Beliefs and Knowledge about

Vegetarianism

by

Navya Gurajada

A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Food and Nutritional Sciences

Approved: 2 Semester Credits

Carol Seaborn

Carol Seaborn, Ph.D., R.D., C.D., C.F.C.S.

The Graduate School

University of Wisconsin-Stout

December, 2007

The Graduate School
University of Wisconsin-Stout
Menomonie, WI

Author: **Gurajada, Navya**

Title: ***Beliefs and Knowledge about Vegetarianism***

Graduate Degree/ Major: MS Food and Nutritional Sciences

Research Adviser: **Carol Seaborn, Ph.D., R.D., C.D., C.F.C.S.**

Month/Year: **December, 2007**

Number of Pages: **81**

Style Manual Used: **American Psychological Association, 5th edition**

ABSTRACT

The study examined the beliefs and knowledge about vegetarianism of residents living in Menomonie, WI and Minneapolis, MN. A questionnaire was developed to obtain information related to vegetarianism about the populations' dietary patterns, beliefs and knowledge about meat and vegetarian diets, as well as opinions about vegetarianism. The shopping malls in Eau Claire, WI and Minneapolis, MN were targeted. Two hundred and seven individuals aged 18 years or older were self selected. A statistical analysis using frequencies, one way analysis of variance using Duncan test of significance and t-test were done using SPSS. Out of 207 participants, 17% of the respondents indicated that they would like to become vegetarians and 38% indicated that they could try becoming a vegetarian. Ten percent of the respondents stated that they are vegetarians at present and 26% indicated that they had tried to become vegetarians but with no success.

The findings of this study indicate a positive response of the respondents towards vegetarianism. However, the respondents indicated that there are limited food choices when

eating out and they do not have enough knowledge about cooking techniques and nutritional recipes. This suggests that professionals could teach cooking techniques using nutritious vegetarian recipes to encourage a healthy lifestyle. Restaurants could also offer more vegetarian items as the popularity of vegetarianism increases.

The Graduate School

University of Wisconsin Stout

Menomonie, WI

Acknowledgments

I firstly wish to thank and sincerely dedicate my thesis to my Advisor, Professor, Dr. Carol Seaborn for her intellectual guidance and support all throughout my thesis. She has shown so much patience with my never ending questions and has been a wonderful source of inspiration. I also express my gratitude to Christine Ness for assisting me with statistical analysis of my survey. I thank my parents, brother and friends for their support and encouragement since I began my thesis.

TABLE OF CONTENTS

List of Tables

List of Figures

Chapter I: Introduction

There appears to be a growing interest in vegetarian diets in America. Recent studies indicate that 2.5% of the U.S population never eats meat, poultry, fish/seafood and 3% have stopped consuming red meat (Stahler, 2006). More than 12 million people are vegetarians and 19,000 more make a switch to a meat-free diet every week. Many others have greatly reduced the amount of animal products they eat (World Animal Foundation, 2007). These trends have implications to public health and for the environment.

Many research studies have shown that vegetarian diets provide all the necessary nutrients at all stages of life if planned properly. Vegetarian diets provide adequate amounts of essential amino acids, iron, vitamin B-12, calcium, vitamin D and zinc. However, poorly planned vegetarian diets may lack vitamin B-12, zinc and iron because their bioavailability is less compared to meat. These vegetarian diets are lower than meat diets in saturated fat and cholesterol. Studies have shown that plasma total cholesterol concentrations, low density lipoprotein cholesterol levels, blood pressure, and body mass index are lower in vegetarians. Vegetarian diets help reduce the risk of chronic diseases like Type 2 diabetes, coronary heart disease, high blood pressure, obesity and a few cancers. These health benefits of vegetarian diets are being slowly recognized by the public.

Other reasons such as animal rights, religious beliefs, and environmental/ecological conservation also have made people choose to become a vegetarian. Vegetarianism is not only a response to the inhumane practices of factory farms but also is a way to conserve natural resources, improve the environment and benefit human health (Bronk & Athur, 2006). Many natural resources like plants, water, and land are wasted in running a meat industry causing pollution and environmental destruction. Nearly ten pounds of plants are fed to the animals to produce one pound of meat. For surplus meat production, the pastures are overgrazed and vast

areas of arable land are being used up to make enough room for the farm land. This in turn is resulting in soil erosion and nutrient depletion, pollution, less biodiversity, world hunger and methane production.

Some religions advocate vegetarianism, at least partially, including Seventh-Day Adventism, Buddhism and Hinduism (Fieldhouse, 1986). Among Seventh-Day Adventists, more than 40% of this religious population follows a meatless diet. However, in modern Western societies, religious reasons are of relatively little importance compared to other motivations, particularly animal welfare, health and environmental issues (Beardsworth & Keil, 1991).

In order to support ethical philosophies, nonviolence and reverence of life, people choose to become vegetarians. Some people are opposed to killing animals for food and abstain from eating meat, poultry and fish (Anderson & Prior, 2007). Another factor for people choosing to become vegetarians could be cost. Most of the plant foods are less expensive than meat products. The cost of meat may limit the amount people can eat.

Statement of the Problem:

Many research studies have shown that meat consumption is unhealthy. Meat consumption leads to various disorders like high blood pressure, obesity, diabetes, constipation, and cancers. Avoiding meat may be the best and simplest way of reducing the risk of various diseases. Vegetarian diets are slowly gaining popularity as people are switching to vegetarian diets. It is generally observed that most of the individuals are completely avoiding or restricting meat consumption in their daily diet. No studies were found in the literature about vegetarianism among the residents of Wisconsin, United States. A better understanding of beliefs and knowledge about vegetarianism could contribute to the knowledge of eating behaviors to benefit the health profession in developing nutrition education.

Purpose of the Study:

The principle aim of this study is to identify people's perception of meat eating and vegetarianism as well as the barriers and benefits of vegetarian diets. This study will seek to identify peoples' beliefs about meat and vegetarianism and personal values associated with vegetarian diets. Research on beliefs and knowledge about vegetarianism will help our profession understand the trends in red meat consumption, current interest in vegetarian diets and its implications for health. This study will also determine the perceived health benefits of vegetarian diets, factors associated with weight control, disease prevention, and health maintenance.

Definition of Terms:

Lacto-vegetarians. This group eats plant foods, milk and milk products but avoid eggs and flesh foods.

Lacto-ovo-vegetarians. This group eats plant foods, milk, milk products and eggs but avoid flesh foods (meat, poultry and fish).

Ovo-vegetarians. This group eats plant foods and eggs, but avoids milk, milk products and flesh foods.

Pesco/pollo-vegetarians. This group eats meats like seafood and chicken, but do not eat other meats, such a beef, lamb and pork.

Total vegetarians. These individuals are also called vegans and eat plant foods only.

Limitations of the Study

The subjects for this study were self-selected and were not randomly selected. The study may lack its validity, if the subjects fail to answer the questions genuinely.

Methodology

Considering the aim of the study, a questionnaire was developed to identify people's beliefs about meat and vegetarian diets and personal values associated with vegetarian diets. The surveys were distributed in the malls in Eau Claire, WI and Minneapolis, MN. Subjects who are 18 years or older were asked to complete the survey individually indicating their opinions about each of the statements. Two hundred and seven subjects participated in the study and it took each individual about 10-15 min to complete the survey. After the surveys have been completed, the data was analyzed statistically to determine the findings, and conclusions were drawn regarding people's perception of meat and vegetarianism as well as barriers and benefits of vegetarianism.

Chapter II: Literature Review

The word "vegetarian" was coined in 1847 in England. The word is derived from the Latin word *vegetus*, meaning "whole, sound, fresh or lively" (Sussman, 1978). Vegetarians are those who do not eat meat, fish, and poultry. The Vegetarian Resource Group's 2003 poll documented that vegetarian diets have gained popularity in about 2.8 percent of the adult population in the United Stated. It was found that approximately 2.5% of the studied population was vegetarians in VRG's 2000 national Zogby Poll of 968 adults (Stahler, 2006). The reasons for being vegetarian could be health, ecological and religious concerns, dislike of meat, compassion for animals, belief in non-violence, and economic reasons.

A vegetarian diet is healthy and has different dietary practices. The dietary patterns are categorized as

Lacto-vegetarians eat plant foods, milk and milk products but avoid eggs and flesh foods.

Lacto-ovo-vegetarians eat plant foods, milk, milk products and eggs but avoid flesh foods (meat, poultry and fish)

Ovo-vegetarians eat plant foods and eggs, but avoid milk, milk products and flesh foods.

Pesco/pollo-vegetarians eat meats like seafood and chicken, but do not eat other meats, such a beef, lamb and pork.

Total vegetarians, also called vegans, eat plant foods only.

Red meats are an excellent source of protein, iron and B vitamins including B6 and B12. A poorly planned, strict vegetarian diet could lead to a nutritional deficiency. Vegetarians should consult a dietitian for assistance to carefully plan a nutritious diet. The American Dietetic Association has stated that vegetarian diets are healthy and nutritionally adequate during all the stages of the life cycle, when appropriately planned. It is important that vegetarians understand

the principles necessary to practice safe and healthy vegetarianism (Anderson & Prior, 2007). The United States Dietary Guidelines state "Vegetarian diets can be consistent with the Dietary Guidelines for Americans, and meet Recommended Dietary Allowances for nutrients". Commonly eaten foods such as legumes, tofu, soy burgers and soymilk with added calcium are included in the USDA's Food Guide Pyramid (US Department of Agriculture and U.S. Department of Health and Human Services, 2000).

Health Implications of Vegetarianism

Vegetarian diets have many health benefits such as lower in saturated fat, cholesterol and animal protein and higher levels of carbohydrates, fiber, magnesium, boron, folate, antioxidants such as vitamins C and E, carotenoids and phytochemicals. Poorly planned vegetarian diets may be deficient in vitamin B-6, vitamin B-12, Vitamin D, calcium and zinc.

Nutrition Considerations for Vegetarians

Protein

Plant sources of protein can provide adequate amounts of essential and non-essential amino acids, in a reasonably varied diet and when caloric intake is sufficient to meet the energy needs. The recommended dietary allowance for adult man is 56 g/day and 46 g/day for an adult woman (Driskell, 2005). Cereals are low in lysine, an essential amino acid which should be considered while planning a diet for vegetarians. Legumes are low in methionine, also a consideration when planning vegetarian diets. Plant foods like whole grains, legumes, vegetables, seeds and nuts have essential and non-essential amino acids. In vegetarian diets, complimentary proteins are utilized, such that legumes low in methionine but high in lysine are paired with cereals that are low in lysine but high in methionine. Thus, the amino acids complement each other resulting in a near complete protein. Lacto-ovo vegetarians and vegans

appear to meet the daily requirement for proteins (Messina & Messina, 1996). Athletes can also meet their protein needs on plant-based diets (Niemen, 1999).

Vitamins

Riboflavin. Studies have shown that vegetarian diets are low in riboflavin compared to non-vegetarian diets; however a clinical deficiency from vegan diets has not been observed (Larsson & Johansson, 2002). The recommended dietary allowance of riboflavin for an adult man is 1.3 mg/d and 1.1 mg/d for an adult woman. Liver, milk and milk products, and red meat are rich in riboflavin and if these foods are restricted in a vegan diet, green leafy vegetables and fortified or enriched grain could be good substitutes. Table 1 summarizes some excellent food sources of riboflavin (Public Policy Statements, 2003).

Table 1

Vegetarian Food Sources of Riboflavin

Nutrient	µg
Almonds , ¼ c	0.3
Cereal, ready-to-eat, fortified, 1 oz (28 g)	0.2-1.7
Cow's milk, whole, 2% or skim, ½ c (125 mL)	0.2
Yogurt, ½ c (125 mL)	0.3
Mushrooms, cooked, ½ c	0.6
Nutritional yeast mini-flakes, 1 Tbsp (3 g)	1.9
Soymilk, fortified, ½ c (125 mL)	0.2

Vitamin B12. Plant foods are deficient in vitamin B12 unless they are fortified. Lacto-ovo vegetarians can get vitamin B12 from dairy products and eggs. The recommended dietary allowance for vitamin B-12 is 2.4 µg/d for both the adult man and woman. Folic acid is rich in

vegetarian diets which may mask the hematological symptoms of vitamin B12 deficiency. The deficiency is detected only when neurological symptoms start to show. The vitamin B12 deficiency development takes a long time of about 5 to 6 years but its onset may lead to irreversible nerve damage (Larsen, 2006). Fortified breakfast cereals, fortified soy or yeast or a vitamin B12 supplement could be good sources for vegans (Herrmann & Geisel, 2002). Table 2 shows the typical vegetarian foods with the vitamin B_{12} content. (Public Policy Statements, 2003).

Table 2

Vegetarian Food Sources of Vitamin B12

Nutrient	µg
Cereals, ready-to-eat, fortified, 1 oz (28 g)	0.6-6.0
Cow's milk, 1/2 c (125 mL)	0.4-0.5
Egg, large, 1 (50 g)	0.5
Nutritional yeast (Red Star Vegetarian Support Formula), miniflakes, 1 tbsp (3 g)	1.5
Soymilk or other nondairy milks, fortified, 1/2 c (125 mL)	0.4-1.6
Veggie "meats," fortified, 1 oz (28 g)	0.5-1.2

Vitamin D. The best source of vitamin D is sunlight. If regularly exposed to sunlight, the body can produce adequate amounts of vitamin D without any source from food. Factors like dark skin, pollution, and northern latitudes may limit this source. The recommended dietary allowances for vitamin D is 5 µg/d for both adult man and woman. Fortified milk, egg yolk, and liver are its best sources but all are of animal origin. Therefore vegans may not get enough

vitamin D through dietary sources. Vitamin D3 (cholecalciferol) is of animal origin and vitamin D2 (ergocalciferol) is of plant origin. Therefore vegans could depend on vitamin D2 supplements (Trang, Cole, Rubin, Pierratos, Siu & Veith, 1998). Table 3 provides a summary of vitamin D in food sources. (Public Policy Statements, 2003).

Table 3

Vegetarian Food Sources of Vitamin D

Nutrient	µg
Cereals, ready-to-eat, fortified, 1 oz (28 g)	0.5-1
Egg yolk, large, 1 (17 g)	0.6
Cow's milk, fortified, 1/2 c (125 mL)	1.2-1.3
Soymilk or other nondairy milk, fortified, 1/2 c (125 mL)	0.5-1.5

Minerals

Calcium. Studies have shown that vegetarians absorb and retain more calcium from food than do non vegetarians. Excess consumption of calcium through dairy foods increases its fecal loss. The recommended dietary allowances of calcium for adult man and woman is 1000 mg/d. Milk and milk products, and dark green leafy vegetables provide the most calcium. Apart from these foods calcium can be obtained from calcium fortified juices, breakfast cereals, legumes and soy foods (Anderson & Prior, 2007). Table 4 provides numerous food sources of dietary calcium. (Public Policy Statements, 2003).

Table 4

Vegetarian Food Sources of Calcium

Nutrient	mg
Soy foods	
Cultured soy yogurt, fortified, 1/2 c (125 mL)	367
Soybeans, cooked, 1/2 c (125 mL)	88
Soybeans, dry roasted, (soy nuts), 1/4 c (43 g)	60
Soybeans, green, 1/2 c (125 mL)	130
Soymilk, fortified, 1/2 c (125 mL)	100-159
Tofu, firm, calcium-set, 1/2 c (126 g)	120-430
Tempeh, 1/2 c (83 g)	92
Legumes (cooked, 1/2 c/125 mL)	
Black beans	46
Chickpeas, garbanzo beans	40
Great northern or navy beans	60-64
Pinto beans	41
Vegetarian baked beans	64
Nuts, seeds and their butters	
Almonds, 1/4 c (36 g)	88
Almond butter, 2 tbsp (30 mL)	86
Sesame tahini, 2 tbsp (30 mL)	128
Breads, cereals, and grains	
Cereal, ready-to-eat, fortified, 1 oz (28 g)	55

Table 4 (Continued)

Nutrient	mg
Fruits	
Figs, dried, 5	137
Orange, 1 large	74
Orange juice, fortified, 1/2 c (125 mL)	150
Vegetables (cooked, 1 c/250 mL)	
Bok choy (Chinese cabbage, pak choi)	167-188
Broccoli	79
Collard greens	239
Kale	99
Kale, Scotch	181
Mustard greens	109
Okra	107
Turnip greens	208
Other foods	
Blackstrap molasses, 1 tbsp (15 mL)	172
Dairy products	
Cow's milk, 1/2 c (125 mL)	137-158
Cheddar cheese, 3/4 oz (21 g)	153
Yogurt, plain, 1/2 c (125 mL)	137-230

Iron. Animal foods and plant foods are good sources of iron, but iron in the animal foods is easily absorbed. Due to high fiber content in plant foods, iron absorption is inhibited and is less available to the body. The recommended dietary allowance of iron is 8 mg/d for an adult man and 18 mg/d for an adult woman. Vegetarians are at a higher risk of developing iron deficiency and women need to pay special attention to this fact. Some food preparation techniques like soaking and sprouting may hydrolyze the fiber hence minimizing the inhibition of iron absorption. Plant foods like dark green leafy vegetables, dried fruits such as raisins, apricots, peaches, and prunes are good sources of iron. Table 5 provides an extensive list of food sources of iron (Public Policy Statements, 2003). It is always good to have vitamin C rich foods with each meal as this vitamin may enhance the absorption of non-heme iron (non-heme iron is found in plants). Apart from these sources, vegetarians can always look for iron fortified products available in the market (Gillooly et al. 1983).

Table 5

Vegetarian Food Sources of Iron

Nutrient	Mg
Soy foods	
Soybeans, cooked, 1/2 c (125 mL)	4.4
Soybeans, dry roasted, (soy nuts), 1/4 c (43 g)	1.7
Soymilk 1/2 c (125 mL)	0.4-1.0
Tempeh, 1/2 c (83 g)	2.2
Tofu, firm, 1/2 c (126 g)	6.6
Veggie "meats," fortified, 1 oz (28 g)	0.5-1.9

Table 5 (continued)

Nutrient	mg
Legumes (cooked, 1/2 c/125 mL)	
Adzuki beans	2.3
Baked beans, canned, vegetarian	1.7
Black beans	1.8
Chickpeas, garbanzo beans	2.4
Great northern beans	1.9
Kidney beans	2.6
Lentils	3.3
Lima beans	2.2
Navy beans	2.3
Pinto beans	2.2
Nuts, peanuts, seeds, and their butters	
Almonds, 1/4 c	1.5
Cashews, 1/4 c (60 mL)	2.1
Peanut butter, 2 tbsp (30 mL)	0.6
Peanuts, dry roast, 1/4 c (60 mL)	0.8
Pumpkin and squash seeds, dried, 1/4 c (60 mL)	5.2
Sesame tahini, 2 tbsp (30 mL)	2.7
Sunflower seeds, toasted, 1/4 c (60 mL)	2.3
Breads, cereals, and grains	
Barley, pearled, cooked, 1/2 c (125 mL)	1.0
Cereal, ready-to-eat, fortified, 1 oz (28 g)	2.1-18
Cream of wheat, cooked, 1/2 c (125 mL)	5.1

Table 5 (continued)

Nutrient	mg
Oatmeal, instant, fortified, cooked, 1/2 c (125 mL)	4.2
Oatmeal, regular, quick or instant, cooked, 1/2 c (125 mL)	1.6
Quinoa, cooked, 1/2 c (125 mL)	2.1
Wheat germ, 2 tbsp (14 g)	0.9
Whole wheat or white enriched bread, 1 slice (28 g)	0.9
Fruits (dried, 1/4 c/60 mL)	
Apricots	1.5
Currants	1.2
Figs	1.1
Prunes	1.1
Raisins	1.1
Vegetables (cooked, 1/2 c/125 mL unless indicated otherwise)	
Bok choy (Chinese cabbage, pak choi)	0.9
Broccoli	0.7
Green or yellow beans	0.8
Kale	0.6
Mung bean sprouts	0.8
Mushrooms	1.4
Potato, baked, with skin, 1 medium (173 g)	2.3
Tomato juice	0.7
Turnip greens	0.6
Blackstrap molasses, 1 tbsp (15 mL)	3.5

Livestock Production and its Environmental Problems

Livestock production has been shown to have serious effects on land degradation, climate, air pollution, water shortage, pollution and the loss of biodiversity (Mangels, 2007). The average yearly meat consumption in the US in 2003 was about 271 pounds per person, whereas the yearly consumption is 11 pounds per person in India. Global production of meat is expected to more than double in the next 50 years. Thirty percent of the land is used for animal production and 70 percent is used for agriculture. These livestock production industries are causing soil erosion, ammonia emission, a significant contributor of acid rain and a greenhouse effect more so than automobiles. For the irrigation of feed crops more than 8 percent of the world's water is being used up. A lot of pesticides and antibiotics are used for the surplus production of meat. This environmental damage can be controlled by reducing the excessive consumption of livestock products among wealthy people (Steinfeld et al., 2006).

Vegetarian Diets and Chronic Diseases

Reducing breast cancer risk. More than 200,000 women are diagnosed yearly with breast cancer in the United States. Regular exercise, maintaining healthy body weight and avoiding alcohol can reduce the risk of breast cancer in women. Beef, pork, hamburgers, hot dogs and processed meats like salami and bologna all appear to increase the risk for breast cancer. Women consuming more than 1 ½ serving of red meat per day are found to be at a greater risk for breast cancer (Cho et al., 2006).

Role of vegetarian diets in gallbladder removal surgeries. Every year, more than 800,000 Americans have their gallbladder removed. Gallbladder disease is a common illness of adults, affecting women more often than men. A recent study examined the relationship between intake of fruits and vegetables and the rate of gallbladder removal surgeries in women. Women whose

diets are rich in green leafy vegetables and citrus fruits were less likely to have their gallbladder removed. This is because the diets rich in fiber stimulate bowel movements and reduce bile storage in the gallbladder, likewise, antioxidants and various minerals in fruits and vegetables enhance gut health (Tsai, Leitzmann, Willet & Giovanucci, 2007).

Prevention of cancer with vegetarian diets. Nearly 20-35 percent of the western adults were able to produce a substance called equol when they consume soy foods. Equol is produced by bacteria in the intestines and is higher in those individuals living in the Asian countries. Equol plays a major role in preventing some of the cancers and also functions as an antioxidant. A comparative study was done to examine the equol production of vegetarians and non-vegetarians. Vegetarians were more than four times likely to produce equol compared to non-vegetarians (Setchell & Cole, 2006).

Doxins and furans are toxic substances that increase the risk of cancer and other health problems. These toxins are released into the atmosphere from waste-burning incinerators and then accumulate in animal fats and fish. As vegetarian diets are free from animal fat, these diets contain low levels of doxins and furans. Studies have shown that foods like fish, seafood, dairy products, pork, poultry and beef were significant sources of doxins and furans (Chen, Su & Lee, 2006).

Non-Hodgkins lymphomas are cancers of the lymph nodes, spleen and other components of the immune system. This type of cancer accounts for about four percent of all new cancer diagnoses and three percent of all cancer deaths in the United States. Studies have shown that people who consume more vegetables (more than 20 servings a week) are at a lower risk of non-Hodgkins lymphomas. Eating more green leafy vegetables and vegetables such as cabbage, kale and broccoli will reduce the risk of non-Hodgkins lymphomas (Kelemen et al., 2006).

Type 2 diabetes and vegetarian diets. At least eight percent of the adult population is affected by type 2 diabetes. Researchers at George Washington University recently investigated the use of a low fat vegan diet as a way of treating adults with type 2 diabetes. During the study, a low fat diet was given to the subjects. Forty three percent of the vegetarian participants and 26 percent of the participants reduced the amount of diabetes medication they used (Barnard et.al, 2006).

Brown rice consumption and dental health. Severe gum diseases may cause heart attacks, strokes and having premature babies. In a recent study, more than 34,000 men were 23 percent less likely to develop gum disease if they were having at least 3 servings of whole grains per day compared to those men who were eating less than half a serving of grains daily. Whole grains, including whole wheat breads, whole grain cereals and pasta, and brown rice may prevent severe gum diseases hence lowering the risk of cardiovascular diseases (Merchant, Pitiphat, Franz & Joshipura, 2006).

Fruits and vegetables for healthy bones. Fruit and vegetable intakes during adolescence are important for bone health. Studies have shown that people consuming more fruits and vegetables have stronger and larger bones. The amount of fruits eaten seemed more important than the amount of vegetables consumed. The same results were found in adult and older women. The effects of fruits and vegetables on bone health may be due to the alkaline nature of foods containing potassium, calcium, and magnesium and also vitamin C, beta carotene and vitamin K. Teens are encouraged to eat more fruits and vegetables to reduce the risk of osteoporosis in the future (Prynne et al., 2006)

Vegetarian diets and eating disorders. Mostly women choose to be vegetarians mainly to lose weight. This diet restriction is associated with eating disorders like anorexia nervosa. Semi-

vegetarians and vegetarians combined are called vegetarians. However semi-vegetarians and vegetarians have different motivations and eating behaviors. Research studies have shown that semi-vegetarians are motivated by weight concerns. Researchers conclude that semi-vegetarians are at higher risk of harmful eating disorders than vegetarian women (Curtis & Comer, 2006).

Vegetarianism and Athletes

Vegetarian diets can also meet the needs of competitive athletes. Vegetarian diets that meet energy needs and contain a variety of plant-based protein foods such as soy products, other legumes, grains, nuts and seeds, provide adequate protein without the use of special foods or supplements (Larson, 2000). For adolescent athletes, special attention should be given to meeting energy, protein, calcium and iron needs. Female athletes may benefit from diets adequate in energy, high levels of fat, calcium and iron. (Snyder, Sleeper & Zierath, 1989).

Vegetarianism throughout the Lifecycle

Well planned vegetarian diets can be nutritionally adequate for all stages of the life cycle including pregnancy and lactation. Some stages of the life cycle have high nutrient requirements due to accelerated growth or disease. Therefore vegetarian diets must be carefully planned and supplemented with special care (National Cattlemen's Beef Association, 2000). The nutritional considerations related to vegetarian diets at different stages of life are:

Infancy and Childhood. Vegetarian infants receive adequate amount of nutrients from breast milk and other commercial supplements; however, nutrients like vitamin D, iron and vitamin B12 need to be supplemented with special monitoring. A daily supplement of iron is recommended for all infants who are breastfed beyond 4-6 months. Extremely restrictive diets such as fruitarians and raw food diets have been associated with impaired growth and therefore cannot be recommended for infants and children (Messina & Messina, 1996). Soymilk, rice milk,

homemade formulas, cow's milk and goat's milk should not be used to replace breast milk or commercial infant formula during the first year because these foods do not contain a proper ratio of micronutrients, nor do they have appropriate micronutrient levels for the young infant (Public Policy Statements, 2003). Vegetarian infants can be introduced to protein rich foods such as mashed or pureed tofu, legumes (pureed and strained), soy or dairy yogurt and cottage cheese. Later, foods such as cubes of tofu, cheese or soy cheese can be introduced. Commercial full fat, fortified soymilk or cow's milk can be used as primary beverage starting at one year of age or for any child who is growing normally and is eating a variety of foods (Mangels & Messina, 2001).

Children. Lacto-ovo-vegetarian children exhibit growth similar to that of non-vegetarian children. Studies have shown that non-macrobiotic vegan children have slightly smaller but within the normal ranges of the standard weight and height. Poor growth has been primarily seen in children who are on very restricted diets (Hebbelinck & Clarys, 2001). Vegan children may have protein needs that are higher than non-vegetarian children due to differences in protein digestibility and amino acid composition of plant food proteins (Mangels & Messina, 2001). Foods rich in calcium, zinc, and iron should be emphasized when planning a vegetarian diet for children. Fortified breakfast cereals, breads and pasta and foods rich in unsaturated fat can help children meet energy and nutrient needs.

Adolescents: Studies show that there is little difference between adolescent vegetarians and non-vegetarians. Vegetarian adolescents are found to consume more fiber, iron, folate, vitamin A, and vitamin C than non-vegetarians. Vegetarian adolescents also consume more fruits and vegetables, and fewer sweets, fast foods, and salty snacks compared to non-vegetarian adolescents (Perry, Guire, Neumark-Sztainer & Story, 2002). Calcium, vitamin D, iron, zinc and

vitamin B12 are the key nutrients for adolescent vegetarians. Vegetarian diets are appropriate and healthful choices for adolescents if properly planned.

Pregnant and lactating women: Lacto-ovo-vegetarian and vegan diets can meet the nutrient and energy needs of pregnant women. Studies have shown that infants born to vegetarian mothers generally have birth weights that are similar to those of infants born to non-vegetarian women (Drake, Reddy & Davies, 1998). Vitamin B12 supplements are needed during pregnancy and lactation for women who exclude all animal foods from their diet. For both vegetarian and non-vegetarian pregnant women, iron supplements are usually recommended (Allen, 2000). Iron status should be monitored for pregnant and lactating women regularly.

Older adults: Studies indicate that older vegetarians have dietary intakes that are similar to non-vegetarians (Marsh, Christiansen, Sanchez, Mickelsen & Chaffee, 1989). Energy needs decrease with aging but requirements for several nutrients like calcium, vitamin D, vitamin B6 and protein are higher. Older vegetarian adults should use vitamin B12 fortified foods or supplements to meet the requirement (Food and Nutrition Board, 1998). Vegetarian diets rich in fiber may be beneficial to older adults with constipation. Older vegetarians may need assistance of dietitians in planning foods that are easy to chew, require minimal preparation or are appropriate for therapeutic diets (Public Policy Statements, 2003).

Consumer Trends and New Product Availability

Factors that may affect the number of vegetarians in the United States and Canada in the future include an increased interest in vegetarianism and the arrival of immigrants from countries where vegetarianism is commonly practiced (National Institute of Nutrition, 2002). Twenty to 25% of adults in the United States report that they eat four or more meatless meals weekly suggesting an interest in vegetarianism (Ginberg & Ostrowski, 2003). More than five percent of

the surveyed population in 1999 always ordered a vegetarian meal when they ate out and close to 60% of the population 'sometimes, often or always' ordered vegetarian meals at restaurants (The Vegetarian Resource Group, 2003). Fast food restaurants are beginning to offer salads, veggie burgers, and other vegetarian options. The National Restaurant Association reports that eight out of ten restaurants in the United States with table service offer vegetarian entrees (National Restaurant Association, 2001). There is an increase in the sales of new products including fortified foods and convenience foods and this trend is expected to impact on the nutrient intake of vegetarians. Fortified foods such as soymilk, meat analogs, juices and breakfast cereals market in U.S was estimated to be $1.5 billion in 2002 and almost doubled to $2.8 billion in 2006 (Mintel International Group Limited, 2001).

Adequately planned vegetarian diets have been shown to be healthful, nutritious and beneficial in preventing certain diseases. The number of vegetarians in the US is expected to increase over the coming years. However, little research has been reported on the actual number of vegetarians in the population. Dietetic professionals should assist the population by providing current and accurate information about vegetarianism so that people can make informed choices about their food and diet.

Chapter III: Methodology

Vegetarian diets are slowly gaining popularity as people are switching to vegetarian diets. A questionnaire was designed to identify people's perception of meat eating and vegetarianism as well as the barriers and benefits of vegetarian diets. The objectives, methodology and the questionnaire used for the research were approved by University of Wisconsin, Stout Institutional Review Board (See Appendix A).

Subject Selection and Description

Two hundred and seven people were self selected from the shopping malls located in Eau Claire, WI and Minneapolis, MN. Subjects above 18 years of age were targeted with no bias and were mainly the general public. The purpose of the study is to understand the dietary patterns of the people, so the general public was suitable for this study to obtain valid data.

Instrumentation

A questionnaire was developed to obtain information related to vegetarianism about the populations' dietary patterns, beliefs and knowledge about meat and vegetarian diets, opinions about vegetarianism. The questionnaire was inspired from the study "*Moving from meat – Vegetarianism, beliefs and information source*" done by Emma. J. Lea, a PhD student from the University of Adelaide, Australia in 2001 (See Appendix B).

The sections of the questionnaire included:

- The first section for the survey was the consent form which described the study, risks and benefits, time commitment and right to withdraw.
- Seven items addressed demographic information of the participant (age, gender, religion, ethnicity, marital status, educational status, and income)

- Five items inquired about the participant's nutritional knowledge of the USDA guidelines and dietary patterns. Item 12 included frequency of eating meat, fruits and vegetables.
- Three items sought information about the respondent's knowledge and beliefs about meat, vegetarianism, and how hard it is to become a vegetarian. The participants indicated their level of agreement with each belief on a Likert-type scale ranging between "strongly disagree" and "strongly agree".
- Eight items inquired about inclination towards vegetarianism- reasons, source of information, and influence of vegetarian diets. These eight items were only completed by those individuals who were vegan, fruitarian or lacto-ovo-vegetarian.

Data Collection Procedures

The shopping malls in Eau Claire, WI and Minneapolis, MN were targeted. Two hundred and seven individuals aged 18 years or older were self selected. The subject selection was entirely unbiased and willingness to participate in the study was the only criteria for sample selection. The participant's consent was taken before starting the survey and their participation was entirely voluntary. Each participant was given a questionnaire that had 23 questions, and it took the subjects 10-15 minutes to complete the survey.

Data Analysis

The data was analyzed using SPSS software. Statistical analysis using frequencies, t-test, and one way analysis of variance utilizing the Duncan test of significance were done. The mean, frequency and standard deviation were calculated for all the parameters. One way analysis of variance using Duncan test of significance and t-test compared statements related to food consumption pattern, beliefs and knowledge about vegetarianism against demographic characteristics.

Limitations

The survey was done in the shopping malls of Eau Claire, WI and Minneapolis, MN and there were 207 participants who took part in the study. Since the sample size is relatively small and locations where the subjects were limited, this study might not represent the U.S population. The questionnaire was prepared by the investigator and without any validation. The subjects were self-selected and the sampling was not random.

Chapter IV: Results

This study will seek to identify peoples' beliefs about meat and vegetarianism and personal values associated with vegetarian diets. The research primarily determines the number of vegetarians in a selected group of population located in the central USA, dietary consumption of meat, opinions about meat and vegetarian's diets, and factors associated with preference to vegetarian diets. This study will also determine the perceived health benefits of vegetarian diets, factors associated with weight control, disease prevention, and health maintenance. After the surveys were completed by 207 subjects, the data was consolidated. The t-test, and one way analysis of variance with Duncan test for significance were done.

The frequencies were done for the demographic characteristics. Table 6 below describes the demographic characteristics of the respondents (n=207). Forty percent of the respondents were between 18-26 years and 27%, 17%, 14%, and 14% were 27-35, 36-44, 45-33, and 54 & older age groups, respectively. Female respondents were 53% of the population whereas only 47% of the samples were men. Fifty seven percent of the respondents were married and 43% were unmarried. Respondents from varied ethnicities such as Caucasians, Native Americans, Asians, and African Americans completed the survey. Seventy six percent of the respondents were Caucasians and 9% of the other ethnic groups represented were Asian, Chinese and Israel. Forty four percent of the respondents' level of education was college/university and 39% had attended high school and 8% had attended vocational/technical school. The average income of 37% of the respondents was $ 20,000-40,000 per annum and 25%, 27%, and 11% for $\leq$20,000, 40,000-60,000 and $\geq$60,000 income groups, respectively.

Table 6:

Demographic Characteristics Represented by Percentages of the Respondents

	Percentage of the respondents (%)
Age	
18-26	40
27-35	27
36-44	17
45-33	14
54 & older	14
Gender	
Male	43
Female	57
Ethnicity	
Caucasian	76
Native American	8
African American	6.5
Other	9
Marital Status	
Married	57
Unmarried	43

Table 6 (continued) Demographic Characteristics Represented by Percentages of the Respondents

	Percentage of the respondents (%)
Ethnicity	
Educational Level	
High School	39
Vocational/technical school	8
College/university	44
Other	10
Income (per annum)	
≤20,000	25
20,000-40,000	37
40,000-60,000	27
60,000-≥60,000	11

Awareness about Nutritional Guidelines

The respondents were asked about their awareness of the USDA nutritional guidelines. Figure 1 depicts the percentages of respondents and their awareness of the USDA nutritional guidelines. Seventeen percent (n=35) of the respondents were very aware and 52% (n=106) of respondents have an idea about the USDA nutritional guidleines. Thirty one percent (n=64) of the respondents had never heard of the USDA nutritional guidelines.

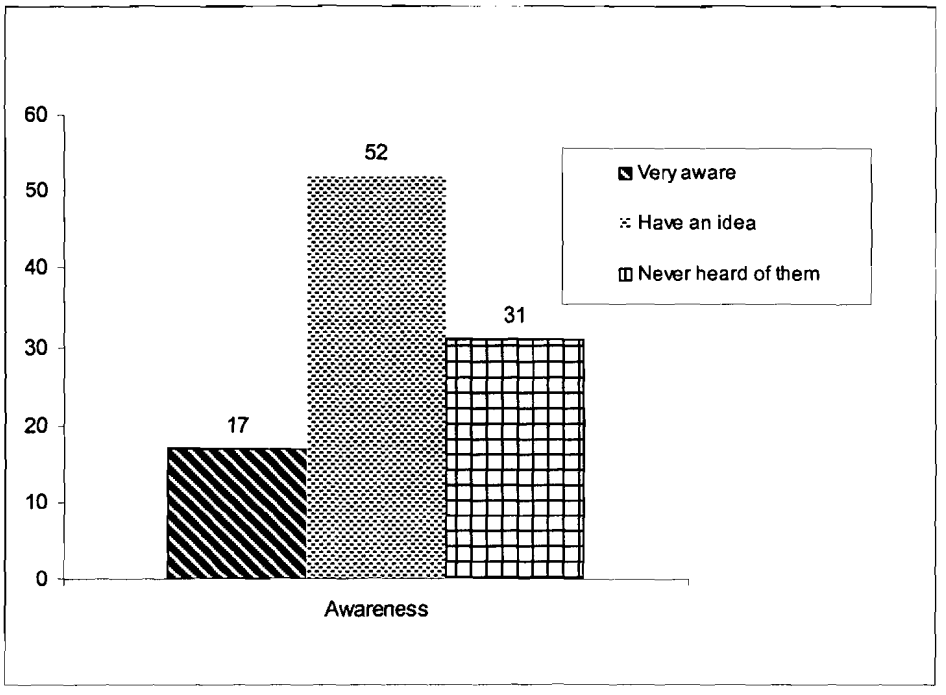

Figure 1. Percentage response of the respondents for awareness about USDA nutritional guidelines (n=207).

Make Conscious Decisions about Food Choices in a Diet

The respondents were asked if they make conscious decisions about food choices in their diet. Figure 2 shows the percentage of the respondents who make conscious decisions about their food choices in their diet. Twenty six percent (n=53) of the respondents always, and 30% (n=62) of the respondents frequently make conscious decisions about food choices in their diet. Nine percent (n=18), and 36% (n=74) of the respondent rarely and sometimes make conscious decisions about food choices in their diet.

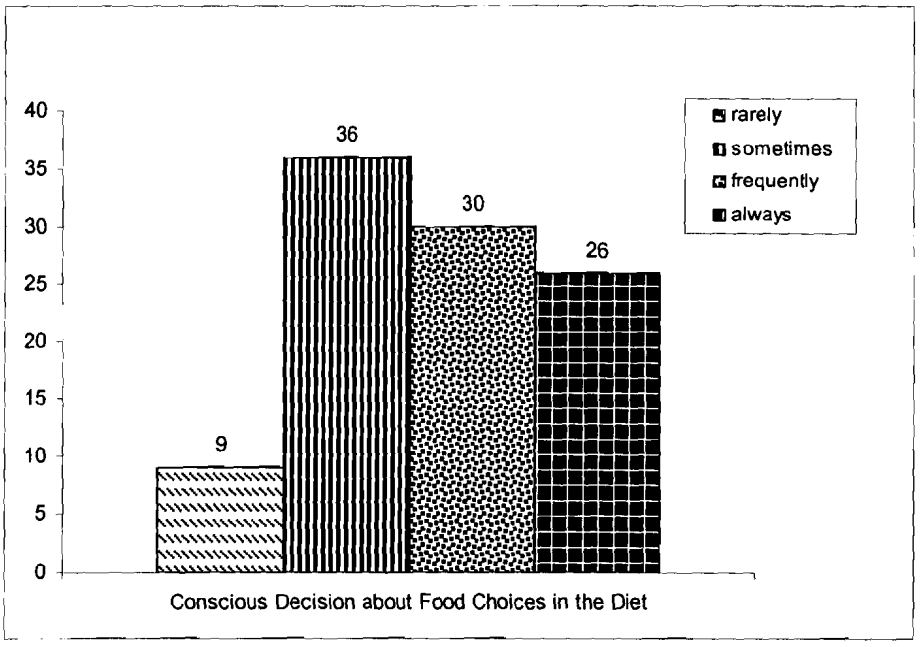

Figure 2. Percentage of respondents making conscious decisions about food choices in the diet (n=207).

Importance of Diets in Treating Illness and Disease

Figure 3 illustrates the respondents agreement with the statement that diet is important in treating illness and disease. Fifity seven percent (n=118) of the respondents believe strongly, and 39% (n=80) of respondents partially agree with the statement. Four percent (n=9) believe that diets are not important in treating illness and disease.

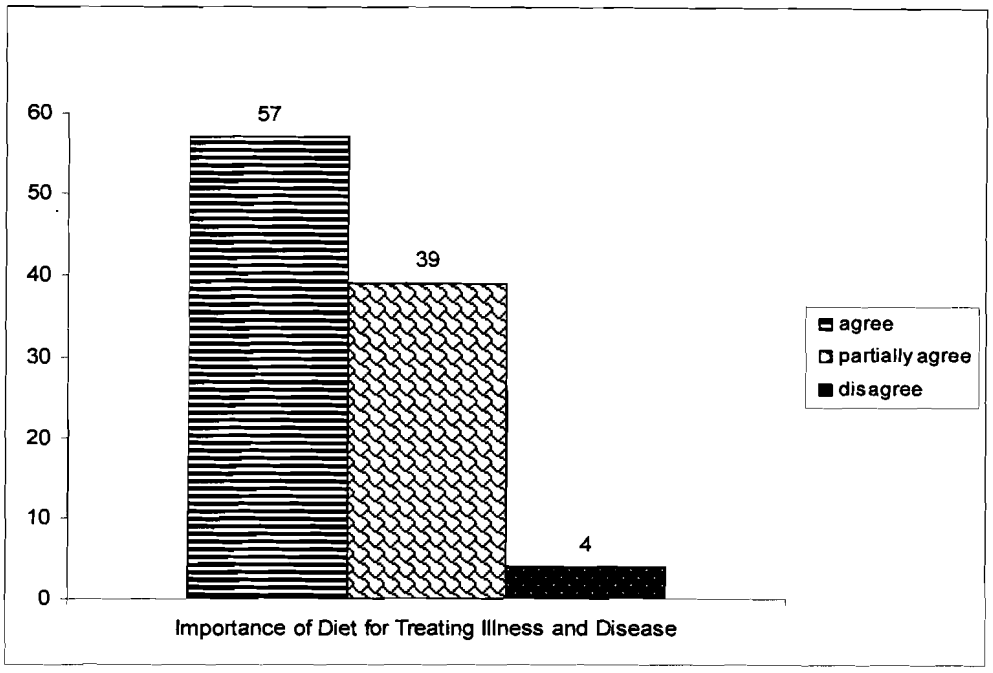

Figure 3. Percentage response of the respondents to importance of diet for treating illness and disease.

Attempt to Become a Vegetarian

Sixty four percent of the respondents stated that they had never tried to become a vegetarian; however, 10% of respondents stated that they are vegetarians now, and 26% stated that they tried to become vegetarians but with no success. Figure 4 shows the percentages of the respondents that are vegetarians at present, those who tried to become vegetarians among the respondents and those who never tried.

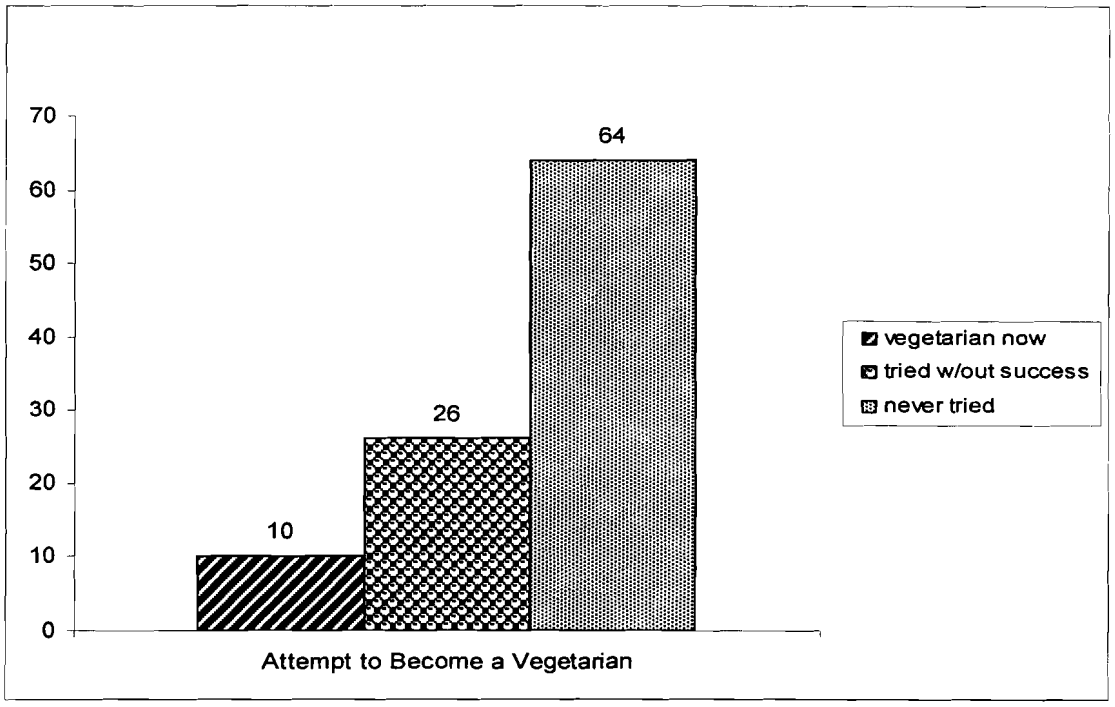

Figure 4. Percentage response for attempt to become a vegetarian, currently vegetarian or never tried to become a vegetarian.

Food Consumption Pattern of the Respondents

The respondents were asked about their food consumption pattern of their diets. Table 7 illustrates the consumption pattern of respondents by percentage. Twenty percent (n=41), 21% (n=43), and 25% (n=51) of the respondents consume red meat never, occasionally and 1-2 times/month, respectively. Twenty seven percent (n=57) consumed meat 2-4 times/week and 7% (n=15) of the respondents almost daily consumed red meat. Poultry was consumed by 46% (n=95) 2-4 times/week, and 27% (n=57) consumed poultry 1-2 times/month. Nine percent (n=18), 12% (n=24) and 6% (n=13) consume poultry never, occasionally and almost daily, respectively. Thirty seven percent (n=80), 24% (n=49), and 23% (n=47) consumed fish/seafood 1-2 time/month, occasionally, and 2-4 times/week, respectively. Twelve percent (n=24) never, and 3% (n=6) almost daily consume fish/seafood. Dairy products were consumed by 79%

(n=163) almost daily and 18% (n=37) 2-4 times/week. Those consuming dairy products occasionally and 1-2 times/month were 1% (n=2) and 2% (n=5). There were no respondents who never consumed dairy products. Fifty five percent (n=113) of the respondents almost daily, consumed fruits and 29% (n=60) consumed fruits 2-4 times/week. A few respondents, 4% (n=8) and 13% (n=26) occasionally and 1-2 times/month respectively consume fruits. Eighty one percent (n=167) of the respondents consumed vegetables almost daily, and 16% (n=33) consumed vegetables 2-4 times/week. A few respondents, 1% (n=2) and 2% (n=5) occasionally and 1-2 times/month, respectively, consumed vegetables.

Table 7

Food Consumption Pattern Percentages of the Respondents

	Never (%)	Occasionally (%)	1-2 times per month (%)	2-4 times per week (%)	Daily or almost daily (%)
Red meat	20	21	25	27	7
Poultry	9	12	27	46	6
Fish/Sea food	12	24	39	23	3
Dairy products	--	1	2	18	78
Fruits	--	4	13	29	55
Vegetables	--	1	2	16	81

Opinions of Respondents about Meat

Table 8 illustrates the percentage of respondents indicating their agreement with statements about meat. Eight percent (n=17), 2% (n=4) and 31% (n=65) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat is an important source for building strength" whereas 30% (n=62) selected agree and 28% (n=59)

chose strongly agree with this statement (4±1.1). Seven percent (n=14), 14% (n=28) and 38% (n=78) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat is an important part of the diet at all stages of life" whereas 27% (n=57) agree and 14% (30) strongly agree with the statement (3±1.0). Three percent (n=7), 5% (n=10) and 32% (n=67) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat is the best absorbed source of iron" whereas 30% (n=63) agree and 29% (n=60) strongly agree with the statement (4±1.0). Nine percent (n=19), 19% (n=40) and 27% (n=56) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat such as beef and lamb is unhealthy to eat" whereas 31% (n= 64) agree and 13% (n= 28) strongly agree with the statement (3±1.1). With the statement "Meat is disgusting", 27% (n=49), 31% (n=65) and 33% (n=69) strongly disagree, disagree, and neutral, respectively, whereas 8% (n=17) agree and 3% (n=7) strongly agree with the statement (2±1.0). Fifteen percent (n=15), 12% (n=25) and 38% (n=78) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Humans have no right to kill animals" whereas 27% (n=56) agree and 8% (n=17) strongly agree with the statement (3±1.1). Ten percent (n=20), 15% (n=32) and 36% (n=75) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat production is cruel to animals" whereas 23% (n=47) agree, and 16% (n=33) strongly agree with the statement (3±1.1). Two percent (n=5), 14% (n=29) and 43% (n=89) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat is expensive" whereas 35% (n=72) agree and 6% (n=12) strongly agree with the statement (3±0.8). Five percent (n=11), 11% (n=23) and 33% (n=68) of the respondents stated their opinion as strongly disagree, disagree, and

neutral, respectively, with the statement "Meat causes heart diseases and cancer" whereas 35% (n=73) agree and 15% (n=32) strongly agree with the statement (3±1.0). Seven percent (n=15), 10% (n=19) and 35% (n=72) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Meat tastes good. I enjoy eating it" whereas 30% (n=63) agree and 18% (n=38) strongly agree with the statement (3±1.1).

Table 8

Percentage of Respondents Indicating Their Agreement with Statements about Meat

	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %	Mean & S.D
Meat is an important source for building strength.	8	2	31	30	28	4±1.1
Meat is an important part of the diet at all stages of life.	7	13	38	27	14	3±1.0
Meat is the best absorbed source of iron.	3	5	32	30	29	4±1.0
Meat such as beef and lamb is unhealthy to eat.	9	19	27	31	13	3±1.1
Meat is disgusting.	24	31	33	8	3	2±1.0
Humans have no right to kill animals.	15	12	38	27	8	3±1.1
Meat production is cruel to animals.	10	15	36	23	16	3±1.1
Meat is expensive.	2	14	43	35	6	3±0.8
Meat causes heart diseases and cancer.	5	11	33	35	15	3±1.0
Meat tastes good. I enjoy eating it.	7	9	35	30	18	3±1.1

Opinions of Respondents about Vegetarianism

Table 9 illustrates opinions of respondents about vegetarianism represented in percentages. Eleven percent (n=22), 25% (n=51), and 36% (n=74) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively with the statement "There is not enough protein and iron in a vegetarian diet" whereas 25% (n=52) agree, and 4% (n=8) strongly agree with the statement (3±1.0). Eight percent (n=17), 34% (n=70), and 27% (n=56) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Vegetarian diets are boring" whereas 28% (n=58) agree, and 3% (n=6) strongly agree with the statement (3±1.0). Twenty seven percent (n=55), 41% (n=86), and 22% (n=46) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Vegetarian diets don't give strength and energy" whereas 8% (n=17) agree, and 1% (n=3) strongly agree with the statement (2±0.9). One percent (n=2), 2% (n=4), and 16% (n=34) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "I love fruits and vegetables" whereas 16% (n=34) agree, and 47% (n=98) strongly agree with the statement (4±0.8). Nearly 0.5% (n=1), 2% (n=4), and 34% (n=71) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Vegetarian diets helps in weight control" whereas 40% (n=82) agree, and 47% (n=98) strongly agree with the statement (2±0.9). Four percent (n=8), 31% (n=64), and 38% (n=78) of the respondents stated their opinion as disagree, neutral, and agree, respectively, with the statement "Vegetarian diets have less saturated fat, hence protect against many diseases" whereas 27% (n=57) strongly agree with the statement (4±0.9). One percent (n=2), 8% (n=16), and 31% (n=65) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement

"Vegetarian diets helps people live longer" whereas 33% (n=68) agree, and 27% (n=56) strongly agree with the statement (4±0.9). Four percent (n=1), 28% (n=58) and 31% (n=64) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Vegetarian diets save money" whereas 27% (n=55) agree, and 10% (n=20) strongly agree with the statement (3±1.0). One percent (n=2), 5% (n=10), and 26% (n=53) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively with the statement "A Vegetarian diet minimizes intake of chemicals and steroids and antibodies found in meat" whereas 38% (n=79) agree, and 30% (n=63) strongly agree with the statement (4±0.9). Forty five percent (n=93), 40% (n=83), and 11% (n=23) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Vegetarians are hippies and weirdoes" whereas 3% (n=7) agree, and 0.5% (n=1) strongly agree with the statement (1±0.8).

Table 9

Opinions of Respondents about Vegetarianism Expressed as Percentages of all the Respondents

	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %	Mean and SD
There is not enough protein and iron in a vegetarian diet.	11	25	37	25	4	2.87±1.0
Vegetarian diets are boring.	8	34	27	28	3	2.84±1.0
Vegetarian diets don't give enough strength and energy.	27	41	22	8	1	2.16±0.9
I love fruits and vegetables.	1	2	16	47	33	4.10±0.8
A vegetarian diet helps in weight control.	0.5	2	34	40	24	2±0.9
Vegetarian diets have less saturated fat, hence protect against many diseases.	--	4	31	38	27	3.89±0.8
Vegetarian diets help people live longer and have a better quality life.	1	8	31	33	27	4±0.9
Vegetarian diets help save money.	4	28	31	27	10	3.09±1.0
A vegetarian diet minimizes the intake of chemicals, steroids, and antibiotics found in meat.	1	5	26	38	30	3.92±0.9
Vegetarians are hippies and weirdoes.	45	40	11	3	0.5	1.74±0.8

Opinions about How Hard it is to Become a Vegetarian

Table 10 illustrates the percentage of respondents indicating opinions of how hard it is to become a vegetarian. Eleven percent (n=22), 19% (n=39), and 29% (n=61) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with

the statement "I don't think it is hard to become a vegetarian" whereas 18% (n=38) agree, and 23% (n=47) strongly agree with the statement (3±1.2). Twenty two percent (n=46), 26% (n=54), and 31% (n=64) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "There are not many vegetarian choices where I shop" whereas 17% (n=35) agree, and 4% (n=8) strongly agree with the statement (2±1.1). Eight percent (n=17), 42% (n=87), and 31% (n=64) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "The food takes too long to prepare" whereas 17% (n=35) agree, and 2% (n=4) strongly agree with the statement (3±0.9). With the statement "My family or peers don't eat vegetarian food" 8% (n=17), 19% (n=40) and 48% (n=99) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, whereas 20% (n=41) agree and 5% (n=10) strongly agree with the statement (3±0.9). Eleven percent (n=22), 33% (n=68) and 31% (n=64) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "The food doesn't seem interesting and tasty" whereas 18% (n=38) agree, and 7% (n=15) strongly agree with the statement (3±1.0). Eight percent (n=15), 16% (n=34), and 34% (n=70) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, with the statement "Not enough knowledge about cooking techniques, nutritional recipes" whereas 24% (n=50) agree, and 18% (n=38) strongly agree with the statement with a (3±1.6). With the statement "Vegetarian food choices are limited when eating out" 3% (n=7), 7% (n=14), and 20% (n=42) of the respondents stated their opinion as strongly disagree, disagree, and neutral, respectively, whereas 36% (n=75) agree, and 33% (n=69) strongly agree with the statement (4±1.0).

Table 10

Percentage of the Respondents Indicating Opinions about How Hard it is to Become a Vegetarian

	Strongly Disagree %	Disagree %	Neutral %	Agree %	Strongly Agree %	Mean and SD
I don't think it is hard to become a vegetarian.	11	19	29	18	23	3.24±1.2
There are not many vegetarian choices where I shop.	22	26	31	17	4	2.54±1.1
The food takes too long to prepare.	8	42	31	17	2	2.62±0.9
My family or peers don't eat vegetarian food.	8	19	48	20	5	2.94±0.9
The food doesn't seem interesting and tasty.	11	33	31	18	7	2.79±1.0
Not enough knowledge about cooking techniques and nutritional recipes.	7	16	34	24	18	3.30±1.1
Vegetarian food choices are limited when eating out.	3	7	20	36	33	3.89±1.0

Would You Want to Become a Vegetarian?

Figure 5 depicts the the percentage of respondent's interest of becoming a vegetarian. When the respondents were asked if they would like to become vegetarians after educating them about the health benefits of vegetarian diets and given more techniques and

recipes as well as more choices in the market place, 45% (n=93) of the respondents indicated that they love meat and would never like to become a vegetarian. Seventeen percent (n=35) of the respondents indicated that they would love to become vegetarians and 38% (n=78) indicated that they could try to become a vegetarian if provided with enough knowledge, cooking techniques and recipes.

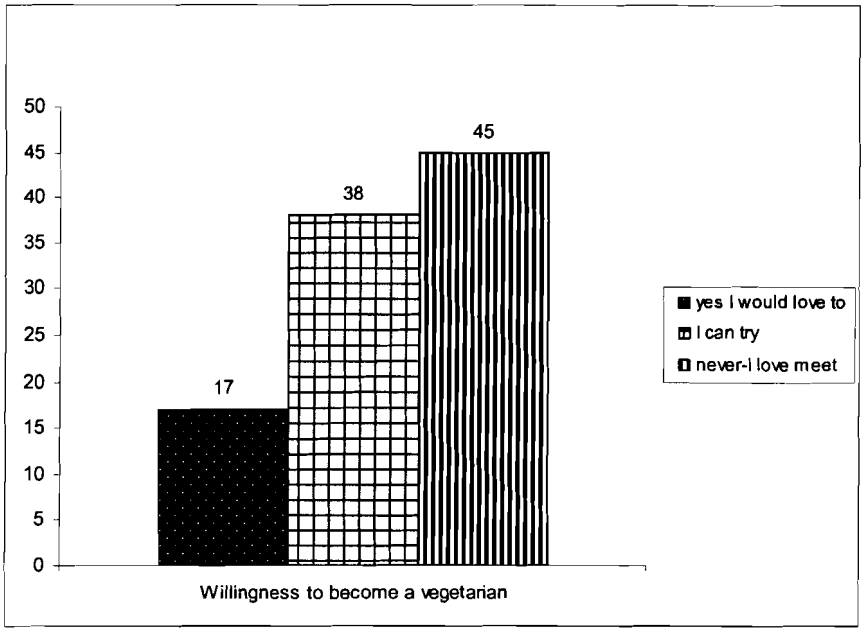

Figure 5. Percentage of respondents' willingness to become a vegetarian.

How Would you Describe your Vegetarian Status?

Seventy nine percent (n=163) of the respondents describe themselves as non-vegetarians and 15% (n=31) described themselves as semi-vegetarians (no meat). Four percent (n=9) describe themselves as lacto-ovo-vegetarians and 2% (n=4) claimed to be vegans. Figure 6 illustrates how the respondents describe themselves as non-vegetarians, lacto-ovo-vegetarians, semi vegetarians or vegetarians.

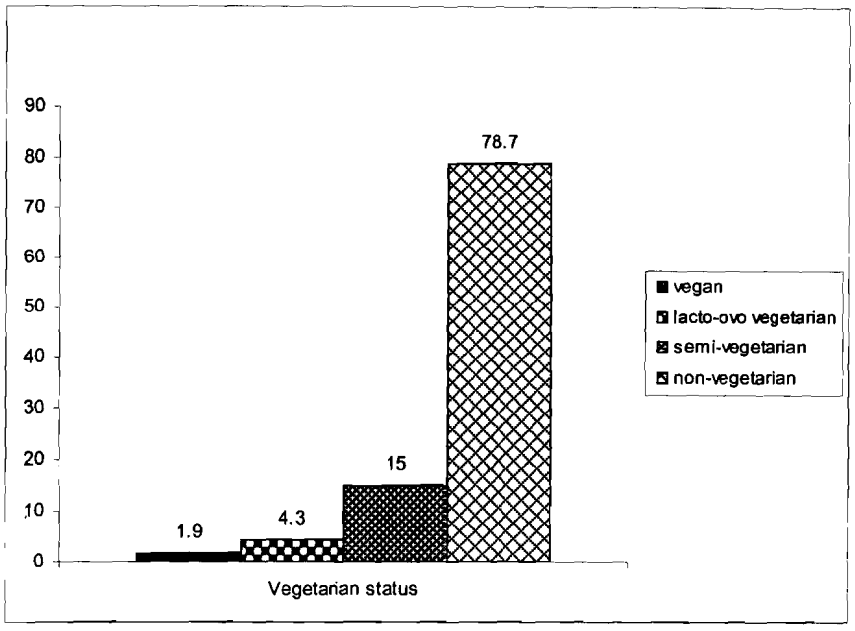

Figure 6. Percentage of the respondent's with their vegetarian status.

Figure 7 indicates number of respondents and whether their transition to become a vegetarian was sudden or gradual. There were 13 respondents observed who avoided meat, poultry and fish but eat only dairy products, vegetables, fruits and eggs. There were 6 respondents who indicated that they were vegetarians since birth. There were 6 respondents who indicated that they chose to become vegetarains when they were younger than 18 years. There was only one respondent of these 13 who became a vegetarian at an age of 21 years. Six respondents were vegetarians since birth, the decision of four to become a vegetarian was gradual and becoming a vegetarian was a sudden decision for three of the respondents.

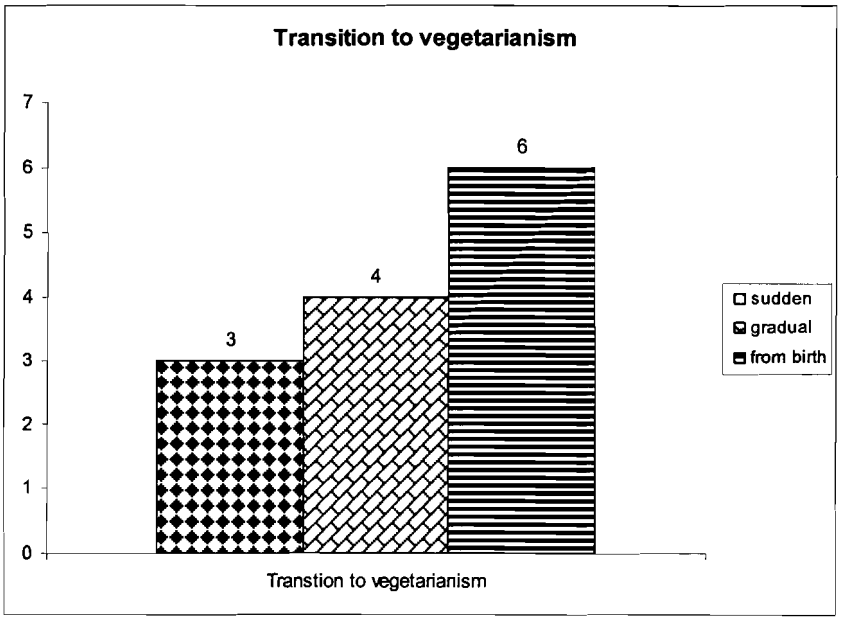

Figure 7. Number of respondents and their response for transition to vegetarianism.

Reasons to Become a Vegetarian

Table 11 illustrates the reasons why the vegetarian respondents (n=13) chose to become vegetarians. Seven of the respondents indicated that they are vegetaians since their family and peer are vegetarians. Six of the respondents indicated that they love fruits and vegetables. The following beliefs that vegetarian diets are fresh and healthy, help in weight control and help in preventing diseases that may be due to excessive meat consumption were selected by five people. Four of the respondents selected spiritual and religious beliefs as a reason why they were vegetarians. Two people selected doctors suggested the diet and two also selected that they can't be cruel to animals. Note: The respondents were able to check more than one response.

Table 11

Reasons Why Vegetarian Respondents Chose to Become Vegetarians (n=13)

	No. of the respondents who checked
Doctor suggested	2
Fresh and healthy	5
Love vegetables and fruits	6
Can't be cruel to animals	2
Spiritual and religious beliefs	4
Weight control	5
Family and peers are vegetarian	7
Prevent diseases associated with meat	5
Other	1

Sources of Information about Vegetarianism:

Table 12 indicates the percentage of the vegetarian respondents that use each information source. Out of 13 vegetarian respondents, about seven of the respondents depended on seeking information about vegetarianism from television and magazines, and four, five and four depended on internet, books and nutritionist/dietitian, respectively. Other sources such as parents, friends, etc. were selected by three respondents. Note: The respondents were able to check more than one response.

Table 12

Information Sources for Vegetarian Respondents

	% checked
Internet	4
Magazine	7
Television	7
Books	5
Nutrition/dietitian	4
Other sources	3

Changes in Life after Becoming a Vegetarian

Figure 8 illustrates the changes in life after becoming a vegetarian. Six of the respondents indicated that they were vegetarians since birth and one indicated that vegetarianism changed their life a lot. Four indicated that there is not much change in their life but they like vegetarian food and one indicated that there is no change at all in their life. When asked if they would encourage other people to become vegetarians, eight of the respondents indicated they would definitely encourage others to follow. Two would most likely encourage others to follow vegetarianism and one of the respondents stated that vegetarianism is hard to follow, and they wouldn't encourage others to follow.

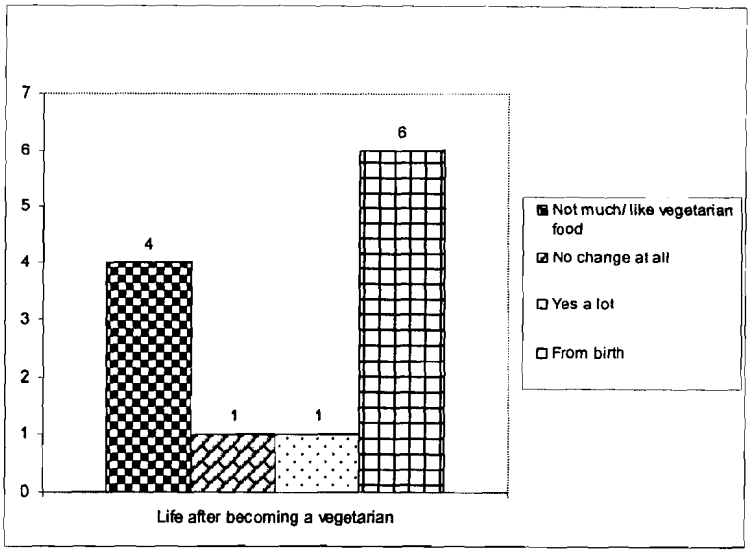

Figure 8. Response for changes in life after becoming a vegetarian.

One Way Analysis of Variance Item Analysis

One Way Analysis of Variance was done for food consumption patterns of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian using the age categories. Table 13 illustrates the one way analysis of variance using the Duncan significance test for the statements regarding consumption of fruits and vegetables and opinions about meat and vegetarianism compared to the age of the respondents. Fifty four years or older aged respondents (4±0.9) consumed less fruits than the other age categories. Fifty four years or older and 27-35 years old respondents (4.84±0.3) ate more vegetables than those 45-53 years old (4.52±0.7). The 54 years or older group (3.57±0.8) think that meat is more expensive than the 45-53 year old (3.14±0.9) and 27-35 year old age groups (2.98±0.9). Fifty four years or older aged respondents (4.47±0.6) significantly believe that vegetarian food choices are limited when eating out than the rest of the age categories.

Table 13

Statistical Difference of Age of the Respondents when Compared to the Statements Regarding Consumption of Fruits and Vegetables and Opinions about Meat and Vegetarianism

	18-26 years old	27-35 years old	36-44 years old	45-53 years old	54 years or older
Consumption of fruits	4.42 ± 0.7^{a}	4.57 ± 0.7^{a}	4.2 ± 0.8^{ab}	4.31 ± 0.9^{ab}	4 ± 0.9^{b}
Consumption of vegetables	4.77 ± 0.5^{ac}	4.84 ± 0.3^{c}	4.71 ± 0.5^{ac}	4.52 ± 0.7^{a}	4.93 ± 0.2^{c}
Meat is expensive	3.34 ± 0.8^{abc}	2.98 ± 0.9^{a}	3.43 ± 0.6^{bc}	3.14 ± 0.9^{ab}	3.57 ± 0.8^{c}
Vegetarian food choices limited when eating out	3.59 ± 1.1^{b}	3.96 ± 1.0^{b}	3.89 ± 0.8^{b}	3.86 ± 1.0^{b}	4.47 ± 0.6^{a}

A t-test was conducted on gender response to items the that included food consumption patterns of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian. Of the statements related to food consumption pattern of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian there was only one item which was significantly different and that was for the statement "Vegetarians are hippies and weirdoes". Males scored a higher mean of 1.92 ± 0.94 than the females (1.61 ± 0.7). On a Likert scale of 1: Strongly disagree and 5: Strongly agree, the males more strongly agree. Note the mean is very low.

One way analysis of variance with a Duncan's test of significance was done for food consumption patterns of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian with

the ethnicity categories. Table 14 illustrates one way analysis of variance using Duncan test of significance for the statements regarding consumption of fruits and vegetables and opinions about meat and vegetarianism compared to the ethnicity categories. Caucasians (3.38±0.9) and Native Americans (3.56±0.9) ate significantly more poultry than others such as Asians, Chinese, and Israel (2.5±1.3). Fish/seafood was significantly consumed more often by Caucasians (2.91±0.9[a]) and Native Americans (3±0.8) than others (2.22±1.2). African Americans (3.77±1.0) believe that "Meat is important part of diet at all stages of life" significantly more strongly than Caucasians (3.34±1.0), Native Americans (3±0.8) and others (2.83±1.3). Native Americans (3.69±0.6) and African Americans (4±1.0) believe that "Humans have no right to kill animals" significantly more strongly than others such as Asians, Chinese, and Israel. (2.78±1.2) and Caucasians (2.89±1.1). African Americans (3.46±0.9) and Native Americans (3±0.8) significantly more strongly agree than others (2.33±1.2) with the statement "Vegetarian diets do not have enough protein and iron". Native Americans (4.06±0.9) significantly more strongly believe that "They do not have enough knowledge about cooking techniques and nutritional recipes" than others such as Asians, Chinese, and Israel (2.56±1.3). The statement "Vegetarian food choices are limited when eating out" was significantly more strongly believed by Native Americans (4.38±1.0), African Americans (4.31±0.6), and Caucasians (3.93±0.9) than others (3.17±1.3).

Table 14

Statistical Differences of Ethnicity Categories when Compared to the Statements Regarding Consumption of Fruits and Vegetables and Opinions about Meat and Vegetarianism

	Caucasian	Native American	African American	Other
Consumption of poultry	3.38±0.9[a]	3.56±0.9[a]	2.92±1.3[ab]	2.50±1.3[b]
Consumption of fish/seafood	2.91±0.9[a]	3.0±0.8[a]	2.38±0.9[ab]	2.22±1.2[b]
Meat is an important part of diet at all stages of life	3.34±1.0[ab]	3.06±0.6[a]	3.77±1.0[b]	2.83±1.3[a]
Humans have no right to kill animals	2.89±1.1[a]	3.69±0.6[b]	4.0±1.0[b]	2.78±1.2[a]
Not enough protein and iron in vegetarian diet	2.86±0.9[ab]	3.0±0.8[b]	3.46±0.9[b]	2.33±1.2[a]
Cooking techniques/nutritional recipes	3.30±1.1[a]	4.06±0.9[b]	3.62±1.0[ab]	2.56±1.3[c]
Vegetarian food choices limited when eating out	3.93±0.9[a]	4.38±1.0[a]	4.31±0.6[a]	3.17±1.3[b]

Table 15 illustrates the statistical analysis comparing married/not married to the statements regarding consumption of fruits and vegetables and opinions about meat and vegetarianism. A t-test was done to analyze consumption pattern of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian versus marital status of the respondents. All the responses to the statements used a Likert scale with 1= strongly disagree and 5= strongly agree. Married respondents (3.61±1.1) had a higher mean than the unmarried (2.82±1.1) and were significantly

different for the statement "Humans have no right to kill animals". The statement "Vegetarian diets don't give strength and energy" was significantly different depending upon marital status. Unmarried respondents (2.38±1.0) had a higher mean than the married respondents (2.01±0.8) but both disagreed to the statement. Married respondents (3.92±0.9) had a significantly higher mean than the unmarried (3.58±0.9) for the statement "Vegetarian diets don't help people live longer". Married respondents (3.47±1.1) had a significantly higher mean than the unmarried (3.07±1.1) for the statement "I do not have enough knowledge: cooking techniques/nutritional recipes."

Table 15

Statistical Analysis Comparing Married/Not Married to the Statements that were Significantly Different.

	Marital Status	Mean & S.D	t value	sig.
Humans have no right to kill animals	Married	3.61±1.1	2.12	0.05
	Unmarried	2.82±1.1		
Vegetarian diets don't give strength and energy	Married	2.01±0.8	-2.6	0.01
	Unmarried	2.38±1.0		
Vegetarian diets don't help people live longer	Married	3.92±0.9	2.5	0.05
	Unmarried	3.58±0.9		
I do not have enough knowledge: cooking techniques/ nutritional recipes	Married	3.47±1.1	2.4	0.05
	Unmarried	3.07±1.1		

One way analysis of variance with a Duncan's test of significance was done for food consumption pattern of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian with education categories of the respondents. Table 16 illustrates one way variance analysis using Duncan test of significance for the below statements with education categories. Respondents with 2 year vocational/technical training (3.5±1.2) had a higher rate of red meat consumption than 4 year college/university participants (2.69±1.2). Respondents with 4 year college/university (4.46±0.7) had a higher rate of fruit consumption than 2 year vocational/technical training (3.75±1.1). Respondents with 4 year college/university (4.82±0.4) had a higher rate of vegetable consumption than 2 year vocational/technical training (4.25±1.0). Respondents with 4 year college/university (3.38±0.9) strongly believed that meat such as beef and lamb are unhealthy to eat than 2 year vocational/technical training (2.38±1.2). Respondents with 4 year college/university (3.26±1.1) and high school education (3.01±1.0) strongly believed that humans have no right to kill animals than 2 year vocational/technical training (1.94±1.1). Respondents with 4 year college/university (3.40±1.1) and high school education (3.15±1.0) strongly believed that meat production is cruel to animals than 2 year vocational/technical training (2.19±0.9). Respondents with 4 year college/university (3.58±0.8) and high school education (3.45±1.0) more strongly believed that meat causes heart diseases and cancer than 2 year vocational/technical training (2.19±0.9). Respondents with 2 year vocational/technical training (4.13±1.0) strongly believed that meat tastes good and enjoy eating it more so than those with 4 year college/university (3.32±1.1) and high school education (3.49±1.0). Respondents with 4 year college/university (4.09±0.8) and high school education (3.78±0.9) more strongly believed that vegetarian diets minimize the intake of chemicals/steroids than 2 year vocational/technical

training (3.25±0.8). Respondents with 4 year college/university (2.92±0.9[a]) and high school education (3.08±0.9) more strongly believed that family or peers don't eat vegetarian food compared to those with a 2 year vocational/technical training (2.44±1.0). Respondents with high school education (4.19±0.9) strongly believed that vegetarian food choices are limited when eating out when compared to the 4 year college/university (3.79±0.9) and 2 year vocational/technical training (3.44±1.3).

Table 16

Statistical Difference of Education Categories When Compared to the Statements Regarding Consumption of Fruits and Vegetables and Opinions about Meat and Vegetarianism

	High school	2 yr voc-tech	4 yr college/univ
Consumption of red meat	2.93±1.2[a]	3.5±1.2[a]	2.69±1.2[b]
Consumption of fruits	4.29±0.8[a]	3.75±1.1[b]	4.46±0.7[a]
Consumption of vegetables	4.8±0.4[a]	4.25±1.0[b]	4.82±0.4[a]
Meat such as beef and lamb are unhealthy to eat	3.25±1.1[a]	2.38±1.2[b]	3.38±0.9[a]
Humans have no right to kill animals	3.01±1.0[a]	1.94±1.1[b]	3.26±1.1[a]
Meat production is cruel to animals	3.15±1.0[a]	2.19±0.9[b]	3.40±1.1[a]
Meat causes heart diseases and cancer	3.45±1.0[a]	2.19±0.9[b]	3.58±0.8[a]
Meat tastes good. I enjoy it	3.49±1.0[a]	4.13±1.0[b]	3.32±1.1[a]
Vegetarian diets minimizes intake of chemicals/steroids	3.78±0.9[a]	3.25±0.8[b]	4.09±0.8[a]
Family or peers don't eat vegetarian food	3.08±0.9[a]	2.44±1.0[b]	2.92±0.9[a]
Vegetarian food choices limited when eating out	4.19±0.9[a]	3.44±1.3[b]	3.79±0.9[ab]

Table 17 illustrates one way analysis of variance using Duncan significance for the statements regarding consumption of fruits and vegetables and opinions about meat and vegetarianism with income categories. All the statements used a Likert scale with the highest score of 5.0 for strongly agree. Respondents of income levels ≥ 60,000 (3.09±1.2), 20,000-40,000 (3.12±1.0), 40,000-60,000 (3.29±1.0) strongly believe that humans have no right to kill animals more so than the ≤20,000 income group (2.54±1.1). Respondents with income ≥ 60,000 (2.39±1.2) significantly more strongly believe that vegetarian diets don't give enough strength and energy when compared to the 40,000-60,000 income group (1.84±0.7). Respondents with income 40,000-60,000 (4.07±0.8) more strongly believe that vegetarian diets help people live longer than the ≤20,000 income group (3.5±0.9). Respondents with income 20,000-40,000 (3.09±1.1) more strongly believe that vegetarian food doesn't seem interesting and tasty when compared to the ≤20,000 income group (2.48±.9).

Table 17

Statistical Difference of Income Categories when Compared to the Statements Regarding Consumption of Fruits and Vegetables and Opinions about Meat and Vegetarianism

	less than 20,000	20,000-40,000	40,000-60,000	60,000 & above
Have no right to kill animals	2.54±1.1[a]	3.12±1.0[b]	3.29±1.0[b]	3.09±1.2[b]
Vegetarian diets don't give enough strength and energy	2.10±0.8[ab]	2.36±1.0[b]	1.84±0.7[a]	2.39±1.2[b]
Vegetarian diets help people live longer	3.5±0.9[a]	3.76±0.9[ab]	4.07±0.8[b]	3.78±1.0[ab]
Vegetarian food doesn't seem interesting and tasty	2.48±.9[a]	3.09±1.1[b]	2.75±1.0[ab]	2.65±1.0[ab]

Table 18 illustrates one way analysis of variance using the Duncan significance test for the below statements with conscious decision about food choices categories. One way variance of analysis with a Duncan's test of significance was done for food consumption pattern of the respondents, opinions of respondents about meat, opinions of respondents about vegetarianism, and opinions about how hard it is to become a vegetarian with the frequency of making conscious decisions about food choices categories of the respondents. Consumption of red meat was significantly higher in those who rarely (3.17±1.0), sometimes (3.01±1.1), and frequently (2.95±1.2) make conscious decisions about food than those who always make conscious decisions (2.26±1.2). Similarly consumption of poultry was significantly higher in those who rarely (3.28±1.0), sometimes (3.45±0.8), and frequently (3.53±0.8) make conscious decisions

about food than those who always make conscious decisions (2.81±1.2). Consumption of fish/seafood was significantly higher in those respondents choosing rarely (3.22±1.0) or frequently (2.9±0.9) compared to those who always (2.47±1.1) make conscious decisions about food choices. Respondents who make conscious decisions about food choices rarely (3.78±0.9), sometimes (3.81±1.1), and frequently (3.94±1.0) believe that meat is an important source of building strength than those who always (3.19±1.2) make conscious decisions about food choices. Respondents who make conscious decisions about food choices rarely (4.11±0.8), sometimes (3.86±0.9), and frequently (3.90±0.9) believe that meat is the best absorbed source of iron than those who always (3.36±1.2) make conscious decisions about food choices. Respondents who always (2.85±1.0) make conscious decisions about food choices strongly believe that meat is disgusting than those who sometimes (1.96±0.8) or rarely (2.33±0.7) make conscious decisions about food choices. Respondents who rarely (3.61±1.0) make conscious decisions about food choices strongly believe that humans have no right to kill animals compared to those who sometimes (2.85±1.1) or frequently (2.90±1.1) make conscious decisions about food choices. Respondents who sometimes (3.68±1.0) make conscious decisions about food choices strongly believe that meat tastes good and enjoy eating meat more so than those who always (3.08±1.2) make conscious decisions about food choices. Respondents who rarely (4.44±0.7) make conscious decisions about food choices significantly and strongly believe that vegetarian food choices are limited when eating out compared to than those who always (3.64±1.1) make conscious decisions.

Table 18

Statistical Difference of Conscious Decision about Food Choices Categories Compared to the Statements Regarding Consumption of Fruits and Vegetables and Opinions about Meat and Vegetarianism

	Rarely	Sometimes	Frequently	Always
Consumption of red meat	3.17 ± 1.0^{a}	3.01 ± 1.1^{a}	2.95 ± 1.2^{a}	2.26 ± 1.2^{b}
Consumption of poultry	3.28 ± 1.0^{a}	3.45 ± 0.8^{a}	3.53 ± 0.8^{a}	2.81 ± 1.2^{b}
Consumption of fish/seafood	3.22 ± 1.0^{a}	2.84 ± 0.9^{ab}	2.97 ± 0.9^{a}	2.47 ± 1.1^{b}
Meat is an important source of building strength	3.78 ± 0.9^{a}	3.81 ± 1.1^{a}	3.94 ± 1.0^{a}	3.19 ± 1.2^{b}
Meat is the best absorbed source of iron	4.11 ± 0.8^{a}	3.86 ± 0.9^{a}	3.90 ± 0.9^{a}	3.36 ± 1.2^{b}
Meat is disgusting	2.33 ± 0.7^{a}	1.96 ± 0.8^{a}	2.44 ± 1.0^{ab}	2.85 ± 1.0^{b}
Humans have no right to kill animals	3.61 ± 1.0^{a}	2.85 ± 1.1^{b}	2.90 ± 1.1^{b}	3.17 ± 1.1^{ab}
Meat tastes good. I enjoy eating it	3.39 ± 0.9^{ab}	3.68 ± 1.0^{a}	3.47 ± 1.0^{ab}	3.08 ± 1.2^{b}
Vegetarian food choices are limited when eating out	4.44 ± 0.7^{a}	4.11 ± 1.0^{ab}	3.69 ± 1.0^{b}	3.64 ± 1.1^{b}

Chapter V: Conclusion

This thesis examined the beliefs and knowledge about vegetarianism of residents living in Wisconsin and Minnesota. This study also elucidated the frequency of meat consumption and beliefs and opinions about meat and vegetarianism. The proportion of vegetarians and perspective vegetarians in the population were determined.

Discussion

The majority of the respondents belonged to the younger age groups of 18-26 years of age and 27-35 years of age. The fifty four and older age groups (14% of the sample) are consuming less fruits and vegetables than the other age groups 36-44 years old, 27-35 years old and 18-26 years old. The older age group of 54 years and older believes more strongly than other groups that meat is expensive and vegetarian food choices are limited when eating out. Dairy products, and vegetables are being consumed almost every day; however, fruits are being consumed at a slightly lower rate of everyday or 2-4 times per week. Fish/seafood consumption is relatively low compared to the other animal based foods. Poultry is the most often consumed meat when compared to red meat and fish/seafood. Although ninety four percent of the participants claimed that they were non-vegetarians, the percent of the study population eating red meat, fish/seafood and poultry daily or almost daily was low compared to 2-4 times/week and 1-2 times per month. Twenty percent of the participants never preferred to eat meat.

There were more women respondents than men, 57% vs. 43%. Respondents strongly disagreed that vegetarians are hippies and weirdoes, however, females disagreed more so than males. This is positive in that both males and females do not perceive or label negatively those who practice vegetarianism. Curtis & Comer, 2006, stated in a study that women follow vegetarianism more so than men as women believe that vegetarian diets help in weight control.

Seventy six percent of the respondents belong to the Caucasians ethnicity and the rest were Native Americans, African Americans and other ethnic groups such as Asian, Chinese, and Israel. Caucasians, Native Americans and African Americans had a higher consumption of poultry and fish/seafood than other ethnic groups composed of Asians, Chinese, and those from Israel. Red meat consumption on a daily basis was relatively low in all the ethnic groups. African Americans believed that meat is an important part of the diet at all stages of life when compared to Native Americans. Native Americans and African Americans agree more so that humans have no right to kill animals and vegetarian diets lack enough protein and iron than Caucasians and other ethnic groups. Caucasians, Native Americans and African Americans also believe that they do not have enough knowledge about vegetarian cooking techniques/nutritional recipes and also express that vegetarian food choices are limited when eating out.

The majority of the respondents were married. Married respondents agree more strongly that humans have no right to kill animals than the unmarried respondents. Married respondents more strongly believe than the unmarried respondents that they do not have enough knowledge about vegetarian cooking techniques/nutritional recipe, that vegetarian food choices are limited when eating out and vegetarian diets help people live longer.

Educational level for most of the respondents was college/university level or high school and the majority of the respondents earned 20,000-60,000 per annum although very few had a higher income of 60,000 and above. Respondents who earn 60,000 and above believe that vegetarian diets help save money and there aren't many vegetarian food choices where they shop. There weren't any significant parameters found with respect to the rest of the statements and income levels.

The awareness about the USDA nutritional guidelines is slowly increasing among the

population irrespective of their education. The majority has an idea of the USDA guidelines yet 31% had never heard of them. A majority of the participants expressed that diet is important in treating illnesses and disease. Very few of the participants indicated that they tried to become vegetarians with no success (26%) and 13 participants (10%) indicated that they are vegetarians now. However 64% had never tried to become vegetarian.

A majority of the respondents (91%) indicated that they were health conscious and made conscious decisions always, frequently or sometimes. Respondents who always made conscious decisions were more likely to believe that meat is not important to build strength in the body and is not a best source of iron. These individuals who always make conscious decisions about food choices eat less red meat, poultry and fish/seafood. This group who always make conscious decisions about food choices as well as who sometimes make conscious decisions about food choices do not believe that vegetarian food choices are limited when eating out when compared to those who rarely make conscious decisions about food choices. Thus those who always make conscious decisions in making their food choices are less likely to eat meat, less likely to consider meat as best absorbed source of iron and less likely to enjoy the taste of meat.

The higher means for the respondents indicated their agreement that meat as an important source for building strength and meat is the best absorbed source of iron. Respondents disagreed with the statement that meat is disgusting. The means were also higher for agreement of respondents to the statements that vegetarian diets decreased intake of saturated fat and chemicals, steroids, and antibiotics to protect against many diseases unlike meat.

A changing trend in people inclining towards vegetarianism was observed as seventeen percent of the respondents indicated that they would like to become vegetarians and 38% indicated that they could try becoming a vegetarian. Ten percent of the respondents stated that

they are vegetarians at present and 26% indicated that they tried to become vegetarians but with no success.

There were 13 respondents identified who follow vegetarianism at present. The majority of those respondents indicated that they were vegetarians because their family and peers were vegetarians. These respondents also indicated that they love fruits and vegetables, believe that vegetarian diets are fresh and healthy, helps in weight control and prevent diseases associated with meat. These 13 vegetarian respondents seek most information about vegetarianism from magazines, television, book, and internet and from nutritionist/dietitian. Six of the respondents indicated that they were vegetarians since birth; another 6 respondents indicated that they chose to become vegetarians when they were below 18 years old. Only one respondent decided to become a vegetarian at an age of 21 years old. This was surprising, it was anticipated that older individuals of this population became vegetarians for health reasons.

Conclusions

Over the coming years the popularity for vegetarianism may possibly rise if the population is educated about cooking techniques and tasty nutritional vegetarian recipes, provided more vegetarian food choices are stocked in the grocery stores, and restaurants increase vegetarian food choices for those when eating out. In this study, the respondents indicated that following vegetarianism is not difficult to follow and believe that vegetarian food does not take too long to prepare, and the food is interesting and tasty. These opinions clearly indicate the respondents' inclination towards vegetarianism and there is possibility of many more vegetarians in the Unites States in the future. This transition would reduce the meat consumption of the population, which in turn would support environmental/ecological conservation and reduce the risk of many chronic diseases such as type 2 diabetes, coronary heart disease, high

blood pressure, obesity, and a few cancers.

Recommendations

This research has identified predictors of health-related meat and vegetarianism beliefs and these results may serve as a basis for future research conducted in this area. These findings indicate that participants might choose vegetarianism if they were educated on the nutritional health benefits of plant based diets and cooking techniques. Education efforts should emphasize tasty, healthy cooking recipes and techniques. Meat could be promoted by combining lean meat with plenty of vegetables to produce a relatively low fat meal. The nutritionist must educate the population about the association between diets that are low in plant foods and high in meat with certain diseases such as heart diseases. The fact that well-planned vegetarian and other plant-based diets are nutritionally adequate and provide adequate iron and protein needs to be emphasized to combat social concerns about vegetarianism among some of the population. Preparation of quick, economical, tasty vegetarian dishes and relatively low fat meat dishes combined with vegetables would benefit the population. It will be helpful to increase the supply of vegetarian food choices in almost all shopping stores. Useful information should be provided to the population through health and nutrition information sources. This information could influence diet-related beliefs and healthier dietary behaviors of the population.

This thesis identified 6.2% of the population being vegetarians and 17% as prospective vegetarians. A similar study was conducted by Emma Lea, a student from Australia who found 14% of the Australian population as being prospective vegetarians. To my knowledge no studies were conducted in United States regarding beliefs about meat and vegetarianism. It would be useful to conduct similar studies in the future across regional areas of the U.S. so that comparisons could be made.

The information provided by this thesis may be used to improve vegetarian diets using the dietary sources of vegetarian foods. The population needs to be educated about health concerns and other environmental issues of meat consumption in order to increase healthy food patterns. Vegetarians need to be encouraged to eat a well planned diet, emphasizing the adequate intake of nutrients such as iron, zinc, vitamin B12. Greater choice of healthy vegetarian meals in restaurants that may also benefit the health of individuals.

References

Allen, L. H., (2000). Anemia and iron deficiency: Effects on pregnancy outcome. *American Journal of Clinical Nutrition*, 71(5), 1280S-1284S.

Anderson, J., & Prior, S. (2007). *Vegetarian diets*. Retrieved November 27, 2007, from http://www.ext.colostate.edu/pubs/foodnut/09324.html

Barnard, N. D., Cohen, J., Jenkins, D. J. A., Turner-McGrievy, G., Gloede, L., Jaster, B., Seidl, K., Green, A. A., & Talpers, S. (2006). A low-fat vegan diet improves glycemic control and cardiovascular risk factors in a randomized clinical trial in individuals with type 2 diabetes. *Diabetes Care 29*(8), 1777-1783.

Beardsworth., & Keil, A. (1991). Health-related beliefs and dietary practices among vegetarians and vegans: A qualitative study. *Health Education Journal* , 38-42.

Bronk, G., & Su, Athur. (2006). . *Newton Tab.* Retrieved November 6, 2007, from Newton Tab and Green Decade Coalition: http://www.humaneteen.org/?q=node/261

Chen, H. L., Su, H. J., & Lee, C. C. (2006). Patterns of serum PCDD/Fs affected by vegetarian regime and consumption of local food for residents living near municipal waste incinerators from Taiwan. *Environment International. 32*(5), 650-655.

Cho, E., Chen. W. Y., Hunter, D. J., Stampfer, M. J., Colditz, G. A., Hankinson, S. E., & Willett, C. W. (2006). Red meat intake and risk of breast cancer among premenopausal women. *Archives of Internal Medicine. 166*(20), 2253-2259.

Curtis, M., & Comer, L. K. (2006). Vegetarianism, dietary restraint, and feminist identity. *Eating Behaviors. 7*, 91-104.

Drake, R., Reddy, S., & Davies, J. (1998). Nutrient intake during pregnancy and pregnancy outcome of lacto-ovo-vegetarians, fish-eaters and non-vegetarians. *Vegetarian nutrition.* CRC Press, Boca Raton, FL, 45-52.

Driskell, J. A. (2005). Nutrient recommendations for adults. Retrieved December, 03, 2007, from http://www.ianrpubs.unl.edu/epublic/live/g1555/build/g1555.pdf

Fieldhouse. (1986). *Food and nutrition: Customs and culture.* London: Croom Helm.

Food and Nutrition Board. (1998). *Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B_6, folate, vitamin B_{12}, pantothenic acid, biotin, and choline.* Washington, D.C: National Academy Press.

Gillooly, M., Bothwell, T. H., Torrance, J. D., MacPhail, A. P., Derman, D. P., Bezwoda, W. R., Mills, W., Charlton, R. W., & Mayet, F. (1983). The effects of organic acids, phytates and polyphenols on the absorption of iron from vegetables. *British Journal of Nutrition. 49*(3), 331-342.

Ginberg, C., & Ostrowski, A . (2003*). The market for vegetarian foods: The Vegetarian Resource Group*. Retrieved November 26, 2007. http://www.vrg.org/nutshell/market.htm

Hebbelinck, M., & Clarys, P. (2001). Physical growth and development of vegetarian children and adolescents, in Sabaté, J. (Eds), *Vegetarian nutrition*, CRC Press, Boca Raton, FL, 173-93.

Herrmann, W., & Geisel, J. (2002). Vegetarian lifestyle and monitoring of vitamin B-12 status. *Clinical Chimica Acta, 47*, 1094-1101.

Kelemen, L. E., Cerhan, J. R., Lim, U., Davis, S., Cozen, W., Schenk, M., Colt, J., Patricia, H., & Ward, M. H. (2006). Vegetables, fruit, and antioxidant-related nutrients and risk of non-Hodgkin lymphoma: A National Cancer Institute–surveillance, epidemiology, and

end results population-based case-control study. *American Journal of Clinical Nutrition, 83*(6), 1401-1410.

Larson, D. E. (2003). Vegetarian Athletes. In Rosenbloom C.A, *Sports nutrition: A guide for the professional working with active people* (405-425). Chicago, IL: American Dietetic Association, Sports, Cardiovascular, and Wellness Dietitic Practice Group.

Larsen, H. R., (2006). Summaries of the latest research concerning vitamin B12. Retrieved November 29, 2007, from http://www.yourhealthbase.com/vitamin_B12.html

Larsson, C. L., & Johansson, G. K. (2002). Dietary intake and nutritional status of young vegans and omnivores in Sweden. *American Journal of Clinical Nutrition 76*, 100-106.

Mangels, A. R., & Messina, V. (2001). Considerations in planning vegan diets: Infants. *Journal of the American Dietetic Association 101*(6), 670–677.

Mangles, R. (2007). Scientific update: A review of recent scientific papers related to vegetarianism. *Vegetarian Journal.* (2), 20-21.

Marsh A, G., Christiansen, D. K., Sanchez, T. V., Mickelsen, O., & Chaffee, F. L. (1989). Nutrient similarities and differences of older lacto-ovo-vegetarian and omnivorous women. *Nutrition Reports International, 39,* 19-24.

Merchant, A. T., Pitiphat, W., Franz, M., & Joshipura, K. J. (2006). Whole-grain and fiber intakes and periodontitis risk in men. *American Journal of Clinical Nutrition. 83*(6), 1395-1400.

Messina, M., & Messina, V. (1996). *The dietitian's guide to vegetarian diets: Issues and applications*. Gaithersburg, MD: Aspen Publishers.

Mintel International Group. (2001). The Vegetarian food market-US report. Chicago, IL : Mintel International Group.

National Cattlemen's Beef Association. (2000). *Beef/meat-containing vs vegetarian diets and health.* Retrieved November 28, 2007, from http://www.beef.org/documents/ACF3A.pdf

National Institute of Nutrition. (2002). Tracking nutrition trends. An update on Canadians' nutrition-related attitudes, knowledge and actions, 2001. Canada: Health Canada.

National Restaurant Assocation. (2001). *Tableservice restaurant trends.* Washington, DC : National Restaurant Association.

Nieman, DC. (1999). Physical fitness and vegetarian diets: Is there a relation? *American Journal of Clinical Nutrition, 70*(3), 570S-575S.

Perry, C. L., McGuire, M. T., Neumark-Sztainer, D., & Story, M. (2002). Adolescent vegetarians-How well do their dietary patterns meet the healthy people 2010 objectives? *Archives of Pediatric Adolescents Medicine. 156*(2), 431-437.

Prynne, C. J., Mishra, G. D., O'Connell, M. A., Muniz, G., Laskey, M. A., Yan, L., Prentice, A., & Ginty, F. (2006). Fruit and vegetable intakes and bone mineral status: A cross-sectional study in 5 age and sex cohorts. *American Journal of Clinical Nutrition. 83*(6), 1420-1428.

Public Policy Statements. (2003). Position of the American Dietetic Association and Dietitians of Canada: Vegetarian diets. *Canadian Journal of Dietetic Practice and Research, 64*(2), 62-81.

Setchell, K. D. R., & Cole, S. J. (2006). Method of defining equol-producer status and its frequency among vegetarians. *Journal of Nutrition, 136*(8), 2188 - 2193.

Snyder, K. S., Sleeper, A. C., & Zierath, S. M. J. (1989). Nutritional, physiological, and menstrual status of distance runners. *Medicine & Science in Sports & Exercise, 21*(2), 120–125.

Stahler, C. (2006). *How many adults are vegetarian?* Retrieved November 27, 2007, from http://www.vrg.org/journal/vj2006issue4/vj2006issue4poll.htm

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., & De Haa, C. *(2006). Livestock's long shadow. Environmental issues and options.* Rome: Food & Agriculture Organization.

Sussman, V. (1978). *The vegetarian alternative: A guide to a healthful and humane diet.* Emmaus, Pennsylvania: Rodale Press.

Trang, H. M., Cole, D. E., Rubin, L. A., Pierratos. A., Siu. S., & Vieth, R. (1998). Evidence that vitamin D3 increases serum 25-hydroxyvitamin D more efficiently than does vitamin D2. *American Journal Clinical Nutrition. 68*(4), 854-858.

Tsai, C. J., Leitzmann, M. F., Willett, W. C., Giovannucci, E. L. (2007). Heme and non-heme iron consumption and risk of gallstone disease in men. *American Journal of Clinical Nutrition. 85*(2), 518-522.U

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (2000) *Nutrition and your health: Dietary guidelines for Americans* (5th edition., text rev.). Washington, DC: U.S. Department of Agriculture.

The Vegetarian Resource Group. (2003). How many people order vegetarian meals when eating out? Retrieved November 26, 2007, from http://www.vrg.org/journal/vj99sep/999scientific.htm

World Animal Foundation. (2007). *Vegetarianism.* (n.d.).. Retrieved from November 8, 2007 http://64.233.167.104/search?q=cache:eY9GwnO7kAAJ:worldanimalfoundation.homestead.com/FACT_SHEET_Vegetarianism.pdf+WAF+fact+sheets+vegetarianism&hl=en&ct=clnk&cd=1&gl=us&client=firefox-a

Appendix A: IRB Approval

Your project, "*Beliefs and knowledge about vegetarianism,*" is **Exempt** from review by the Institutional Review Board for the Protection of Human Subjects. The project is exempt under Category 2 of the Federal Exempt Guidelines and holds for 5 years.

Please copy and paste the following message to the top of your survey form before dissemination:

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

Appendix B: Consent Form

Title: ***Beliefs and knowledge about vegetarianism.***

Investigator:
Navya Gurajada, Graduate Student
Department of Food and Nutrition, 219 Home Economics Building
University of Wisconsin, Stout, Menomonie, WI 54751
gurajadan@uwstout.edu, 715-232-2216 Advisors Office; 715-523-9658 Mobile

Description:
The purpose of this research is to determine the participant's beliefs and knowledge about vegetarianism. This research will help our profession understand the trends in red meat consumption and current interest in vegetarian diets and its implications for health.

Risks and Benefits:
This survey seeks your opinions about vegetarianism. The questions in the survey are very general and annonymous. There is no risk of invasion of your privacy. However there is some risk involved in dealing with emotions that questions about your dietary habits may invoke. This study will benefit the profession in understanding peoples' beliefs and knowledge about vegetarianism.

Time Commitment and Payment:
The survey takes 10-15 min to complete.

Confidentiality:
The general information sought will be confidential. Your name will not be included on any document and you cannot be identified from any of this information.

Right to Withdraw:
Your participation in this survey is entirely voluntary. You may withdraw your participation from the research anytime without incurring adverse consequences. However, there is no way to identify your anonymous documentation after it has been turned into the researcher.

IRB Approval:
This study has been reviewed and approved by the University of Wisconsin's – Stout Institutional Review Board (IRB). The IRB determined that this study meets ethical obligations required by Federal law and University policies. If you have questions, or reports regarding your rights as a research subject, please contact the IRB administrator or the investigator.

Investigator:
Navya Gurajada, 813-215-9333
gurajadan@uwstout.edu

Advisor:
Dr. Carol Seaborn, 715-232-2216
seabornc@uwstout.edu

IRB Administrator
Sue Foxwell, Director, Research Services
152 Vocational Rehabilitation Bldg
University of Wisconsin--Stout.
Menomonie WI 54751
715-232-2477
foxwells@uwstout.edu

Statement of consent:
By completing this following survey, you agree to participate in the project entitled, **Beliefs and knowledge about vegetarianism.**

Beliefs and Knowledge of Vegetarianism

Please fill in the blanks and check the response that would apply to you.

1. Age: _____ years
2. Check gender: ___ Male ___ Female
3. Ethnicity (Please check all that apply):
   ___ White/Caucasian ___ Pacific Lander
   ___ Asian American ___ Hispanic/Latino
   ___ Native American ___ African American
   ___ Other (Please describe): _____
4. Religious affiliation: Please describe if applies : _____
5. Marital status: (check one)
   ___ Single ___ Co habilitation ___ Married ___ Separated
   ___ Divorced ___ Widowed
6. Highest educational level:
   ___ Primary school ___ 2 year voc-tech training ___ High School
   ___ 4 year college/university ___ Other: _____
7. Income (per annum):
   ___ ≤ 20,000 ___ 20,000 – 40,000 ___ 40,000 – 60,000
   ___ 60,000 – 80, 000 ___ 80,000 – 100, 000 ___ ≥ 100,000
8. Are you aware of the USDA nutritional guidelines?
   ___ Very aware ___ Have an idea ___ Never heard of them
9. Do you make conscious decisions about food choices in your diet?
   ___ Always ___ Frequently ___ Sometimes ___ Rarely
   ___ Tried, but without success
10. Do you think diet is important in treating illness and disease?
    ___ Agree ___ Partially agree ___ Disagree
11. Have you tried to become a vegetarian?
    ___ I am a vegetarian now ___ I tried but without success ___ Never tried
12. Please check your consumption pattern of the following foods:

	Never	Occasionally	1-2 times per month	2-4 times per week	Daily or almost daily
Red meat					
Poultry					
Fish/ Sea food					
Dairy Products					
Fruits					
Vegetables					

13. Please check a box to indicate your opinion regarding the following statements about meat.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Meat is an important source for building strength.					
Meat is an important part of the diet at all stages of life.					
Meat is the best absorbed source of iron.					
Meat such as beef and lamb is unhealthy to eat.					
Meat is disgusting.					
Humans have no right to kill animals.					
Meat production is cruel to animals.					
Meat is expensive.					
Meat causes heart diseases and cancer.					
Meat tastes good. I enjoy eating it.					

14. Please check a box to indicate your opinion regarding the following statements about vegetarianism.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There is not enough protein and iron in a vegetarian diet.					
Vegetarian diets are boring.					
Vegetarian diets don't give enough strength and energy.					
I love fruits and vegetables.					
A vegetarian diet helps in weight control.					
Vegetarian diets have less saturated fat, hence protect against many diseases.					
Vegetarian diets help people live longer and have a better quality life.					
Vegetarian diets help save money.					
A vegetarian diet minimizes the intake of chemicals, steroids, and antibiotics found in meat.					
Vegetarians are hippies and weirdoes.					

15. Please check a box to indicate your opinion regarding the following statements about how hard it is to become a vegetarian.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I don't think it is hard to become a vegetarian.					
There are not many vegetarian choices where I shop.					
The food takes too long to prepare.					
My family or peers don't eat vegetarian food.					
The food doesn't seem interesting and tasty.					
Not enough knowledge about cooking techniques and nutritional recipes.					
Vegetarian food choices are limited when eating out.					

16. After knowing about the health benefits of vegetarian diet and given more techniques and recipes and more choices in the market place, would you want to become a vegetarian?
Yes, I would love to ___ I can try ___ Never, I love meat

17. How would you describe yourself?

a) Vegan (No fish, meat, poultry, eggs, dairy products)
b) Fruitarian (Only fruits, nuts and vegetables)
c) Lacto ovo vegetarian (No meat, fish or poultry, but eat eggs and dairy products)
d) Semi-vegetarian (No red meat)
e) Non-vegetarian

If checked (d) and (e), Thank you, you are done here!

If checked (a), (b), (c), please answer the following Questions.

1) At what age did you become vegetarian? _____ years
2) This transition was
___ Sudden ___ Gradual
3) Select the reason that closely matches why you chose to become a vegetarian. (check all that apply)
My doctor suggested ___ I think it's more fresh and healthy
___ I love vegetables and fruits ___ I can't be cruel to animals
___ Spiritual and religious beliefs ___ Weight control
___ My family/peers are vegetarians ___ Prevent diseases associated with meat consumption
___ Other, please specify: _____

4) Where have you gotten most of your information about vegetarianism? (check all that apply)
___ Internet ___ Magazines ___ Television ___ Books
___Nutritionist/dietitian ___Other, please specify: _____

5) Did you see any change in your life after becoming a vegetarian?
___ not much change but I like vegetarian food ___ No change at all
___ I am planning to start having meat again ___ Yes, a lot. Please specify:
_____

6) Would you encourage people to become vegetarians?

___ Definitely ___ Most likely
___ No, it's hard to follow ___ Never, meat is the best

Please provide any additional comments you would like to make regarding vegetarianism:

_____
_____
_____
_____
_____

Thank you!