.0224). The percentages used for each group were based on the total sample of those who responded to this question.

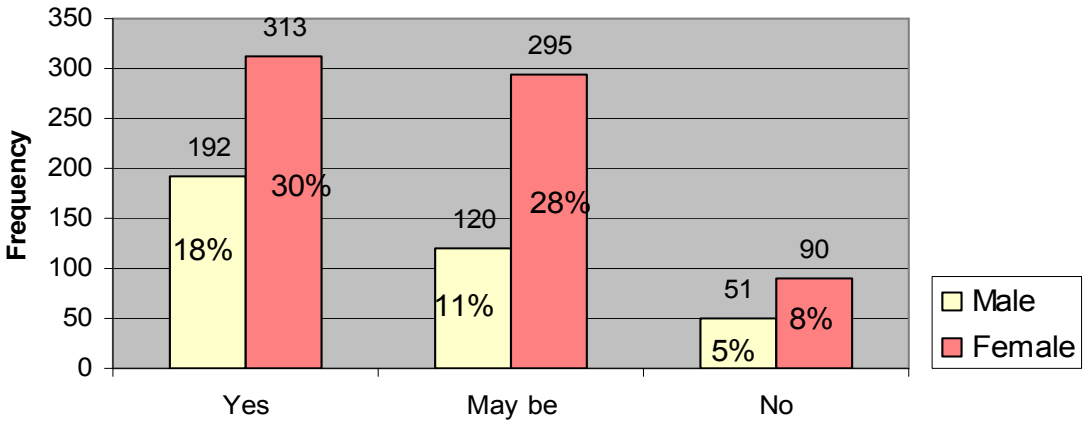


Figure 7: The responses of the OBCSY participants regarding the intention to consider price per serving when buying beef for their family. The percentage used for each group were based on the total sample who responded to the question.

Question 7: Do you think of beef as nutritious food:

_____ *Yes* _____ *Maybe* _____ *No* *(Figure 8)*

There were a total of 1060 responses to this question. Eighty percent of those who responded indicated they thought of beef as a nutritious food (B=286, G=563), 16% responded they might think of beef as a nutritious food (B=61, G=106), and four percent of participants responded they did not think of beef as a nutritious food (B=15, G=29). There was no significant difference in the distribution between boys and girls (P=0.7538). The percentages used for each group were based on the total sample of those who responded to this question.

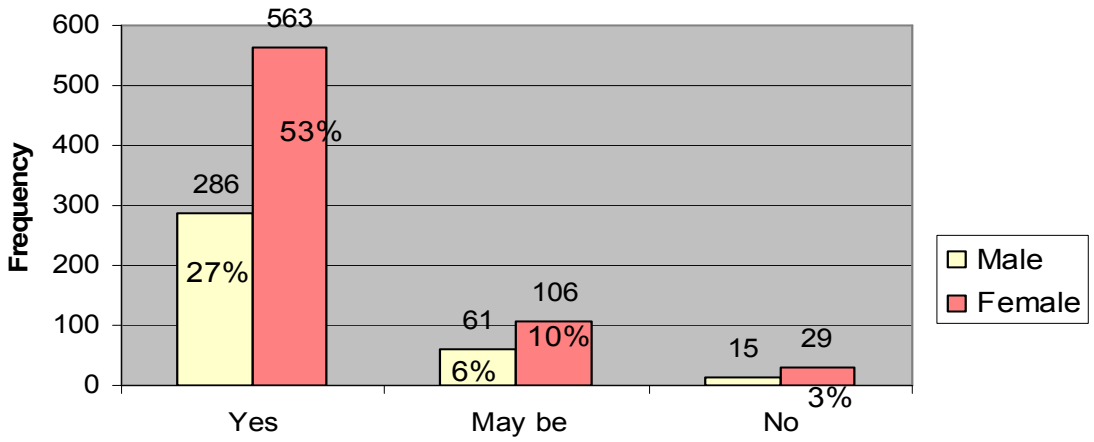


Figure 8: The responses of OBCSY participants regarding their believe where beef as a nutritious food. The percentages used for each group were based on the total sample who responded to the question.

Question 8: Are you going to cook beef recipes at home:

_____ *Yes* _____*Maybe* _____ *No* *(Figure 9)*

One thousand-sixty participants responded to question eight. Sixty-seven percent responded they would cook beef recipes at home (B=239, G=467), 30% responded they might consider cooking beef recipes at home (B=108, G=212), and three percent responded they would not cook beef recipes at home (B=15, G=19). There was no significant difference in the distribution between boys and girls (P=0.1557). The percentages used for each group were based on the total sample of those who responded to this question.

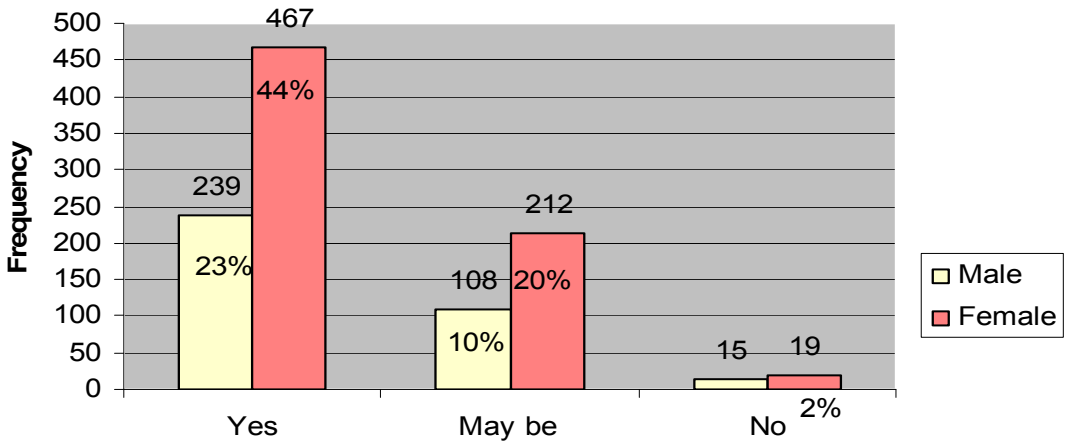


Figure 9: The responses of the OBCSY participants regarding their interest to cook beef at home by gender. The percentages used for each group were based on the total sample of those who responded to the question.

Question 9: Write something you learned from the workshop today. (Figure 10)

All of the lessons learned by participants were summarized and placed into 15 categories. They were categorized as:

1. beef is healthy/ nutritious food;
2. cooking provides lots of fun;
3. had learned to cook at least one of the beef recipes;
4. learned about ZIP;
5. learned about cooking skills;
6. safety precaution in kitchen;
7. learned to be cooperative;
8. learned about sanitation;
9. learned about products made from beef animals;

10. learned about food safety;

11. learned how to read recipes,

12. learned different method to cook beef;

13. learned it is easier to cook beef than previously thought;

14. learned about general beef facts;

15. nothing.

There were 923 responses to this question. Twenty-four percent responded they had learned how to prepare at least one of the beef recipes (B=74, G=149), 14% learned a different method to cook beef (B=58, G=69), 12% learned beef is a healthy and nutritious food (B=42, G=70), 11% learned about beef facts (B=31, G=68), three percent responded cooking provided lots of fun (B=10, G=19), seven percent learned about food safety (B=9, F=53), four percent responded they learned about products made from beef animals, three percent learned cooking skills (B=9, F=23), three percent learned about safety precaution in kitchen (B=7, G=24), and sanitation (B=12, G=14), two percent responded they had learned recipes reading skills (B=5, G=17), two percent responded they had realized cooking beef was easier than previously thought (B=7, G=11), and approximately one percent of participants responded they did not learn anything from the workshop (B=3, G=3).

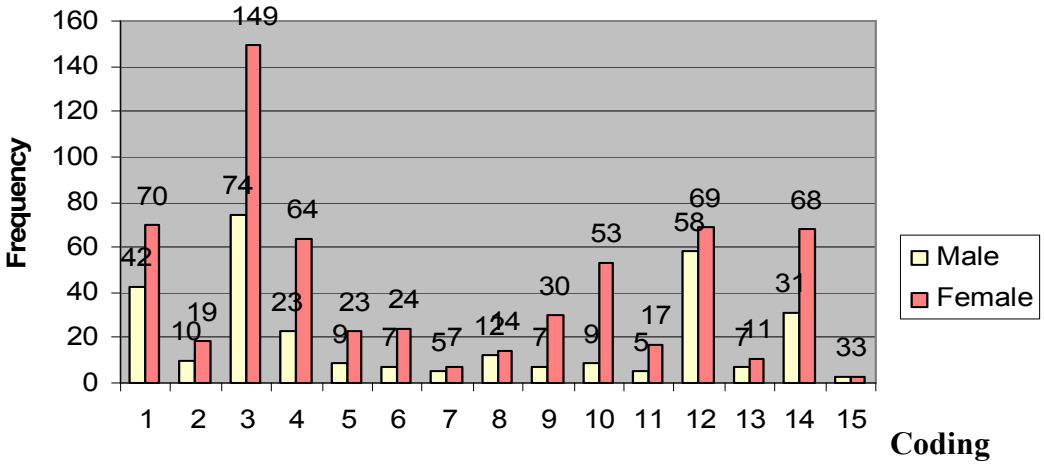


Figure 10: The responses of the OBCSY participants regarding the lesson they had learned from the workshop.

Responses to questionnaires by grade

Chi square analyses were conducted for participants in grades four, five and six participants to examine the association of program efficiency for question one through eight.

Question 1: Do you plan to eat beef:

____ *More often* _____ *the same* _____ *less often* *(Figure 11)*

There were a total of 560 usable responses for grade four (n=185), five (n=203) and six (n=172). Fifty-seven percent of forth grade respondents indicated they planned to increase their beef intake, 37% responded no change in their plan to eat beef and five percent responded they would decrease their beef intake. Fifty percent of fifth grade

participants responded they planned to eat beef more often, 48% responded they planned no change in their frequency of beef consumption and two percent responded they would eat less beef. Forty-one percent of sixth grade participants responded they planned to eat beef more often, 54% responded they had no plan to change their frequency of beef consumption and 4% responded they would eat beef less often. There was a significant different in the chi square distribution between the grades (P=0.0086). The percentages used for each group were based on the total number of those who responded to this question.

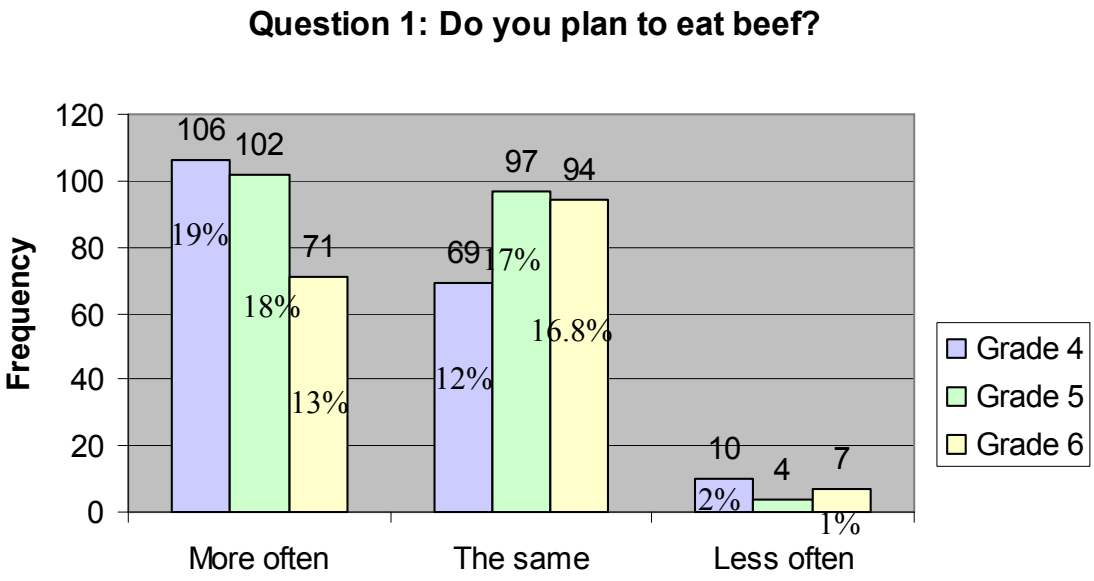


Figure 11: The responses from the OBCSY participants regarding their plan to eat beef by grades. The percentages used in each groups were based on the total sample of those who responded.

Question 2: How confident are you that you can cook beef recipes:

____ *More* _____ *the same* _____ *less* *(Figure 12)*

There were 557 total responses from all three grades; grade four (n =182), grade five (n =204) and grade six (n =171). Seventy-nine percent of forth graders who responded indicated they were now more confident in their ability to cook beef recipes, 17% responded no change in their confidence and four percent indicated a decrease in their confidence. Seventy-two percent of fifth grade participants responded they had an increase in their confidence to cook beef recipes, 23% responded no change in their confidence in their ability to cook beef recipes and five percent responded they had a decrease in their confidence in their ability to cook beef recipes. Seventy-four percent of sixth grade participants responded they had an increase in their confidence in their ability to cook beef recipes, 23% stated no change in their confidence level and two percent stated that they had decreased confidence to cook beef recipes. There was no significant difference in the chi square distribution between grades (P= 0.3123). Even though there was no significant difference, the result shows more participants indicated they had an increase in their confidence in their ability to cook beef recipes. The percentages used for each group were based on the total number of those who responded to this question.

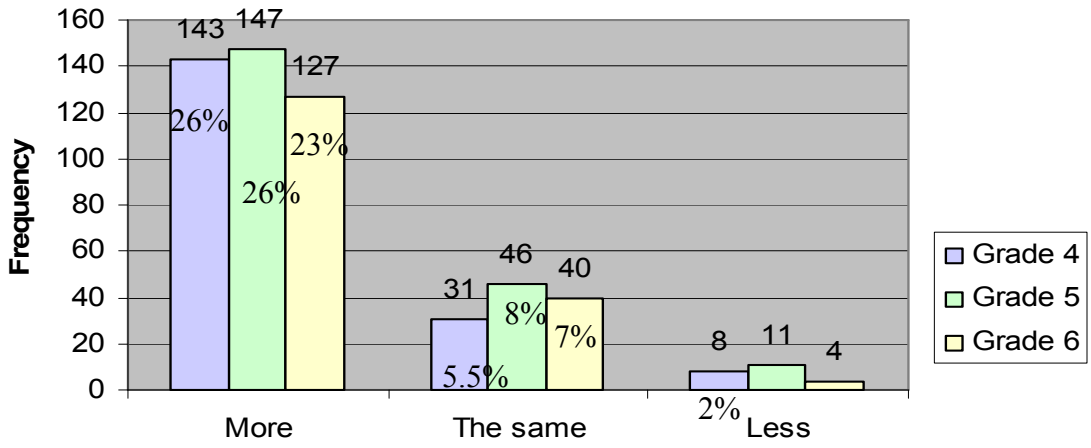


Figure 12: The responses from the OBCSY participants regarding their confident in their ability cook beef recipes. The percentages used in each groups were based on the total sample of those who responded.

Question 3: Next time you cook beef will you use thermometer to tell when it is done:

_____for sure _____ may be _____ probably not (Figure 13)

There were 558 responses from all grades to question three; grade four (n = 185), grade five (n = 203) and grade six (n = 170). Forty-four percent of forth graders who answer question three responded they would use a thermometer to measure doneness when cooking beef, 42% stated they would consider using a thermometer to measure the doneness when cooking beef and 15% stated they would not use a thermometer to measure doneness when cooking beef. Thirty-three percent of participants from fifth grade responded they would use a thermometer to measure doneness when cooking beef, 45% responded they would consider using a thermometer and 22% responded they would not use a thermometer to measure doneness when cooking beef recipes. Thirty-four

percent of sixth grade respondents indicated they would use a thermometer to measure doneness when cooking beef recipes, 40% responded they would consider using a thermometer and 26% responded they would not use a thermometer. There was a significant difference in the chi square distribution between grades (P=0.0435). The percentages used for each group were based on the total number of those who responded to this question.

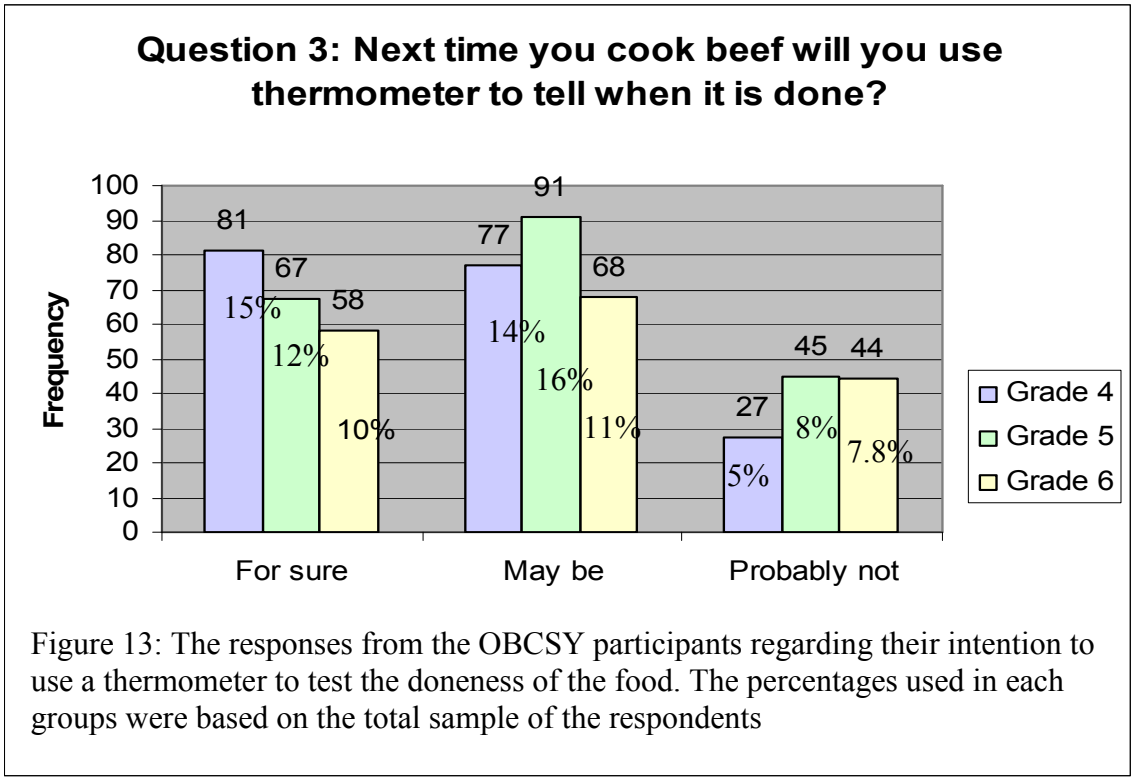


Figure 13: The responses from the OBCSY participants regarding their intention to use a thermometer to test the doneness of the food. The percentages used in each groups were based on the total sample of the respondents

Question 4: Will you pack a cold source in the bag next time you take a beef sandwich in a sack lunch? _____ Yes ____maybe ____No (Figure 14)

Total responses of all three grades was 560; grade four (n = 155), grade five (n =203) and grade six (n =172). Sixty-five percent of forth grade participants who responded to question four indicated they would pack a cold source in their sack lunch bag, 24% of participants responded they might consider using a cold source and 11%

responded they would not use a cold source. Sixty-seven percent of the fifth graders who responded to question four indicated participants responded they would use a cold source and 25% responded they would not use a cold source in their sack lunch bag. Sixty-five percent of sixth graders who responded indicated they would use a cold source, 22% responded they would consider using a cold source, and 13% of the participants responded they would not use a cold source. There were no significant differences in the chi square distribution between grades (P=0.79). However there was a difference in the interest level among the respondents who indicated they would consider packing a cold source in their sack lunch bag, might be considering in packing a cold source in their sack lunch bag and not packing a cold source in their sack lunch bag. Most respondents indicated that either they will pack a cold source in their sack lunch bag or at least will consider packing a cold source in their sack lunch bag. The percentages used for each group were based on the total number of those who responded to this question.

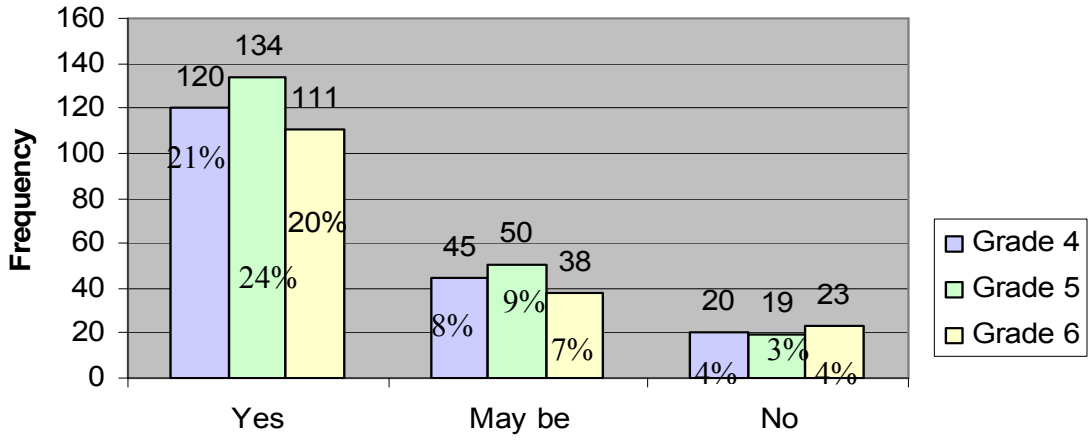


Figure 14: The responses from the OBCSY participants regarding their willingness to pack a cold source in a lunch bag. The percentages used in each groups were based on the total sample of those who responded.

Question 5: How big a serving of beef will you usually eat from now on :

_____ 3 oz _____ 4 oz _____ 5 oz (Figure 15)

There were a total of 560 responses from all three grades; grade four (n =185), grade 5 (n =203) and grade six (n =172). Seventy-seven percent of forth graders who responded indicated they would eat three ounces of meat from now on, 13% indicated they would eat four ounces of meat from now and 13% indicated they would eat five ounces of meat from now on. Sixty-eight percent fifth graders who responded indicated they would eat three ounces of meat from now on, 18% indicated they would eat four ounces meat from now on, and 14% indicated they would eat five ounces of meat from now on. Sixty-five percent sixth grade respondents indicated they would eat three ounces

of meat from now on, 22% of the respondents indicated they will eat four ounces of meat from now on, and 13% indicated they would eat five ounces of meat from now on. There were no significant differences in the chi square distribution between grades (P=0.09). However there was a difference among the respondents who indicated they would eat three ounces, four ounces and five ounces of beef. There were more respondents who indicated they would eat a three ounces serving of beef than the four ounce and five ounces serving, regardless of gender and grade levels. The percentages used for each group were based on the total number of those who responded to this question.

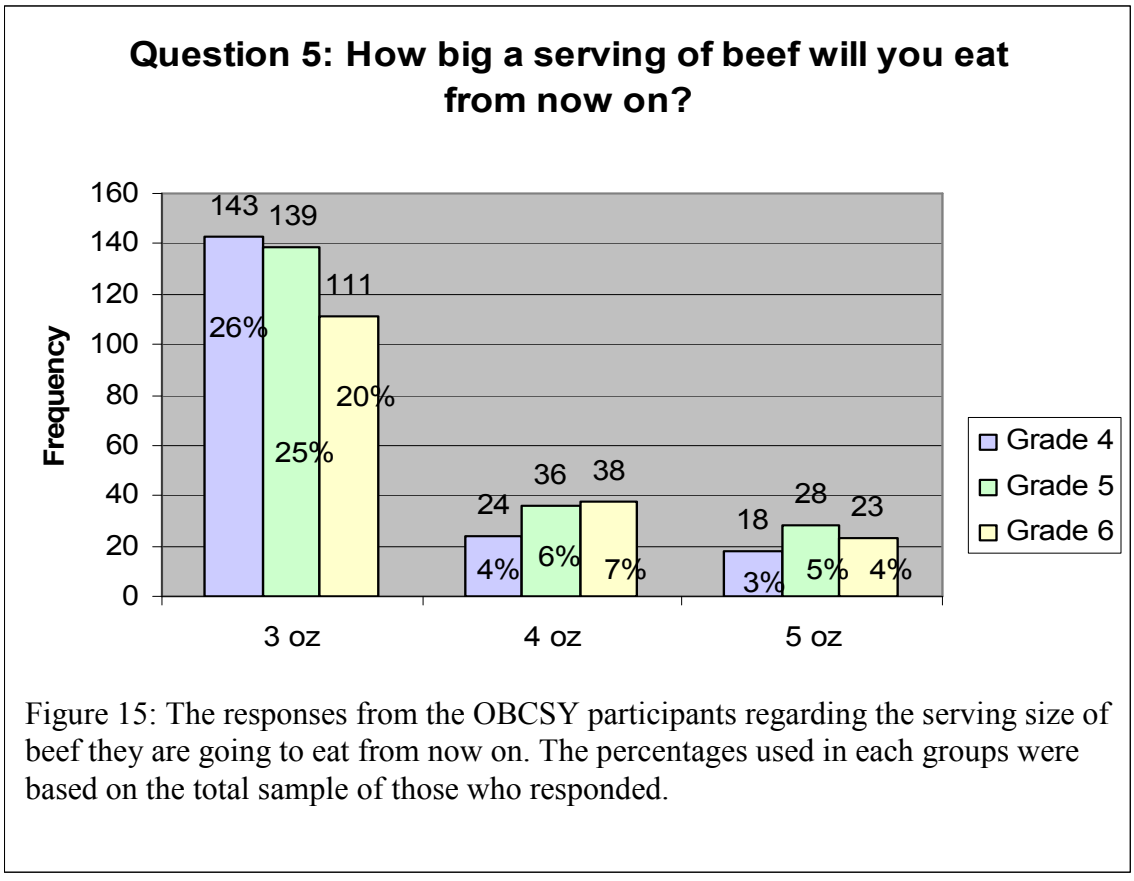


Figure 15: The responses from the OBCSY participants regarding the serving size of beef they are going to eat from now on. The percentages used in each groups were based on the total sample of those who responded.

Question 6: When you help your family to buy beef will you consider price per serving:

_____Yes _____ Maybe _____ No (Figure 16)

Total responses from all three grades were 561; grade four (n =185), grade five (n = 204) and grade six (n =172). Fifty-four percent of fourth grade respondents indicated they would consider price per serving when buying beef for their family, 39% indicated they might consider the price per serving and eight percent indicated they would not consider price per serving when buying beef for their family. Fifty-one percent of fifth grade respondents indicated they would consider price per serving when buying beef for their family, 39% responded they might consider price per serving when buying beef for their family and 10% indicated they would not consider price per serving. Forty-two percent of sixth graders who responded indicated they would consider price per serving when buying beef for their family, 46% indicated they might consider price per serving when buying beef for their family, and 12% indicated they would not consider price per serving when buying beef for their families. There were no significant differences in the chi square distribution between grades (P=0.1827). However there was a difference in the awareness level among the respondents who indicated that they would consider price per serving when buying beef, might be consider price per serving and would not consider price per serving when buying beef for their families. The majority of respondents either would consider the price per serving or might consider price per serving when buying the beef, regardless of gender and grade variables. The percentages used for each group were based on the total number of those who responded to this question.

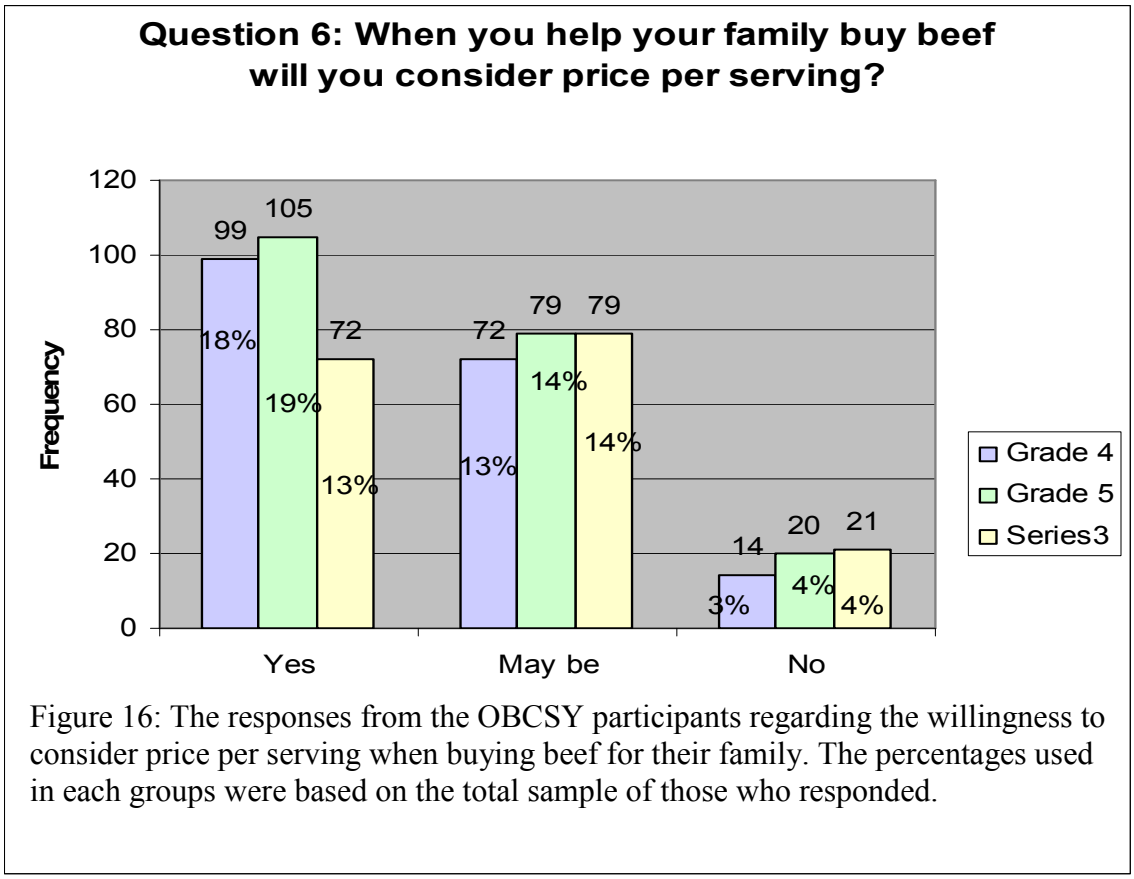


Figure 16: The responses from the OBCSY participants regarding the willingness to consider price per serving when buying beef for their family. The percentages used in each groups were based on the total sample of those who responded.

Question 7: Do you think of beef as nutritious food:

_____ *Yes* _____ *Maybe* _____ *No* *(Figure 17)*

Total usable responses from all three grades were 559; grade four (n =185), grade five (n =202), and grade six (n =172). Eighty-one percent of fourth grade participants who responded indicated they agreed that beef was a nutritious food, 17% responded that beef might be a nutritious food, while three percent disagreed that beef was a nutritious food. Eighty percent of participants from fifth grade responded they agreed that beef is a nutritious food, 16% indicated beef might be a nutritious food and five percent responded they disagreed beef was a nutritious food. Eighty-four percent of sixth grade respondents agreed that beef was a nutritious food, 13% indicated beef might be a nutritious food, and 3% of respondents indicated they disagreed that beef was a nutritious food. There was no

significant difference in the chi square distribution between grades (P= 0.7282). However there was a difference in their belief where beef is a nutritious food among the respondents. The majority of the participants agreed beef is a nutritious food regardless of gender and grade classification. The percentages used for each group were based on the total number of those who responded to this question.

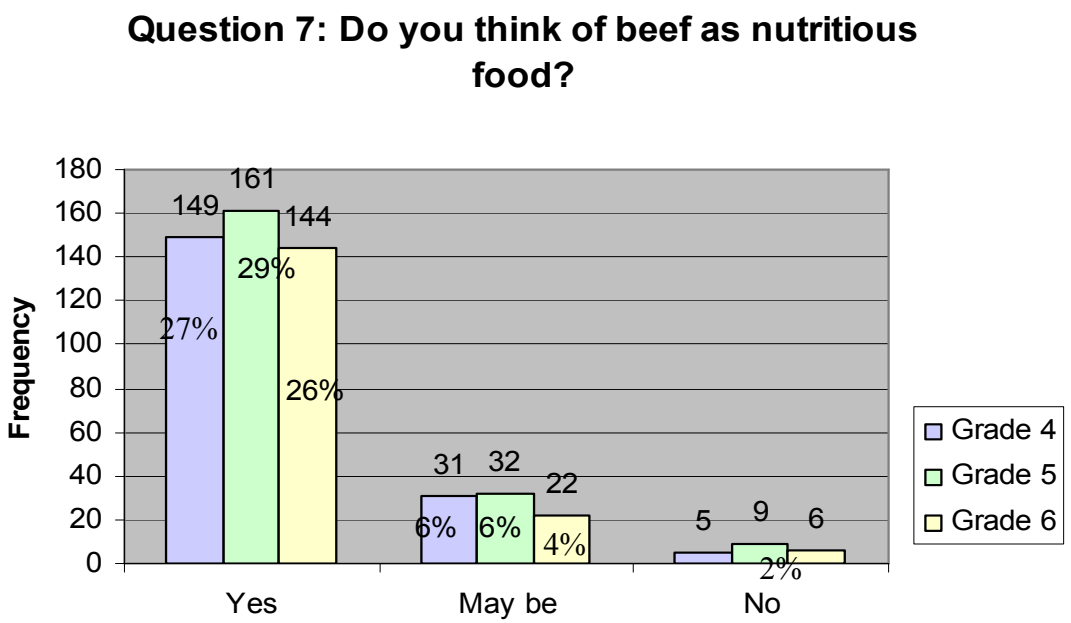


Figure 17: The responses from the OBCSY participants regarding their belief where beef as a nutritious food. The percentages used in each groups were based on the total sample of those who responded.

Question 8: Are you going to cook beef recipes at home:

_____ *Yes* _____*Maybe* _____ *No* *(Figure 18)*

Five hundred sixty one children responded from all three grades; grade four (n = 186), grade five (n =203) and grade six (n =172). Seventy percent of grade four

participants who responded indicated they were going to cook beef at home, 27% indicated they would consider cooking beef at home, and two percent indicated they would not cook beef at home. Sixty-eight percent of respondents from fifth grade indicated they would cook beef recipes at home, 31% responded they might consider cooking beef recipes at home and 1% responded they would not cook beef recipes at home. Sixty-six percent of the sixth graders who responded indicated they would cook beef recipes at home, 30% indicated they might consider cooking beef recipes at home, and four percent indicated they would not cook beef recipes at home. There was no significant difference in the chi square distribution between grades (P= 0.3292). However there was a difference in interest level in cooking beef recipes at home among the respondents who indicated they would cook, might cook and would not cook beef recipes at home: The percentages used for each group were based on the total number of those who responded to this question.

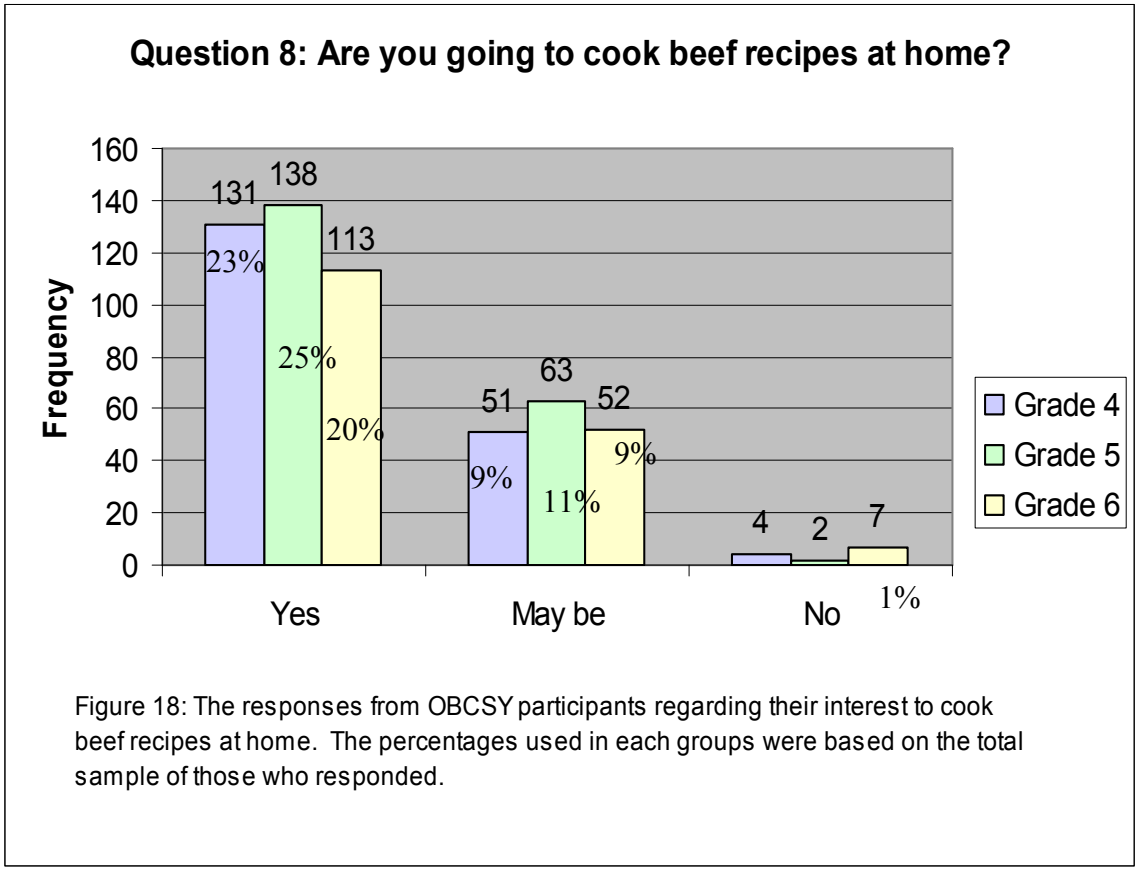


Figure 18: The responses from OBCSY participants regarding their interest to cook beef recipes at home. The percentages used in each groups were based on the total sample of those who responded.

Question 9: Write something you learned from the workshop today.

Chi square distribution between grades for question nine was not calculated due to the limited counts of the cells.

Discussion

This study was conducted to evaluate the effectiveness of OBCSY in meeting the goals of helping children increase their understanding of how beef fits into a healthy diet, how to buy and cook beef and how to make sure the risk of foodborne illness is kept low. The self check evaluation check list was used to examine how close the predetermined

objectives were met while the effectiveness of OBCSY was measured by examining the responses to each question.

Effects of OBCSY from gender perspective

Significant differences were found between genders for question 5: "How big a serving of beef will you usually eat from now on?" and question 6: "When you help your family buy beef will you consider price per serving?" Most girls stated they would eat a 3-ounce serving of beef from now on, while the boys stated they would eat either a 4 or 5-ounce serving beef. More girls than boys responded they would consider price per serving when buying beef for the family. These differences may not exemplify a true positive effect of OBCSY because the sample size of girls is almost double that of the boys and girls are often more diet conscious and are more likely to be responsible for household related activities, such as grocery shopping.

Overall there was no significant difference found in participants' willingness to change their plans to eat beef, their confidence that they could cook beef recipes at home, their intent to use a cold source in sack lunches, their agreement that beef is a nutritious food, and their confidence that they would to cook beef recipes at home.

Effects of OBCSY from a grade perspective

A significant difference was found between grades for question 1 which asked how often participants planned to eat beef in the future and question 3 which asked if they would use a food thermometer to determine doneness when cooking beef in the future. Fourth graders showed more positive responses in their intent to change their

current beef consumption pattern than fifth and sixth graders. Results showed that as the age/grade of participants increased there was a decrease in willingness to change their frequency of beef consumption. This finding supported the idea that eating behavior and attitudes form in the early stage of life and the resistance to behavior change is proportional with increase in age/grade.

The same pattern was seen in participants' willingness to use a thermometer to determine the doneness of beef; fourth grade participants were more willing to use a thermometer than fifth and sixth grade participants.

Because there was no pretest/posttest comparison made on participants it is possible that a change in consumption or use of a thermometer to determine doneness was not necessary for individual participants. They may have been consuming appropriate levels of beef and using a meat thermometer prior to attendance at the OBCSY.

Overall there was no significant difference found in participants' confidence in their ability to cook beef recipes, their expectation that they would use a cold source when packing sack lunches, the size of beef per serving they would eat, their willingness to consider price per serving when buying beef for the family, their agreement that beef is a nutritious food, or their confidence that they would to cook beef recipes at home. Lack of a pretest/post test prevents the conclusion that participants failed to make appropriate changes. The researchers cannot determine whether or not participants came into the program already taking appropriate actions.

Effectiveness of OBCSY

Even though there were a limited number of significant differences found the evaluation results trends show the OBCSY successfully impacted participants' awareness and knowledge about beef. They were aware that beef is a nutritious food, of the appropriate size of a serving of beef, they learned beef cooking skills and how to read recipes, and how to prepare safe food and reduce the risk of injury in the kitchen. In short, OBCSFY met its predetermined objectives in as much as could be determined from the self check questionnaire results.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

The Oklahoma Beef Cooking School for Youth (OBCSY) was developed to help children learn and practice skills associated with buying and preparing food using beef as the source of protein and to help them make nutritious food choices. The curriculum offered hand-on experience where the children learned food preparation skills, the economics of buying beef for the family, the nutrition contributions of beef to diet, good food safety practices, information on careers associated with the beef industry and facts about beef animals and the beef industry. Through cooking, participants used psychomotor skills such as reading, talking, math skills, science, nutrition, thinking and social skills (Church E., 2006). The curriculum of OBCSY focused on the nutritional contribution of beef to a healthy diet, ways to stay safe in the kitchen and how to cook great food.

Participants learned facts about beef, including the 12 cuts of beef that meet the U.S. governments labeling guidelines for lean or extra lean and that 95% lean ground beef is higher in many essential micronutrients and can be lower in fat and calories than ground turkey. Through this curriculum, the children learned information such as the importance of nutrients including protein, zinc, and iron associated with beef and a

healthy diet. The participants worked in teams to prepare user-friendly recipes and had the opportunity to taste and evaluate food they had prepared at the end of the session.

The purpose of this study was to evaluate the impact of participation in the OBCSY: to determine if the cooking school met the goals of helping children to increase their understanding of how beef can fit into a healthy diet, how to purchase beef, nutritious methods of preparing beef and how to reduce their risk of foodborne illness.

The objectives were: 1) To evaluate the effect of participation in OBCSY on the frequency of beef as food choice by children who participated in OBCSY, 2) To evaluate the effect of OBCSY on the confidence of cooking beef in children who participated in OBCSY, 3) To evaluate the effect of OBCSY on good food safety practices by children who participated, 4) To evaluate the effect of participation in OBCSY on the portion size/serving of beef children anticipate they will eat after participation in OBCSY, 5) To evaluate the effect of participation in OBCSY on taking into consideration of the price per serving during the purchase of beef by children who participated in OBCSY, 6) To evaluate the effect of participation in OBCSY on the perceptions of contribution of beef to a nutritious diet by children who participated in OBCSY, and 7) To evaluate the effect of participation in OBCSY on the probability of cooking beef as one of the central foods at home by children who participated in OBCSY.

Discussion of Hypotheses

Hypothesis one stated: There was no difference in the frequency of beef as anticipated food choice for children after they had participated in the OBCSY.

As seen in figure 11, there will be a significant different in chi square distribution between grades (P= 0.0086). Therefore, the researcher rejected the null hypothesis for there was no different in the frequency of beef as anticipated food choice for children after they had participated in the OBCSY.

Hypothesis two stated: There will be no difference in the confidence of children in the ability to prepare beef recipes after they had participated in the OBCSY. As seen in figures 3 and 12, there was no significant difference in the chi square distribution by either gender or grade level in the participants expected confidence in their ability to cook beef recipes. Therefore, the researcher accepted the null hypothesis.

Conclusions

The findings from this study suggested OBCSY was able to improve participants' knowledge and skills about beef in both genders. Participants at younger ages are more adaptive to behavioral change interventions as compared to older children. Younger participants (Grade 4) were more willing to change their routine beef eating habits and were more willing to accept the need to use a thermometer to measure the doneness of beef. These findings supported the literature review that improvement in nutrition knowledge and skills alone will not necessarily foster long term behavioral changes in individuals. The implication from this finding is very critical if this study was going to be furthered. We can then propose the target audience of such programs in the future be focused on third and fourth graders where eating behavior/foundation is not yet fully established but children are more cognitively ready than first and second graders. We

can also apply this finding in future nutrition education programs that aim for behavioral change versus to increased knowledge and technical skills.

Limitation(s)

As mentioned in Chapter I, there are limitations in this study. First, there was no pretest-posttest evaluation available for data comparison at the end of the program. Secondly, this was a one time intervention program where the long term effects were unable to be testified: and also there was no control group or treatment group used to gather baseline data. Third, there was no control group.

Recommendations

Based on the limitation as mentioned above, it is recommended for futures study that:

1. A control group to be used to serve as baseline data. This group of participants would not be involved in any of the cooking lessons.
2. A pretest-posttest intervention designed to be used.
3. The study to be designed so long term effects can be evaluated; using the same group of participants. Researchers should conduct another round of intervention (after a 6 month period) and compare the posttest data to see if there was a significant difference in targeted goals and objectives.

The costs to the American public for poor food choices, the lack of life skills necessary to prepare food at home, and poor food safety practices is huge in terms of physical health, lost wages and work productivity and confidence in the food supply. The Oklahoma Cooperative Extension Service is an important part of the process of

improving Oklahoman's nutritional health via the development of food and nutrition education programs that increase food and nutrition knowledge, food purchasing and preparation skills. These efforts will contribute to a decrease in the number of illnesses and deaths due to overweight and obesity and its associated chronic illnesses.

Table 1

Consumption Statistics Show 20 Years of Change

Item	Unit	Per capita consumption 1977	Per capita consumption 1997	Percent change, 1977-97(1)
Turkey(3)	lb	6.9	13.9	101
Chicken(3)	lb	29.0	50.9	75
Veal(3)	lb	2.6	.9	-68
Canned beefs	lb	2.0	.9	-55
Cane and beef sugar	lb	94.2	66.5	-29
Canned corn	lb	14.1	10.0	-29
Beef(3)	lb	86.3	63.8	-26
Lamb(3)	lb	1.1	.8	-26
Margarine	lb	11.6	8.6	-25

Notes: 1 Percent computed from unrounded data. 2 Dry weight basis. 3 Boneless, trimmed weight. Source: Judith Jones Putnam and Jane E. Allshouse, Food Consumption, Prices, and Expenditures, 1970-97. SB-965. USDA's Economic Research Service, Apr. 1999.

Table 2

Table 1. Dietary Intakes of Iron and Zinc Based on Data from the USDA CSFII, 1994-1996

	Age/Sex Group									
	Infants* <12 months	Children 1-2 years	Girls 12-19 years	Boys 12-19 years	Women 20-29 years	Men 20-29 years	Women 60-69 years	Men 60-69 years	Women 70+ years	Men 70+ years
Proportion of Americans Meeting 100% of RDA for **Iron**	87.9	43.9	27.7	83.1	25.9	86.9	59.3	85.5	37.7	78.5
Proportion of Americans Meeting 100% of RDA for **Zinc**	73.0	15.2	23.9	34.7	19.6	36.6	13.3	24.4	17.4	14.5

*Excludes breast-fed infants.

Figure 19

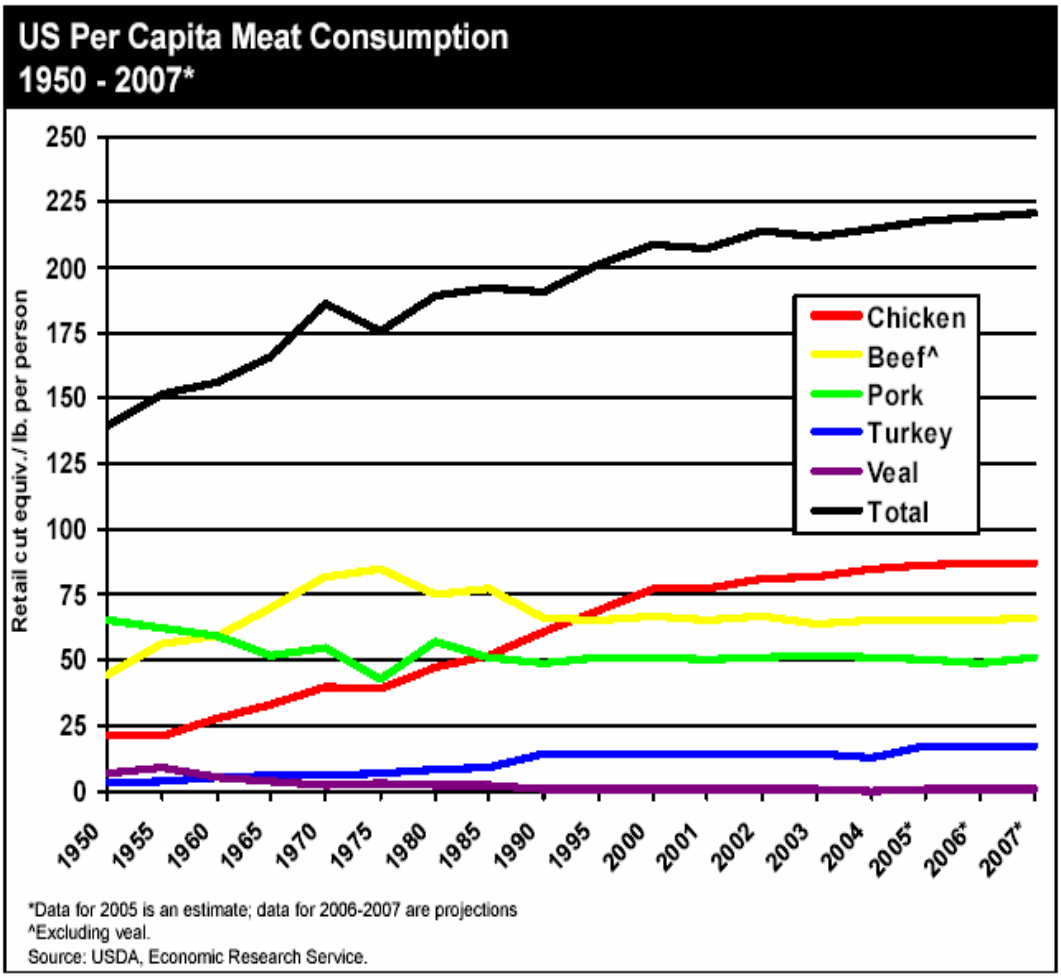

US Per Capita Meat Consumption
1950 - 2007*
Retail cut equiv./ lb. per person
250
225
200
175
150
125
100
75
50
25
0
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2001
2002
2003
2004
2005*
2006*
2007*
Chicken
Beef^
Pork
Turkey
Veal
Total
*Data for 2005 is an estimate; data for 2006-2007 are projections
^Excluding veal.
Source: USDA, Economic Research Service.

Figure 20

Figure 1. Conceptual Model for Developmental Effects of Early Iron Deficiency Anemia.*

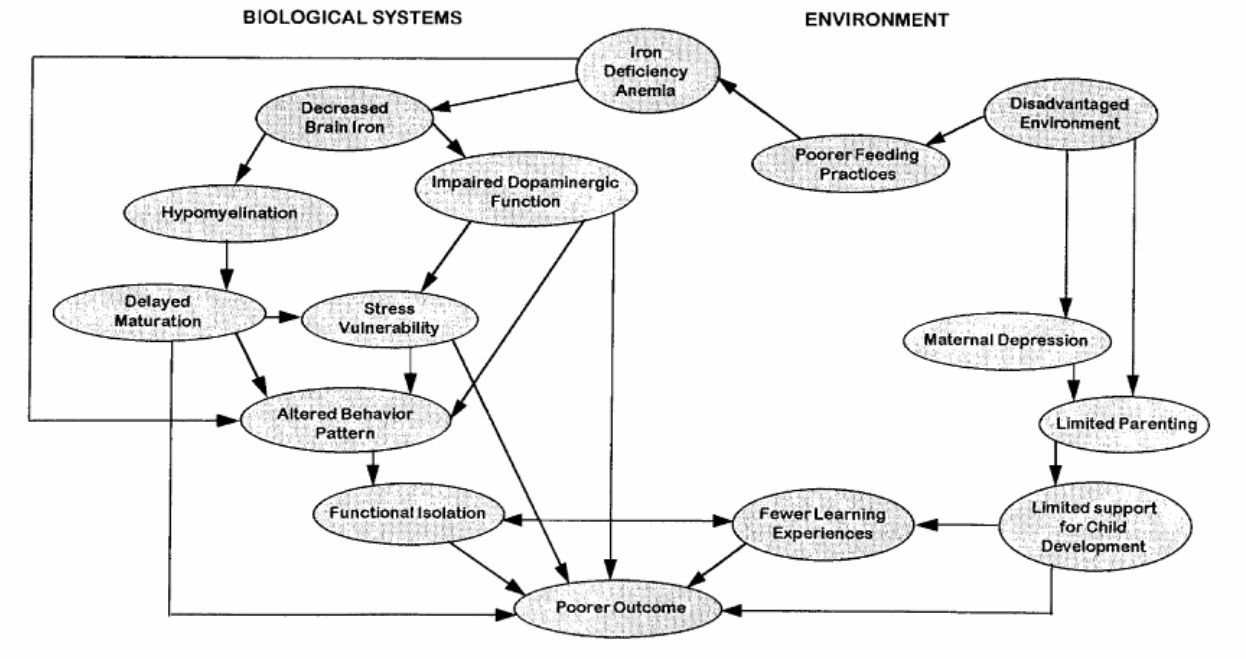
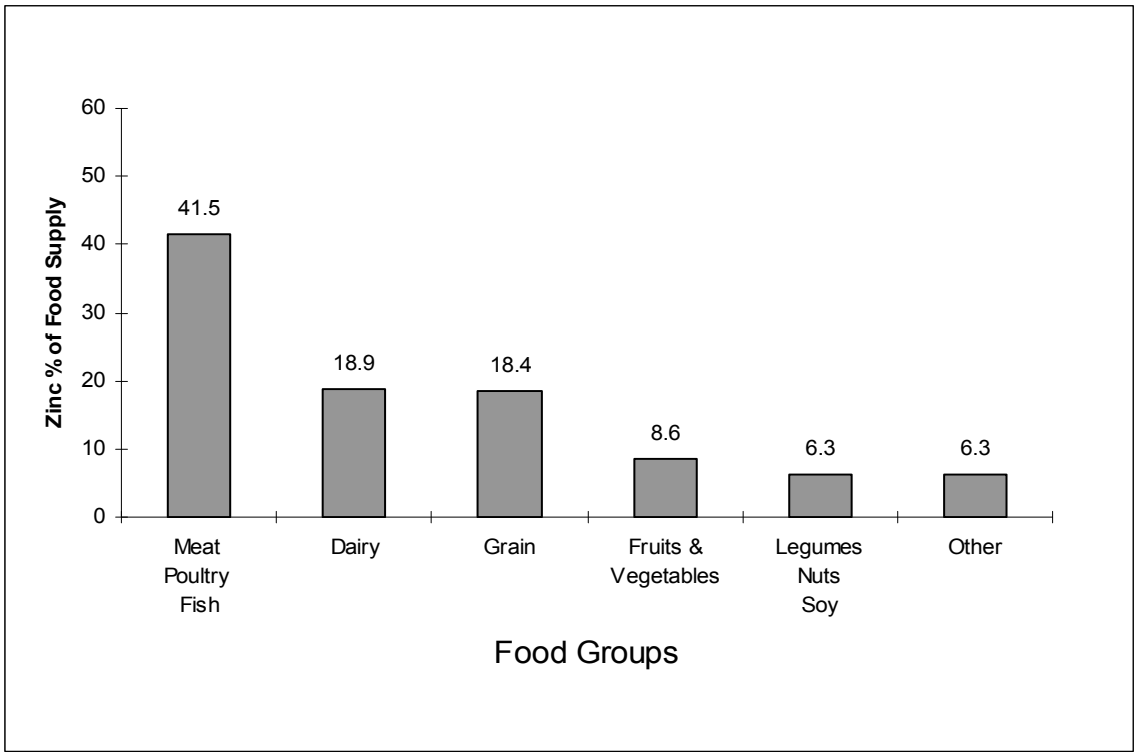


Figure 21

Figure: Source of Zinc in the U.S food Supply



Gerrior S, Bente L. Nutrient Content of the U.S. Food Supply, 1909-94. Home Economics Research Report No. 53. 1997. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion

REFERENCES

Adolf RO, Duval S, Emken EA. (2000). Biosynthesis of conjugated linoleic acid in humans. *Lipids,* 35:131-135.

Agras WS. Et al.,(2004). "Risk factor for childhood overweight. A prospective study from birth to 9.5 years" *Journal of Pediatric* 145, 20-25.

Auld G, Romaniello C., Heimendinger J., Hambidge C, Hambidge M. (1998). Outcomes from a school-based nutrition education program using resource teacher and cross-disciplinary models. *Journal of Nutrition Education*, 30, 268-280.

Bandura A. (1977). Social Learning Theory. Eaglewood Cliffs, NJ: Prentice Hall.

Bandura A. (2000). Self-efficacy, The exercise of control. New York: W.H. Freeman and Company

Banni S, Angioni E, Murru E, Carta G, Melis MP, Bauman D, Dong Y, Ip C. (2001). Vaccenic acid feeding increase tissues levels of conjugated linoleic acid and suppresses development of pre-malignant lesions in rat mammary gland. *Nutrition and Cancer*, 41:91-97.

Barth S. (2001). Foundations of food safety lodging hospitality, 57(6), 11-13.

Bean NH. & Griffin PM. (1990). Foodborne disease outbreak in the U.S., 1973-1987: pathogen, vehicles, and trends. *Journal of food protection*, 53, 80-817.

Birch L, ZimmeranS, Hind H. (1980). The influence of social affective context on the formation of children's food preferences. *Child Development*, 51, 856-861.

Birch LL., and Marlin DW. (1982). I don't like it, I never tried it: Effect of exposure to food on two year-old children's food preferences. *Appetite,* 4, 353-360.

Birch LL., JohnsonSL., & Fisher JA. (1995). Children's eating: The development of food-acceptance patterns. *Young children*, 50, 71-78.

Birch L.(1998). Development of food acceptance patterns in the first year of life. *Journal of Nutrition Education,* 1998, 57, 617-624.

Borah-Giddens, J. & Falciglia, GA. (1993). A Meta analysis of the relationship in food preferences between parents and children. *Journal of nutrition education*, 25, 102-107.

Bonneff P & Simioni M. (2001). Assessing consumer response to protect designation of origin labeling: a mixed multinomial logic approach. *European Review of Agricultural Economics*, 28, 433-449.

Bronfenbrenner, U. (1979). The ecology of human development: Experimental by nature and deign. Boston: Harvard University Press.

Buzby JC & Robert ST. (1997). Economic costs and trade impacts of microbial foodborne illness, world health statistic Quarterly, 50(1-2), 57-66.

Cattleman's Beef Board (2005). Beef industry at a glance. Accessed 2/26/2007 from www.beef.org/documents/Beef_Industry_at_a_Glance

Cattleman's Beef Board (2007). ZIP 4 Tweens. Accessed 2/26/2007 from http://www.zip4tweens.com/

Cattlemen's Beef Board and National Cattlemen's Beef Association (2007). Beef , It's it what for dinner: new nutrition guidelines. Accessed 03/12/2007. http://www.beefitisfordinner.com/nutrition/newguidelines.asp.

Center for Disease Control and Prevention, CDC (1996).Surveillance for foodborne-disease outbreaks-U.S, 1988-92. Morbidity and mortality weekly report 45(Suppl 5), 1-55.

CDC. (2005). Foodborne illness: Frequent Asked Question. Division of Bacterial and Mycotic Disease. Retrieved from http://www.cdc.gov/ncidod/emergplan/index.htm

Center for Disease Control and Prevention (2003). Behavior Risk Factor, Surveillance System. U.S. Department of Health and Human Services. Retrieved 02/12/2007, from http://www.cdc.gov/nccdphp/pe-factsheets/pe-pa.htm

Church E. (2006). Thinking in the kitchen: Brainstorm while you cooking. *Scholastic parents and children*, 13(5), 73.

Clark L., Roote R. (2004). Building basic living skills in youth-Kids' Chef School. *Journal of Extension,* 24(3).

Collins J. (2000). Impact of changing consumer lifestyles on the emergence /reemergence of foodborne pathogen. *American Meat Institute, Arlington, Virginia*, 13(4).

Condrasky M. (2006). Cooking with a Chef. Journal of Extension, 44(4), 4FEA5.

Contento I, Balch GI, Bronner YL. (1995). The effective of nutrition education and implications for nutrition education policy, programs and research: a review of research. *Journal of Nutrition Education*, 27, 284-418.

Corwin, S. J., Sargent, R. G., Rheaume, C. E., & Saunders, R. P. (1999). Dietary behaviors among fourth graders: A social cognitive theory study approach. *American Journal of Health Behavior, 23,* 182-197.

Cotton PA, Subar AF, Friday JE, Cook A. (2004). Dietary source of nutrients among U.S adult, 1994-1996. *Journal of American Dietitian Association*, 104(6): 921-930.

Crockett, S. J., Mullis, R., Perry, CL., & Luepker RV. (1989). Parent educatin in youth-directed nutrition interventions. Preventive Medicine, 18, 321-328.

Drucker R, Hammer L, Agras W, Bryson S. (1999). Can mother influence their children's eating behavior? *Journal of Development Behavior Pediatric*, 20, 88-92.

Fight-Bac: Educating consumer about safe food handling. Accessed on 2/27/2007 from http://www.fightbac.org/content/view/150/85/

Fisher, JO., Mitchell, DC., Smiciklas-Wright, H., Birch LL., (2002). Parental influences on young girls fruit and vegetable, micronutrient, and fat intake. Journal of American Dietetic Association, 102(1), 58-64.

Gable, S. & Lutz, S. (2001). Nutrition socialization experiences of children in the Head Start program. *Journal of the American Dietetic Association, 101,* 572-577.

Gibson, RS. (1994). Content and bioavailabiity of trace mineral in vegetarian diets. *Journal of Clinical Nutrition*, 59(suppl):1223-1232.

Glavin MO. (2003). A single microbial Sea. Food safety as a global concern, *Environment* 23(1), 203.

Godwin S., Copping R., Speller-Henderson L, Pearson L. (2005).Study finds consumer food safety knowledge lacking. Journal of Family and Consumer Sciences, 97(2),

278-284.
Golan M & Weizman A. (2001). Familial Approach to the treatment of childhood obesity:conceptual model, University of Jerusalem, Israel.
Holben, DHY, Smith AM. (1999). The diverse role of selenium within selenoproteins: a review. *Journal of American Dietetic Association*, 99:836-843.
Jackson, Y., Dietz, W. H., Sanders, C., Kolbe, L. J., White, J. J., Wechsler, H. et al. (2002). Summary of the 2000 Surgeon General's listening session: Toward a national action plan on overweight and obesity. *Obesity Research, 10,* 1299-1305.
Judy P & Allhouse J. (1998). Food consumption, prices and expenditures 1970-95, USDA Economic Research Service, Washington D.C, Statistical Bulletin No. 939.
Kelder S.H., Perry C.L., Klepp K.I., & Lytle LL. (1994). Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *American Journal of Public Health*, 84(7), 1121-1126.
King B.S., Tietyen J.L, Vicker S.S. (2000). Food and Agriculture: Consumer trends and opportunities. Cooperative Extension Service; University of Kentucky, College of Agriculture.
King JC. (2000). Determinants of maternal zinc status during pregnancy. *American Journal of clinical Nutrition*, 71:1334s-1343s.
Klegs R, Stein R, Eck L, Isbell T. (1991). Parental influences on food selection in young children and its relationship to childhood obesity. *American Journal of Clinical Nutrition*, 53,859-864.
Knight, P. G., Jackson, J. C., Bain, B., & Eldemire-Shearer, D. (2003). Household food safety awareness of selected urban consumers in Jamaica. *International Journal of Food Sciences and Nutrition, 54,* 309-320.
Koca Y, Ozdal OL, Celik M, Unal S, Balaban N. (2003). Antioxidant activity of seminal plasma in fertile and infertile men. *Archeology Anthology*, 49:355-359.
Landau MD. (2005). 5 nutrients kids aren't getting enough and must. *Redbook*, 204(5), New York.
Lynn-Garbe C. (2005). Weighing in on the issue of childhood obesity. *Children Education*, 81(2), 70.
Matheson D., Spranger K., Saxe A. (2002). Preschool children's perceptions of food and their food experiences. *Journal of Nutrition Education Behavior*, 34, 85-92.
McCabe-Sellers, B, Q Beattie, S. (2004). Food safety: Emerging trends is foodborne illness surveillance and prevention. *Journal of the American Dietetic Association*, 104, 1708-1717.
Meer RR. & Misner SL. (2000). Food safety knowledge and behavior of expanded food and nutrition education program participants in Arizona. *Journal of food Protection.* 63(12), 1725-1731.
National Beef Board (2004). Beef from pasture to plate. Retrieved 03/05/2007 from http://www.texasbeef.org/communications.php?comm_id=42&sess_id=b6518f22308f7359aa21743e4002df09
National Cattlemen Board (2003). Beef fact: Stearic Acid. A unique saturated fat. Retrieved Nov 2006 from http://www.oklanutrition.org/strearicacid.htm
National Cattlemen Beef Board (2005). Beef work as hard as you do. Accessed 01/25/2007 from http://www.beefitswhatsfordinner.com/nutrition/nutrients.asp

National Cattlemen's Beef Association. The source for Bovine Encephalopathy Information. Accessed 3/11/2007 from BSEInfo.org
Novak JD (1977). A theory of education. Ithaca, NY: Cornell University Press.
Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2002b). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Jama-Journal of the American Medical Association, 288,* 1728-1732.
Oogarah-Pratap B., Bholah R., Cyparsade M., Mathoor K.(2004). Influence if home economics on the nutrition knowledge and food skills of Mauritian School Adolescents. Nutrition and Food Science, 34(6), 264-267.
Oscarson R. and Branum J. (1999). A soy bean education curriculum for preschoolers: Introducing new food to children. *Journal of family and consumer sciences*, 91(1), 59-64.
Riswadkar, A. (2000). An introduction to HACCP: the hazard analysis and critical control point system for food processors. *Professional safety*, 45(6), 33-36.
Ritzenthaler LK, McGuire MK, Falen R, Shultz TD, Dasgupta N, McGuire MA. (2001). Estimation of conjugated linoleic acid intake by written dietary assessment methodologies underestimates actual intake evaluate by food duplicate methodology. *Journal of Nutrition*, 131:1548-1554.
Robert J., John B., Juith V., Mercer Nelda, Rivas J., & Broadbent L. (2006). Wichealth.org: impact if a stage of change-based internet nutrition education program. Journal of Nutrition Education and Behavior, 38, 222-229.
Robin L. (2007). New Demand for Beef Creates a Niche for New Products. The Samuel Roberts Noble Foundation, Inc. http://www.noble.org/Ag/Economics/NicheProducts/index.htm
Roosen J., Hansen K., Thiele S. (2004). Food safety and risk perception in a changing world. Humboldt-University of Berlin.
Satter E.M. (2000). How to get your kids to eat…But not too much. Palo Alto, CA: Bull Publishing.
Singer MR., Moore LL., Garrahie EJ. & Ellison R.C (1995). The tracking of nutrient intake in young children: The Framingham Children's Study. *American Journal of Public Health*, 85, 1673-1677.
Skinner J., Carruth B. (2002). Do foods related experiences in the first 2 years of life predict dietary variety in school-aged children? *Journal of Nutrition Education Behavior*, 34, 310-315.
Solomon S., & Kington R. (2002). National efforts to promote behavior change research: Views from the office of behavioral and social sciences research. *Health Education Research,* 17(5), 495-499.
State Legislature (2005). The high cost of obesity. Accessed 2/26/2007 from http://www.ncsl.org/programs/health/phnews4.htm
Taylor, J. P., Evers, S., & McKenna, M. (2005). Determinants of healthy eating in children and youth. *Canadian Journal of Public Health-Revue Canadienne de Sante Publique, 96,* S20-S26.
The American Dietetic Association. (1999). Position of the American Dietetic Association: Functional Foods. *Journal of American Dietetics Association*, 99, 1278-1285.

Tibbs, R., Haire-Joshu, D., Schechtman KB., Brownson, R., Nanney MS., Houston, S. & Auslander , W. (2001). The relationship between parental modeling, eating patterns, and the dietary intake of African-American parents. *Journal of American Dietetic Association,* 101,535-541.

U.S. Department of Agriculture, Agriculture Research Service, (2005a). USDA: Food availability Spreadsheet. Food per capita consumption data set homepage. Accessed 2/28/2007 from http://www.ers.usda.gov/data/foodconsumption/FoodAvailSpreadsheets.htm#mtpcc

U.S. Department of Agriculture, Agriculture Research Service, (2005b). Dietary Guidelines for American 2005: Chapter 1 Background and Purpose of the *Dietary Guidelines for Americans.* Retrieved 3/9/2007 from http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter1.htm

U.S. Department of Agriculture, Agriculture Research Service, (2005c). Overweight and Obesity: Home. Retrieved 03/17/2007 from http://www.cdc.gov/nccdphp/dnpa/obesity/

U.S. Department of Agriculture, Agriculture Research Service, (2004). USDA Nutrient Database for Standard Reference, Release 17. Nutrient Data Laboratory homepage (http://www.nal.usda.gov/fnic/foodcomp).

U.S. Agriculture, Agricultural Research Service (1998). Database: Result from USDA 1994-1997 Continuing Survey of Food intakes by individuals and 1994-96. Diet and Health Knowledge Survey. ARS Food Survey research group. Retrieved Nov 2006 from http://www.barc.usda.gov/bhnrc/food survey/home.htm

U.S. Census Bureau. (2005). America's families and living arrangements: 2005. Accessed 2/26/2007 from http://www.census.gov/population/socdemo/hh-fam/cps2005/tabFG5-all.csv

U.S Department of Health and Human Service, HHS(2000). Healthy People 2000 progress review, food and drug safety. Washington, DC: HHS, Public Health Service (PHS), office of disease prevention and health promotion (ODPHP). Retrieved 08/10/2006 from file://c:DOCUME~1\LOCALS~1\Temp\4Y8DPL1M.htm

US Dept of Health and Human Service (2000). *Healthy people 2010*. Washington, DC: US government printing office, from http://www.healthypeople.gov

U.S. Department of Health and Human Services and U.S. Department of Agriculture. 2005 Dietary Guidelines for Americans. Accessed 02/26/2007. Http://www.healthierus.gov/dietary guidelines/2005.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. Backgrounder: 2005 Dietary Guidelines for Americans. Accessed 03/20/2007. http://www.health.gov/dietaryguidelines/2004

Variyam, J. N., Blaylock, J., Lin, B. H., Ralston, K., & Smallwood, D. (1999). Mother's nutrition knowledge and children's dietary intakes. *American Journal of Agricultural Economics, 81,* 373-384.

Waylett DK, Mohamaedshah F, Murphy MM, Douglass JS, and Heimback JT. (1999). The role of beef as a source of vital nutrients in healthy diets. Prepared for the National Cattlemen's Beef Association. Arlington, *VA: Environment.*

Welch G (2005). The growing problems of overweight American youths. American Fitness Sept/Oct, CEU corner.
WHO (1992). Surveillance programme for control of foodborne infections and intoxications in Europe. Fifth report, 1985-1989, pp 1-235.
WHO (2002). Food safety and food borne illness. Accessed 2/27/2007 from http://www.who.int/mediacentre/factsheets/fs237/en/
Wright DE., & Radcliffe JD. (1992). Parent's perceptions of influences on food behavior development of children attending day care facilities. Journal of Nutrition Education, 24, 198-201.
Young, E, & Fors, S. (2003). Factors related to eating habits of students in grades 9-11. *The Journal of School Health*, 17, 483-488.
Zheng JJ, Mason, JB, Rosenberg, IH, et al. (1993). Measurement of zinc bioavailablity from beef and a ready to eat breakfast cereal in humans: application of a whole-gut lavage technique. *American Journal of Clinical Nutrition*, 58, 902-907.

APPENDICES

Nutrient Comparisons of Meat, Poultry and Seafood

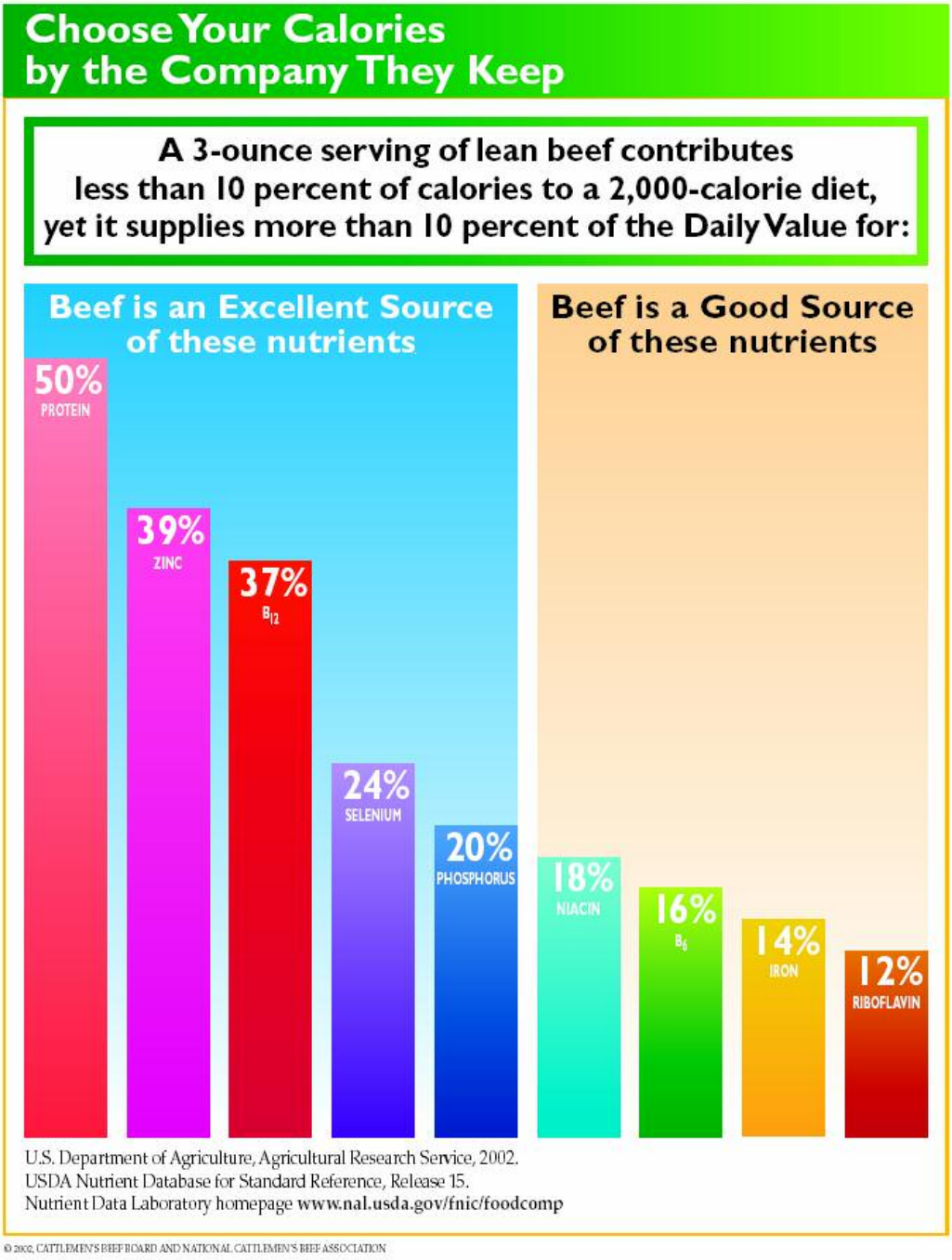
	CALORIES	TOTAL FAT (g)	SATURATED FATTY ACIDS (g)	CHOLESTEROL (mg)	PROTEIN (g)	IRON (mg)	ZINC (mg)
Daily Value*	2000	65	20	300	50	18	15
Lean Cuts of BEEF							
Top Round, broiled	153	4.2	1.4	71	26.9	2.4	4.7
Eye Round, roasted	143	4.2	1.5	59	24.6	1.7	4.0
Mock Tender Steak, broiled	136	4.7	1.6	54	22.0	2.5	6.6
Shoulder Pot Roast (boneless)	147	5.7	1.8	60	22.4	2.6	5.4
Round Tip, roasted	157	5.9	2.0	69	24.4	2.5	6.0
Shoulder Steak (boneless), braised	161	6.0	1.9	80	24.9	3.2	6.7
Top Sirloin, broiled	166	6.1	2.4	76	25.8	2.9	5.5
Bottom Round, roasted	161	6.3	2.1	66	24.5	2.7	3.9
Top Loin, broiled	176	8.0	3.1	65	24.3	2.1	4.4
Tenderloin, broiled	175	8.1	3.0	71	24.0	3.0	4.8
T-Bone Steak, broiled	172	8.2	3.0	48	23.0	3.1	4.3
Tri-Tip, roasted	177	8.2	3.0	70	24.0	3.2	4.2
CHICKEN							
Chicken Breast (with skin), roasted	167	6.6	1.9	71	25.3	0.9	0.9
Chicken Breast (skinless), roasted	140	3.0	0.9	72	26.4	0.9	0.9
Chicken Thigh (with skin), roasted	210	13.2	3.7	79	21.3	1.1	2.0
Chicken Thigh (skinless), roasted	178	9.2	2.6	81	22.0	1.1	2.2
TURKEY							
Turkey Breast (skinless), roasted	115	0.6	0.2	71	25.6	1.3	1.5
Turkey, Whole (with skin), roasted	146	4.9	1.4	89	24.0	1.7	2.5
GROUND MEAT							
Ground Beef, 95% lean/5% fat, pan-broiled	139	5.0	2.2	65	21.9	2.4	5.5
Ground Beef, 90% lean/10% fat, pan-broiled	173	9.1	3.7	70	21.4	2.4	5.4
Ground Beef, 85% lean/15% fat, pan-broiled	197	11.9	4.7	73	20.9	2.3	5.3
Ground Turkey, cooked	200	11.2	2.9	87	23.3	1.6	2.4
SEAFOOD							
Orange Roughy, dry heat	76	0.8	0.0	22	16.0	0.2	0.8
Halibut, dry heat	119	2.5	0.4	35	22.7	0.9	0.5
Tuna, Yellowfin, dry heat	118	1.0	0.3	49	25.5	0.8	0.6

U.S. Department of Agriculture, Agricultural Research Service, 2002. USDA Nutrient Database for Standard Reference, Release 15. Nutrient Data Laboratory homepage **www.nal.usda.gov/fnic/foodcomp**. All beef cuts 1/4" trim, separable lean only, except Tri-Tip, Tenderloin and Tender Steak, 0" trim. All products 3 oz. cooked servings.

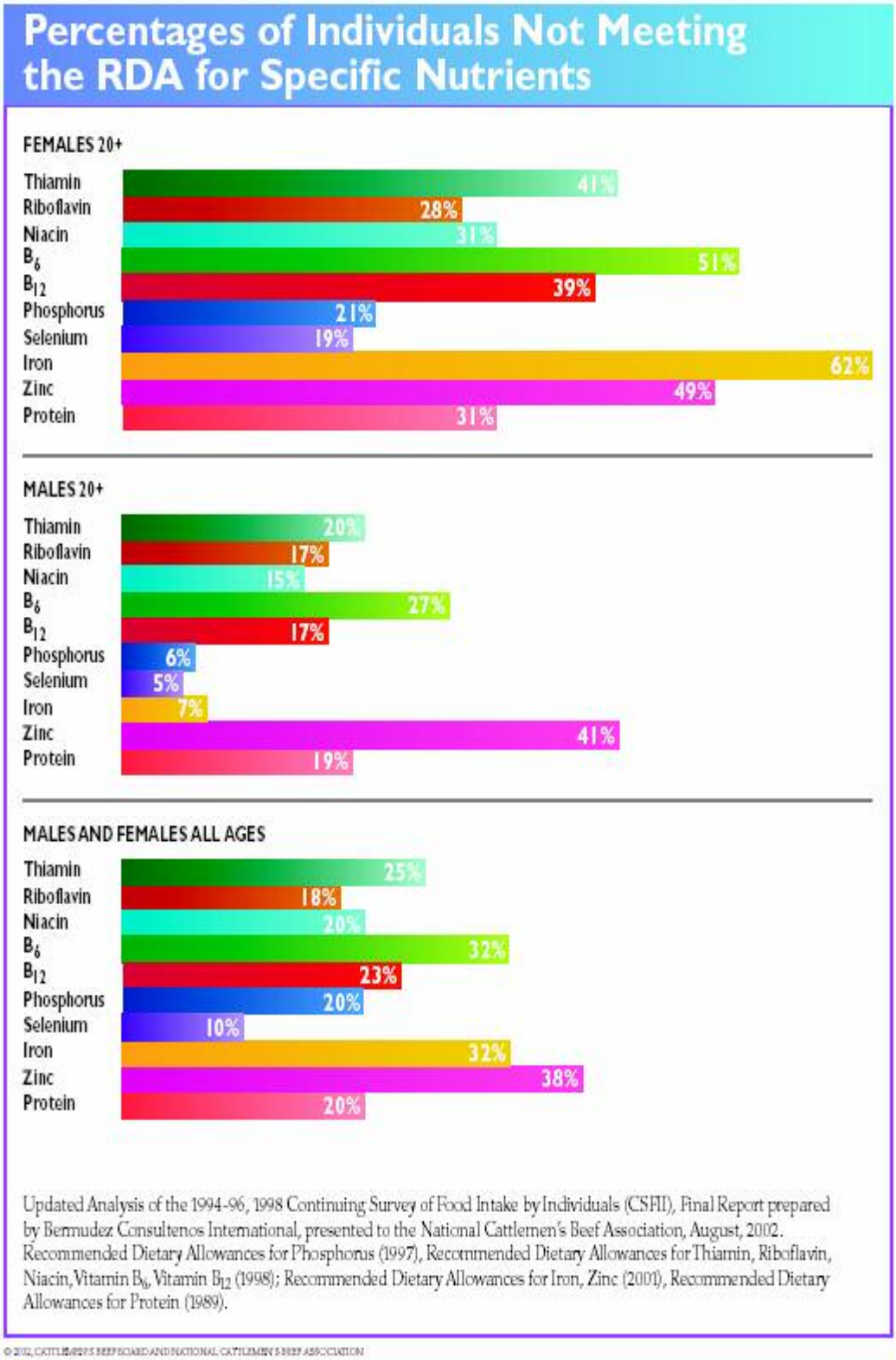
*Based on 2000 calorie intake for adults and children 4 or more years of age.

18-215

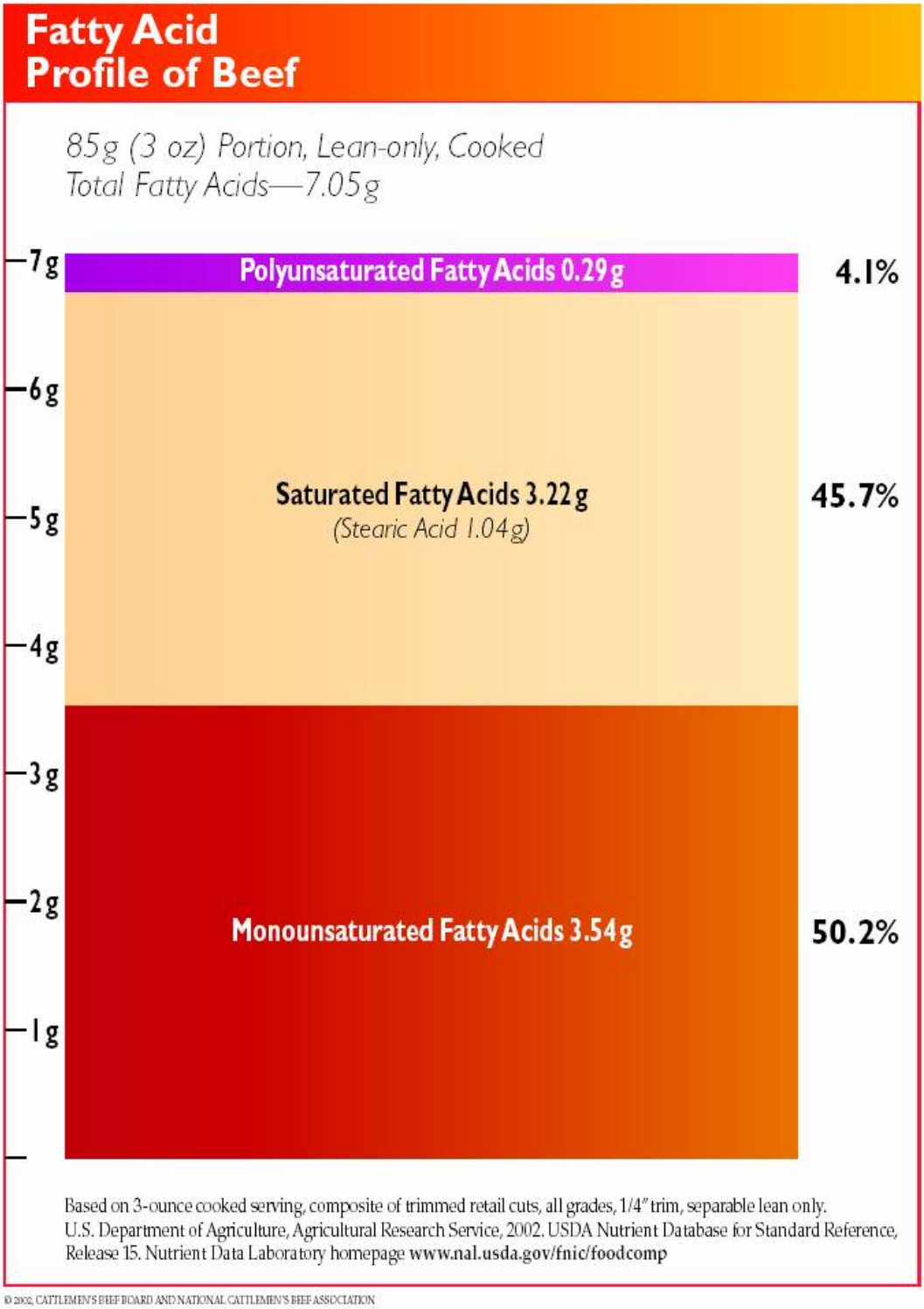
APPENDIX B


Choose Your Calories
by the Company They Keep
A 3-ounce serving of lean beef contributes
less than 10 percent of calories to a 2,000-calorie diet,
yet it supplies more than 10 percent of the Daily Value for:
Beef is an Excellent Source
of these nutrients
50%
PROTEIN
39%
ZINC
37%
B12
24%
SELENIUM
20%
PHOSPHORUS
Beef is a Good Source
of these nutrients
18%
NIACIN
16%
B6
14%
IRON
12%
RIBOFLAVIN
U.S. Department of Agriculture, Agricultural Research Service, 2002.
USDA Nutrient Database for Standard Reference, Release 15.
Nutrient Data Laboratory homepage www.nal.usda.gov/fnic/foodcomp
© 2002, CATTLEMEN'S BEEF BOARD AND NATIONAL CATTLEMEN'S BEEF ASSOCIATION

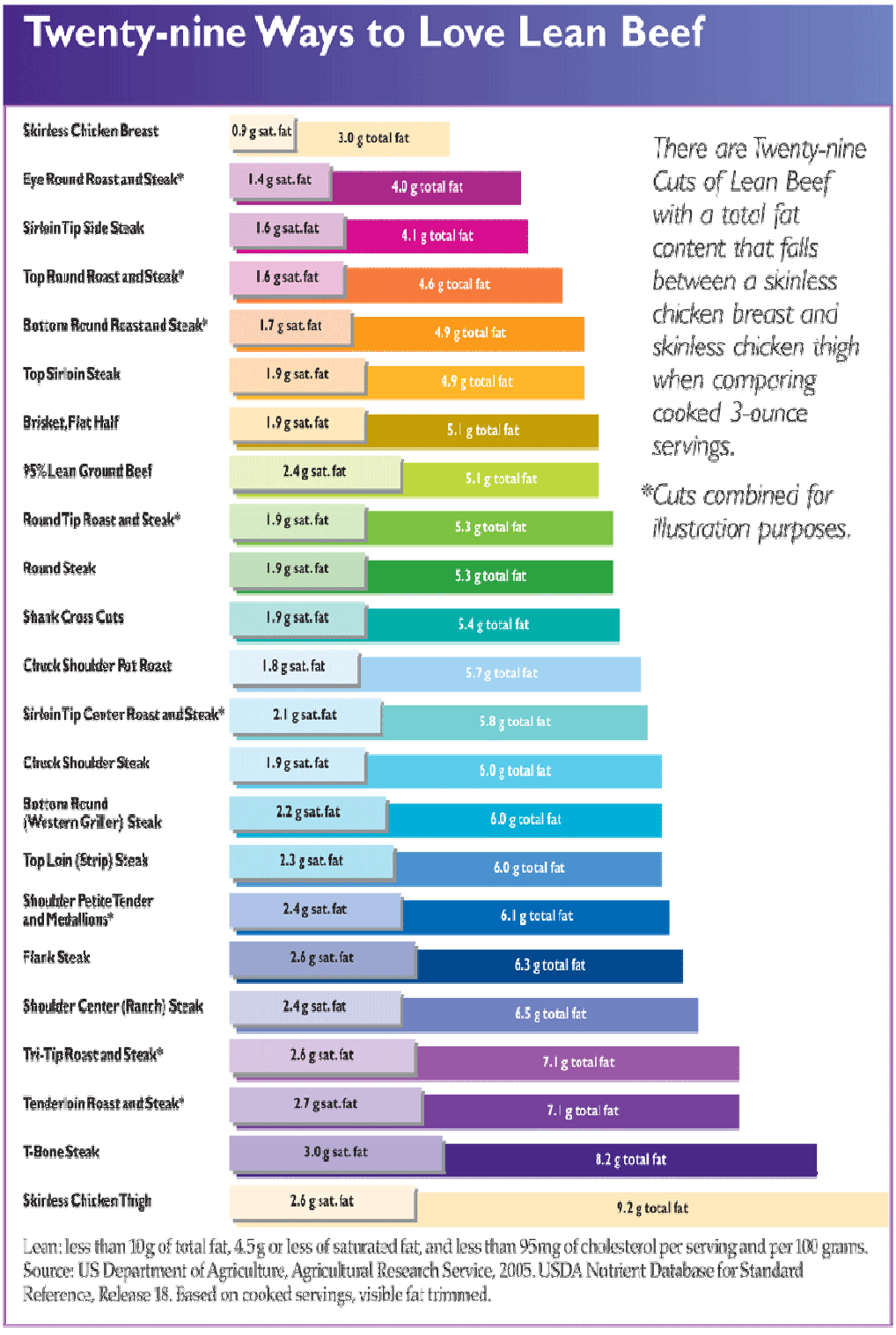
APPENDIX C



APPENDIX D


Fatty Acid
Profile of Beef
85g (3 oz) Portion, Lean-only, Cooked
Total Fatty Acids—7.05g
7g
6g
5g
4g
3g
2g
1g
Polyunsaturated Fatty Acids 0.29g
4.1%
Saturated Fatty Acids 3.22g
(Stearic Acid 1.04g)
45.7%
Monounsaturated Fatty Acids 3.54g
50.2%
Based on 3-ounce cooked serving, composite of trimmed retail cuts, all grades, 1/4" trim, separable lean only.
U.S. Department of Agriculture, Agricultural Research Service, 2002. USDA Nutrient Database for Standard Reference, Release 15. Nutrient Data Laboratory homepage www.nal.usda.gov/fnic/foodcomp
© 2002, CATTLEMEN'S BEEF BOARD AND NATIONAL CATTLEMEN'S BEEF ASSOCIATION

APPENDIX E


Twenty-nine Ways to Love Lean Beef
Skinless Chicken Breast
0.9 g sat. fat
3.0 g total fat
Eye Round Roast and Steak*
1.4 g sat. fat
4.0 g total fat
Sirloin Tip Side Steak
1.6 g sat. fat
4.1 g total fat
Top Round Roast and Steak*
1.6 g sat. fat
4.6 g total fat
Bottom Round Roast and Steak*
1.7 g sat. fat
4.9 g total fat
Top Sirloin Steak
1.9 g sat. fat
4.9 g total fat
Brisket, Flat Half
1.9 g sat. fat
5.1 g total fat
95% Lean Ground Beef
2.4 g sat. fat
5.1 g total fat
Round Tip Roast and Steak*
1.9 g sat. fat
5.3 g total fat
Round Steak
1.9 g sat. fat
5.3 g total fat
Shank Cross Cuts
1.9 g sat. fat
5.4 g total fat
Chuck Shoulder Pot Roast
1.8 g sat. fat
5.7 g total fat
Sirloin Tip Center Roast and Steak*
2.1 g sat. fat
5.8 g total fat
Chuck Shoulder Steak
1.9 g sat. fat
6.0 g total fat
Bottom Round (Western Griller) Steak
2.2 g sat. fat
6.0 g total fat
Top Loin (Strip) Steak
2.3 g sat. fat
6.0 g total fat
Shoulder Petite Tender and Medallions*
2.4 g sat. fat
6.1 g total fat
Flank Steak
2.6 g sat. fat
6.3 g total fat
Shoulder Center (Ranch) Steak
2.4 g sat. fat
6.5 g total fat
Tri-Tip Roast and Steak*
2.6 g sat. fat
7.1 g total fat
Tenderloin Roast and Steak*
2.7 g sat. fat
7.1 g total fat
T-Bone Steak
3.0 g sat. fat
8.2 g total fat
Skinless Chicken Thigh
2.6 g sat. fat
9.2 g total fat
There are Twenty-nine Cuts of Lean Beef with a total fat content that falls between a skinless chicken breast and skinless chicken thigh when comparing cooked 3-ounce servings.
*Cuts combined for illustration purposes.
Lean: less than 10g of total fat, 4.5g or less of saturated fat, and less than 95mg of cholesterol per serving and per 100 grams.
Source: US Department of Agriculture, Agricultural Research Service, 2005. USDA Nutrient Database for Standard Reference, Release 18. Based on cooked servings, visible fat trimmed.
© 2005, CATTLEMEN'S BEEF BOARD AND NATIONAL CATTLEMEN'S BEEF ASSOCIATION

APPENDIX F

Parental Informed Consent Form

Thank you for enrolling your child in the Oklahoma Beef Cooking School for Youth. The Cooperative Extension Service is offering this hands-on experience where children will learn food preparation skills, about the economics of buying beef for the family, the contributions of beef to the diet, good food safety practices and careers associated with the beef industry. Part of the project is an evaluation of what the children learned about each of these subjects.

We are asking permission for your child to complete a brief evaluation at the end of the Cooking School called a "self check" to help us learn the effectiveness of the project. The self check is a one-page, eight-question, multiple choice questionnaire with one open question asking for the child to write something they learned during the Cooking School.

There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

The evaluation is confidential. The self check asks only for the child's grade in school and if they are a boy or girl. Forms will be collected by County Extension Educators and forwarded to Barbara Brown, Ph.D., Food Specialist at OSU in Stillwater. There responses from Cooking Schools across Oklahoma will be combined for analysis. Information will be used to report results to the Oklahoma Beef Council. The OSU Institutional Review Board has the authority to inspect consent records and data files to assure compliance with approved procedures.

If you have questions about the research, contact Barbara Brown, 308 HES, OSU, Stillwater, OK 74078, phone: (405) 744-6824, e-mail: bbrown@okstate.edu. For information on subjects' rights, contact Dr. Sue Jacobs, IRB Chair, 415 Whitehurst Hall, (405) 744-1676.

Participation in the evaluation is voluntary and the child can stop at any time without reprisal or penalty.

I have read and fully understand the consent form. As parent or guardian I authorize

_____ (print child's name) to participate in the described research.

_____ _____
Parent/Guardian Name (printed) Date

_____ _____
Signature of Parent/Guardian Date

I certify that I have personally explained this document before requesting the parent/guardian's signature.

_____ _____
Signature of County Educator Date

Oklahoma Beef Cooking School for Youth Self Check

Write the grade you are in: _____ Check if you are a: ____Boy ____Girl

Thank you for coming. Read the questions think about what you did and learned today. Put a check beside your answer.

1. Do you plan to eat beef:
   ____ more often ____ the same ____ less often

2. How confident are you that you can cook beef recipes?
   ____ more ____ the same ____ less

3. Next time you cook beef will you use a food thermometer to tell when it is done?
   ____ for sure ____ maybe ____ probably not

4. Will you pack a cold source in the bag next time you take a beef sandwich in a sack lunch?
   ____ yes ____ maybe ____ no

5. How big a serving of beef will you usually eat from now on?
   ____ 3 ounces ____ 4 ounces ____ 5 or more ounces

6. When you help your family buy beef will you consider price per serving
   ____ yes ____ maybe ____ no

7. Do you think of beef as a nutritious food?
   ____ yes ____ maybe ____ no

8. Are you going to cook a beef recipe at home?
   ____ yes ____ maybe ____ no

9. Write something you learned at the workshop today.

APPENDIX H

Oklahoma Beef Cooking School for Youth

Informed Consent Script

To: County Educators
From: Barbara Brown, Food Specialist
RE: Script to be read to participants before they are given the opportunity to complete an evaluation form (Beef Cooking School for Youth Self Check).

PLEASE READ TO PARTICIPANTS BEFORE THE LESSON IS EVALUATED:

In order for the Oklahoma Cooperative Extension Service to be able to determine if the Oklahoma Beef Cooking School for Youth has been effective we would like you to participate in the Self Check process. Completing the evaluation form is voluntary and confidential. There is nothing on the form that would let us know who completed the form, when it was completed or where a particular cooking school was held. It will help us determine if the school has met our goal of helping children increase their understanding of how beef fits into a healthful diet, how to buy and cook beef, and how to make sure the risk of foodborne illness is kept low.

If you have questions about subjects' rights you may contact Dr. Carol Olson, Institutional Review Board Chair at 415 Whitehurst, Stillwater, OK 74078. You may also reach Dr. Olson at (405) 744-1676 or on-line at colson@okstate.edu.

Thank you for your help in improving the quality of our programming.

Barbara Brown, Food Specialist
Oklahoma Cooperative Extension Service

APPENDIX I

REC'D URC
MAR 2 7 2007

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

Federal regulations and OSU policy require IRB review of all research involving human subjects. Some categories of research are difficult to discern as to whether they qualify as human subject research. Therefore, the IRB has established policies and procedures to assist in this determination.

1. Principal Investigator Information

First Name: Swee	Middle Initial: H.	Last Name: Kong
Department/Division: NSCI		College: HES
Campus Address:		Zip+4:
Campus Phone:	Fax:	Email: kong_hwa18@yahoo.com
Complete if PI does not have campus address:		
Address: 86 S. University Place Apt. 9		City: Stillwater
State: OK	Zip: 74075	Phone: 405 762-6885

2. Faculty Advisor (complete if PI is a student, resident, or fellow) ☐ **NA**

Faculty Advisor's name: Barbara J. Brown		Title: Assistant Prof., Food Specialist Oklahoma Cooperative Extension Service
Department/Division: NSCI		College: HES
Campus Address: 308 HES		Zip+4: 74078-6141
Campus Phone: 405 744-6940	Fax: 405 744-1357	Email: barbara.brown@okstate.edu

3. Study Information:

A. Title: Evaluation of the Oklahoma Beef Cooking School for Youth

B. Give a brief summary of the project. (See instructions for guidance)

Archival data will be used by the PI to evaluate de-identified data collected from participants who completed the Self Check at the end of each Oklahoma Beef Cooking School for Youth (OBCSY) conducted in 2005.

The purpose of the OBCSY program was to provide in-depth in-service training to Extension Educators on the curriculum which covered beef nutrition, cooking methods for beef, food safety and beef purchasing information. Those Educators then provided "hands on" Beef Cooking Schools to youth ages 8 to 18 in their respective counties across the state. A OBCSY packet was put together for each county that conducted a cooking school. When cooking schools were given Educators focused on preparation skills, nutrition, food safety practices and economics of beef in the diet. Each county receiving a OBCSY grant targeted an audience of 50 participants.

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

Seventy-six Educators received in-service training. Grants of $320-$400 were distributed to counties that applied for funding.

It was expected that youth that participated in the program would increase their understanding of the nutritional contributions of beef to their diet, increase their skill in preparing beef and reduce their risk of foodborne illness by using appropriate food handling methods.

C. Describe the subject population/type of data/specimens to be studied. (See instructions for guidance)
Children ages 8-18 (archival, de-identified data)

4. Determination of "Research".
45 CFR 46.102(d): *Research* means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge. Activities which meet this definition constitute research for purposes of this policy whether or not they are conducted or supported under a program which is considered research for other purposes.

One of the following must be "no" to qualify as "non-research":

A. Will the data/specimen(s) be obtained in a systematic manner?
X No ☐ Yes

B. Will the intent of the data/specimen collection be for the purpose of contributing to generalizable knowledge (disseminating the knowledge obtained outside of Oklahoma State University, e.g., presentation or publication)?
☐ No x Yes

5. Determination of "Human Subject".
45 CFR 46.102(f): *Human subject* means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) data through intervention or interaction with the individual or (2) identifiable private information. Intervention includes both physical procedures by which data are gathered (for example venipuncture) and manipulations of the subject or the subject's environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

A. Does the research involve obtaining information about living individuals?
X No ☐ Yes (data is archival and de-identified)
If no, then research does not involve human subjects, no other information is required.
If yes, proceed to the following questions.

All of the following must be "no" to qualify as "non-human subject":

Oklahoma State University Institutional Review Board

Request for Determination of Non-Human Subject or Non-Research

B. Does the study involve intervention or interaction with a "human subject"?
X No ☐ Yes (data is archival and de-identified)

C. Does the study involve access to identifiable private information?
X No ☐ Yes (data is archival and de-identified)

D. Are data/specimens received by the Investigator with identifiable private information?
X No ☐ Yes (data is archival and de-identified)

E. Are the data/specimen(s) coded such that a link exists that could allow the data/specimen(s) to be re-identified?
X No ☐ Yes (data is archival and de-identified)
If "*Yes*," is there a written agreement that prohibits the PI and his/her staff access to the link?
☐ No ☐ Yes

6. Signatures

Signature of PI Sweet Hwa Hong **Date** 3/27/07

Signature of Faculty Advisor (If PI is a student) Barbara J. Brown **Date** 3/26/07

☒ Based on the information provided, the OSU-Stillwater IRB has determined that this project **does not** qualify as human subject research as defined in 45 CFR 46.102(d) and (f) and **is not subject to oversight by the OSU IRB.**

☐ Based on the information provided, the OSU-Stillwater IRB has determined that this research **does** qualify as human subject research and **submission of an application for review by the IRB is required.**

Sue C Jacobs

Dr. Sue C. Jacobs, IRB Chair

3-27-07
Date

VITA

Swee Hwa Kong

Candidate for the Degree of

Master of Science

Thesis: EVALUATION OF OKLAHOMA BEEF COOKING SCHOOL FOR YOUTHS (OBCSY)

Major Field: Human Environmental Sciences, Nutritional Sciences

Biographical:

Personal Data: Born in Miri, Sarawak, Malaysia on May 8, 1983, the daughter of Chung Seng Kong and Sii Ling @ Sui Eng Lau.

Education: Graduated from Sekolah Menengah Kerajaan Lutong, Miri, Sarawak in Dec 2000; received Diploma from INTI College Sarawak, Kuching, Sarawak in May 2002; received Bachelor of Science degree in Nutritional Sciences from Oklahoma State University, Stillwater, Oklahoma in May 2005; completed Dietetic Internship Program at Oklahoma State University, Stillwater, Oklahoma in May 2007.

Experience: Employed by Oklahoma State University, Department of Nutritional Sciences as a teaching/research assistant from June 2005-Aug 2006; employed by Oklahoma State University, Seretean Wellness Center as a graduate assistant from Aug 2006- May 2007, employed currently at Carter Chevrolet Agency, Okarche, Oklahoma as a private dietitian.

Professional Memberships: American Dietetic Association; Oklahoma Dietetic Association

Name: Swee Hwa Kong Date of Degree: May, 2007

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: EVALUATION OF BEEF COOKING SCHOOL FOR YOUTHS (OBCSY)

Pages in Study: 96 Candidate for the Degree of Master of Science

Major Field: Human Environmental Sciences, Nutritional Sciences

Scope and Method of Study: The purpose of this study was to evaluate the effectiveness/ impact of participation in OBCSY: to determine if the cooking school met the goals of helping children to increase their understanding of how beef can fit into a healthy diet, how to purchase beef, nutritious methods of preparing beef ad how to reduce risk of foodborne illness. Children of age 8-18 participated in the OBCSY completed a self check tool at the end of each OBCSY. The self check tool consisted of 8 multiple choice questions and one open-ended question about what the participant learned the day of the school.

Findings and Conclusions: The result of this study indicated significant differences (gender perspective) in how big a serving will participant eat after participated on OBSCY and whether or not they would consider price per serving when buying beef for family. There was also significant difference between grades in how often the participants planned to eat beef in the future and if they would use a food thermometer to determine doneness when cooking beef in the future. OBCSY successfully impacted participants' awareness and knowledge about beef. Future research is needed to identify interventions that will foster long term behavior change for healthy lifestyle.

ADVISER'S APPROVAL: Barbara Brown