Perceptions of meat and dairy foods and plant-based alternatives among college students

by

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Abstract

Interest and participation in plant-based lifestyle patterns in North America has increased significantly due to perceived health benefits and concerns about the environment, ethics, and safety of the food supply. The Academy of Nutrition and Dietetics suggests that vegetarian diets are healthful, nutritionally adequate. There is growing evidence that plant-based dietary patterns are more sustainable than animal-based diets because they use fewer natural resources and are less environmentally taxing. With the projected world population growth and declining resources, sustainable diets and environmental sustainability are a must.

As the need and interest in plant-based dietary patterns increases, it becomes important to evaluate public perception. There is currently little research focusing on attitudes and perceptions of the broader plant-based dietary pattern, particularly in the college-aged population. This exploratory study investigated individual perceptions of meat, dairy foods, and plant-based alternatives.

Study results indicated taste preferences for meat and dairy foods were high. Additionally, students in the College of Agriculture and students who had a rural background were more likely to have a positive perception of meat and dairy foods than plant-based foods. These findings suggest the implementation of interventions such as education and the development of plant-based meat and dairy food alternatives matching their flavor profile as closely as possible may best assist in the shift from an animal-based to a plant-based dietary pattern.

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Little did I know at the beginning of this endeavor that it would be the hardest thing I had ever done. I have been challenged, have become stronger, have more knowledge and have discovered an issue that is of great importance to me. I have grown as a human being, student, educator, partner and mother. Without the love and support I have received along the way this would have been an impossible journey. There were times along the way I felt lost, confused, exhausted, depressed and felt as though I had failed as a student, an employee, a partner, friend and a mother. My confidence was shattered and there were so many moments where the task just felt unattainable. This lead to many tears being shed and many doubts in my head, but those tears also lead to moments where I realized that the tables had turned and my babies were the ones comforting, supporting and encouraging me and for this I am astounded and grateful.

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Dedication

First, I dedicate this to my babies, Kaden and Adelyne. You have inspired and encouraged me, taught me and filled my heart with joy when I see you are proud of me.

Second, I dedicate this to my partner, Matthew McLeod, you have offered me love, support, patience and encouragement all throughout this journey.

Finally, I humbly dedicate this to myself as a testament to my hard work, diligence, and desire to help others and myself to be well.

Chapter 1 - Introduction

The purpose of this pilot study is to explore the health and environmental benefits associated with a plant-based dietary pattern and public perceptions, as well as to conduct a general review regarding the perceptions of meat and dairy foods and plant-based alternatives among college students at Kansas State University.

Introduction: What is a Plant-Based Dietary Pattern?

First, it is necessary understand the difference in a vegetarian and a plant-based dietary pattern, and how it compares to a typical dietary food pattern. A vegetarian diet is defined as a dietary pattern excluding meat (including fowl) or seafood, or products containing those foods. [1,2] Variations of the diet include lacto-vegetarian (includes dairy), lacto-ovo-vegetarians (includes dairy and eggs) and vegan diets (excludes all foods of animal origin). [2] A plant-based dietary pattern does not necessarily exclude meat or dairy products all together. It is higher in fruits, vegetables, whole grains, legumes, fish and poultry than the typical American "Western" dietary food pattern which has higher intakes of red meats, processed meats, refined grains, sweets and desserts. [3]

Introduction: Human Health & Plant-Based Dietary Patterns

The plant-based dietary pattern is lower than meat-centered diets in cholesterol, saturated fat and animal protein. It is higher in antioxidants (such as vitamin C and E), folate, fiber, phytochemicals and carotenoids; and has been shown to be significantly associated with a reduced risk of cardiovascular disease (CVD), type 2 diabetes (T2D) and all-cause mortality. [3,4] Plant-based diets that allow small amounts of red meat are associated with reduced risk of diseases, particularly CHD and T2D. [2] On the contrary, the "Western" dietary food pattern is

significantly associated with increased risk of CVD, T2D and all-cause mortality, in addition to increased cancer mortality. [3]

There is strong evidence from both epidemiologic and clinical studies supporting a plant-based dietary pattern for their health benefits. Plant-based dietary patterns contain a number of foods and nutrients known to have independent health benefits. [2] This type of diet is characterized by greater consumption of fruit and vegetables, which contains a myriad of phytochemicals, dietary fiber, and antioxidants that may offer protective advantages for both cancer and CVD risk. The consumption of fruit and vegetables has also consistently been inversely associated with risk of CVD, which has been confirmed by meta-analyses. [2] Legumes, nuts, grains, and soy protein-food components are also found in abundance in these dietary food patterns, which may be independently associated with positive health outcomes and contribute significant amounts of protein, healthy fat and micronutrients. [2,5] While specific food components are studied and are of importance when evaluating health benefits, there has been a shift in recent years toward emphasizing dietary patterns such the plant-based dietary pattern, as opposed to the traditional approach that focuses on specific nutrients or foods. [3] Evidence indicates the health benefits associated with specific foods and nutrients found in plant-based dietary patterns such as fiber, calcium, polyunsaturated fat and monounsaturated fats. A plant-based dietary pattern can have an impact on a number of chronic diseases and health risks including all cause-mortality, cardiovascular diseases (CVD) (i.e. coronary heart disease (CHD), coronary artery disease (CAD), ischemic stroke, ischemic heart disease, arterial stiffness and coronary artery lesions), Hypertension (HTN), Diabetes (DM) including T2D, obesity, the gut microbiota/colonic microflora, maintaining bone health and perhaps even cancer.

Introduction: Sustainability & Plant-Based Dietary Patterns

The World Commission on Environment and Development defines sustainability as follows: “Humanity has the ability to make development sustainable-to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” [6]

Introduction: Sustainability & Plant-Based Dietary Patterns

Food Demand

The world population is growing exponentially and is expected to reach 9 billion by the year 2050. That is a 28% increase from the current 7 billion. [7] The Food and Agriculture Organization of the United Nations (FAO) projected that by 2050 world food demand will be approximately 70% higher than in 2005/2007, [8] but later revised this figure to 60%. [9] However, other recent analyses say a 100-110% increase in global crop supply will be needed from 2005-2050. [6,10] In spite of the abundance of evidence supporting the unsustainability of a primarily animal-based diet population growth coupled with the increased wealth, development, urbanization, trade, transnational food corporations, retailing growth, food industry marketing and consumer attitudes and behaviors has led to an increased demand of animal-based foods such as meat and dairy. [7] Since 1963, there has been a 62% increase worldwide in meat consumption. A greater increase of approximately 300% has occurred in developing nations. [7] The simultaneous population growth and demand for animal-based products places an even greater strain on the already vulnerable environment.

Introduction: Sustainability & Plant-Based Dietary Patterns

Food Security

To achieve environmental sustainability and food security, which is at further risk with the threat of lower food yields due to substantial climate change, [7,11] challenges within the current food system require radical changes in the way food is produced, processed, stored, distributed, accessed, as well as the types of food consumed. [7] Both the public and scientific communities have had an increased awareness of the environmental impact and sustainability of protein food production and the consequences of food choices. [5] Evidence shows meat and dairy products are responsible for a larger share of natural resource utilization and pollution impacts compared with plant foods. [12] Animal food production by means of factory farming is a major driver of biodiversity loss, climate change and freshwater depletion. [6,7] Decreasing the consumption of meat and other animal products will free up large amounts of food, such as soy and grains, that could be consumed directly by humans. Foley et al [7,13] recently estimated the potential to increase the global food supply by shifting 16 major crops from the current mix of uses (i.e. human consumption, livestock feed, and biofuels) to human food consumption only. They estimated a 28% increase in food availability, or the equivalent of a 49% increase in dietary energy for human consumption. Decreased consumption of meat would benefit the environment. Industrial livestock production contributes to increasing environmental degradation. [7] The modification of diets should be included as a strategy for public health improvements because consumers have immediate control over the consumption of particular foods and can be influenced by appropriate actions from policy makers. [12]

Introduction: Interest in a Plant-Based Dietary Pattern

Interest and participation in plant-based dietary patterns in North America has increased significantly [4,14] due to health benefits associated with a plant-based dietary pattern and concerns about the safety of the food supply, among others. [1,14,15]

Introduction: Public Perception & Plant-Based Dietary Patterns

As the need, interest, and participation in plant-based dietary patterns continue to grow, it is important to further investigate health and environmental implications and public perception because human behavior and policy are the catalysts for an agricultural and dietary shift. There is currently a lack of research focusing on attitudes and perceptions of diets, [16] and how the examination of these perceptions pertains to the broader plant-based dietary pattern. [4] Without an understanding of the psychosocial and socio-demographic factors (as examined via the survey) associated with meat consumption and perceptions, it is not possible to begin to develop educational strategies needed to enable the public in learning of the possible benefits of plant-based dietary patterns. [4] It is apparent that strategies and education are needed because evidence from both epidemiologic and clinical studies of the benefits of plant-based dietary patterns show the current dietary intake of such foods by most Americans is far below the recommended servings based on national dietary guidelines. [3] People may face barriers to altering their behavior if they do try to eat a healthier diet. It has been argued that behavioral change will only occur when the benefits outweigh the barriers to entry. [4] Therefore, the investigation of individuals' perceptions of meat and dairy foods will assist in identifying perceptions and socio-demographic factors. This newfound understanding will be useful for designing successful approaches in transitioning dietary and agricultural practices in a more healthful and sustainable direction.

Introduction: Study Population

The chosen population for this exploratory study is of particular interest because these individuals have the timely potential to influence the plant-based food industry. Firstly, they are currently consumers, and consumer demands are the driving force to the food system. [7,17] These individuals are in pursuit of a higher education that may afford them positions of influence within society. Having individuals in positions of influence who are knowledgeable a plant-based dietary pattern will aid in shifting to a more healthful and sustainable lifestyle. This age group has been underrepresented in previous studies evaluating beliefs regarding vegetarian diets. A random population sample was taken with an underrepresentation of 19-24 year olds and an over-representation of 45-64 year olds, and married people, compared to Census data. [4] Therefore, gaining knowledge regarding college student's perceptions and how they developed (i.e. the evaluation of socio-demographic factors and perceptions) may provide some insight as to where additional education and potential interventions would be most effective in developing a plant-based dietary pattern lifestyle.

Chapter 2 - Human Health & Plant-Based Dietary Patterns

A plant-based dietary pattern emphasizing preference for plant-derived foods may reduce all-cause mortality and would potentially be more easily understood and accepted by the population rather than a pure vegetarian diet. [18] Plant-based dietary patterns in which very low amounts of meat and processed meat are being consumed appear to be associated with greater longevity and lower cardiometabolic risk; additionally, while there is evidence linking red meat intake (particularly processed meat) and increased risk of CHD, cancer and T2D, [2,18] it appears that a plant-based diet containing small intakes of meat, fish and dairy products may offer health benefits as well as protection against CVD, cancer and overall mortality. [2,4] Occasional meat-eaters demonstrated a 20% reduction in CHD when compared with regular meat-eaters. [2] The 2015 Dietary Guidelines Committee supports these findings. They concluded that a healthy dietary pattern is higher in vegetables, fruits, whole grains, low-fat or nonfat dairy, seafood, legumes and nuts; lower in red and processed meat; and low in sugar-sweetened foods and drinks and refined grains. [19]

As stated earlier, a plant-based dietary pattern can have an impact on a number of chronic diseases and health risks including all cause-mortality, cardiovascular diseases (CVD) (i.e. coronary heart disease (CHD), coronary artery disease (CAD), ischemic stroke, ischemic heart disease, arterial stiffness and coronary artery lesions), Hypertension (HTN), Diabetes (DM) including T2D, obesity, the gut microbiota/colonic microflora, maintaining bone health and perhaps even cancer.

Human Health & Plant-Based Dietary Patterns: All-Cause Mortality

All-cause mortality refers to excess causes of death related to a disease or condition within a population during a period of time. Data from cohort studies indicates that increased

meat consumption, especially processed meat, is positively and strongly associated with all-cause mortality, independent of other lifestyle factors. [2] A 5-year follow up of the Adventist Health Study 2 cohort showed an overall association of vegetarian dietary patterns with lower mortality and the Prevención con Dieta Mediterránea (PREDIMED) study concluded that among omnivorous subjects at high cardiovascular risk, those who consumed a primarily plant-based food pattern were at a reduced risk of all-cause mortality. [18]

Human Health & Plant-Based Dietary Patterns: CVD

An estimated 92.1 million US adults have at least 1 type of CVD. By 2030, 43.9% of the US adult population is projected to have some form of CVD. [19] When considered separately from other CVDs, stroke ranks fifth among all causes of death. [19] In 2013, there were 6.5 million stroke deaths: making stroke the second leading cause of death behind ischemic heart disease. High-income countries (particularly the United States) saw the highest rates of prevalence. [19] NHANES 2011-2012 shows that the use of cholesterol lowering treatment has increased substantially among adults, from 8% in 1999-2000 to 18% in 2011-2012. [19] This indicates that more Americans are experiencing high blood cholesterol levels and are turning to pharmacological treatment to try to lower them which may lead to increased financial burden and a potentially lower quality of life. The alternative dietary treatment and preventative action of consuming food in a dietary pattern with an emphasis on plant-based foods is well supported, should be more cost effective and should enhance quality of life. Red and processed meat intake has been positively associated with CVD, T2D and certain cancers in epidemiological studies while plant-based food pattern diets of all types have shown to have a lower risk of cardiovascular diseases and T2D compared to their omnivorous counterparts. [2,3,20] Furthermore, the NIH (National Institutes of Health) prospective study from the United States, involving over

half a million adults aged 50-71 years over 10 years, found increased risk of total mortality and CVD mortality among those in the highest quintile of red meat and processed meat intake, compared with those in the lowest quintile. [2] Additionally, intakes of low-carbohydrate diets that were higher in plant-based sources of proteins and oils rather than animal-based sources were also associated with reduced CHD event and incidence of T2D. [3] This observed reduction in CHD may be due to a plant-based dietary pattern promoting the lipid-lowering effects by consuming foods that are lower in saturated fat (SFA), and higher in protective factors such as fruits, vegetables, nuts, whole grains, n-3 MUFAs and n-6 PUFAs. [2,4,21] Studies show that when intake of SFA is replaced with n-6 PUFAs, the risk of CHD is reduced. [2] Such benefits were seen in individuals consuming a plant-based dietary pattern. There was an observed 34% reduction in CHD mortality in individuals eating fish but no meat when compared with regular meat eaters as well as a reduced risk of CHD for individuals consuming modest fish and dairy consumption as well as occasional meat intake when compared with regular meat-eaters. [2] There is convincing evidence from epidemiologic and clinical trials that n-3 MUFAs reduce the incidence of CAD and all-cause mortality. [21] While fatty fish has been promoted as the standard n-3 fatty acid (FA) food source, there are plant food source alternatives that are rich in Alpha-Linolenic acid (ALA), which is a n-3 FA found in foods such as flaxseed, walnuts, and vegetable oils, including canola and soybean oils. [21]

Human Health & Plant-Based Dietary Patterns: HTN

Hypertension (HTN) is another very prevalent health concern in the United States that can be positively impacted by the implementation of a plant-based dietary pattern. The age-adjusted prevalence of HTN among US adults ≳20 years of age is estimated to be 34% in NHANES 2011 to 2014, which is equivalent to 85.7 million adults. [19] The higher intake of fruits

and vegetables seen in plant-based dietary patterns may be responsible for the reduced incidence of HTN in these populations. In "A Dietary approach to prevent hypertension: A review of Dietary Approaches to Stop Hypertension (DASH) study" fruit and vegetable intake was found to be responsible for about one-half of the blood pressure reduction of the Dietary Approaches to Stop Hypertension diet. [1,22]

Human Health & Plant-Based Dietary Patterns: DM

Diabetes has proven to be a great health concern in the United States over the past several years. An estimated 23.4 million adults have diagnosed DM, 7.6 million have undiagnosed DM, and 81.6 million have prediabetes. [19] A number of studies show a plant-based dietary pattern has a positive impact on the protection against DM, improving blood sugar levels and increasing insulin sensitivity. As previously mentioned plant-based dietary patterns are generally higher in fruits and vegetables and evidence suggests that high fruit and vegetable intakes may also reduce the risk of developing T2DM. [2] Furthermore, nuts are another common food found in higher amounts in plant-based dietary patterns and three large cohort studies found women in the Nurses' Health Study (NHS) who consumed nut and peanut butter had a reduced risk of T2DM. [23] On the contrary meat and processed meats, which are reduced or absent from plant-based, vegetarian and vegan diets have been found to be an important risk factor even after the adjustment for BMI. [1] These findings, after adjusting for BMI, are significant such that obesity has been shown to increase risk of T2DM. [1] It is evident that a plant-based dietary pattern may be very impactful in the prevention and treatment of DM.

Human Health & Plant-Based Dietary Patterns: Obesity

The obesity epidemic has been sweeping the United States for years and has become increasingly prevalent. [24] In 2011-2012 16.9% of 2-to-19 year olds and 34.9% of adults aged 20

years or older were obese. [25] Obesity is a risk factor for morbidity and mortality aggravating the risk of CVD, DM, malignant and metabolic diseases and is a risk factor of social and financial burdens as well. [24,26] Studies have shown plant-based dietary patterns to have a positive impact on the prevention and treatment of obesity. Additionally, an analysis of 3 large prospective cohort studies revealed an inverse relationship between the consumption of plant-based foods and weight gain, meaning an increased intake of foods such as vegetables, nuts, whole grains and fruits will decrease the occurrence of weight gain. [3] A plant-based dietary pattern can play a role in the treatment of obesity as well. Another aspect examined specific to plant-based dietary patterns and how it may impact BMI is the minimal or zero intake of meat. Among Adventists, 30% of whom follow a meatless diet, BMI increased as the frequency of meat consumption increased in both men and women. [1] Therefore, it is apparent that plant-based dietary patterns play a role in the prevention and treatment of obesity. This may be due to the increased consumption of foods more prevalent in these dietary patterns such as vegetables, fruits, nuts and whole grains and/or possibly due to the absence of foods in these dietary patterns such as meat.

Human Health & Plant-Based Dietary Patterns: Gut Microbiota/Colonic Microflora

The large intestine (colon) is one of the most diversely colonized and metabolically active organ in the human body. The modulation of the gut microbiota is a growing area of interest, and it has been suggested to have the potential to reduce risk factors associated with chronic diseases. [3] Together with the immune system, colonic and mucosal microflora contribute significantly to the barrier that prevents pathogenic bacteria from invading the gastrointestinal (GI) tract. There are a number of factors that influence the composition of the microflora including changes in physiological conditions of the host (e.g., age, stress, health status),

environmental circumstances (e.g., antibiotic therapy, hygiene with antiseptics, etc.) and composition of diet. [27] Plant-based dietary patterns contain dietary components such as prebiotics and resistant starches (fiber) that favorably alter the gut microbiota and may have significant implications to human health. [3,27] Dietary fiber and fermentable substrate (i.e. non-digestible or undigested carbohydrates) are sources of metabolic fuel for gut microbial fermentation and in turn will result in end products that may be used by the host (i.e. short-chain fatty acids). [3]

Human Health & Plant-Based Dietary Patterns: Bone Health

Dairy foods are most widely publicized as being the best source of calcium and vital for maintaining bone health. However, foods that are generally consumed more frequently and in higher amounts in plant-based dietary patterns, such as fruits and vegetables play an important role in bone health. Studies show that an increased fruit and vegetable intake has a positive effect on the calcium economy and markers of bone metabolism. [1] Green leafy vegetables, calcium-fortified plant foods such as fruit juices, soy milk, rice milk and breakfast cereals can provide ample amounts of dietary calcium. [1] There may be questions regarding the bioavailability of calcium in plant-based beverages (i.e. soy) compared to cow's milk; however, there is support showing the bioavailability of calcium from soy milk that is fortified with carbonate is equivalent to cow's milk. [1]

Human Health & Plant-Based Dietary Patterns: Cancer

While further studies are needed, it does appear that plant-based dietary patterns may positively impact risk for cancer. The largest prospective cohort study of 34,192 Seventh Day Adventists suggested cancer of the colon and prostate were significantly more likely in omnivores than in vegetarians, although this was not confirmed in a pooled analysis from two

UK populations. [2] Therefore, there is promising evidence that following a plant-based dietary pattern may decrease risk of cancer; however further studies are required.

Human Health & Plant-Based Dietary Patterns: Fiber

As mentioned previously there are a number of food nutrients shown to have health benefits that are found in abundance when following a plant-based dietary pattern such as dietary fiber, magnesium and potassium, vitamins C and E, folate, carotenoids, flavonoids and other phytochemicals. [1] Fiber is a nutrient of particular interest as the benefits go far beyond the well-recognized benefit of improved bowel function. [27] Additionally, regularly consuming the recommended amount of fiber includes benefits such as reduced risk of diabetes, CVD including CHD, HTN, metabolic syndrome as well as benefits on weight management, colonic health and immune function. [1,26,27] Foods that are high in fiber include whole grains, vegetables, fruits and legumes all of which are foods consumed regularly when following a plant-based dietary pattern [27] and yet several studies show Americans typically consume only half of the recommended amount which is 25-38g/day. [3,27]

Fiber: Bowel Function

Bowel regularity is primarily due to an increase in stool weight due to the physical presence of fiber, water held by fiber and increased bacterial mass from fermentation. These larger and softer stools increase the ease of defecation and reduce transit time through the intestinal tract, which may prevent and alleviate constipation. [27]

Fiber: DM

Several studies show individuals living with diabetes in the United States do not meet adequate mean daily fiber intake in their diets even though numerous studies indicate soluble fiber is associated with lower postprandial glucose levels/reduced glycemic response and

increased insulin sensitivity in both healthy and diabetic subjects. [26] By consuming the recommended amount of fiber, it has the potential to attenuate glucose absorption rate, prevent weight gain, and increase the load of beneficial nutrients in the diet, all of which may help prevent diabetes. [27] Numerous large-scale cohort studies support a strong inverse relationship between dietary fiber consumption and the development of T2D. [27]

Fiber: CVD and HTN

Epidemiologic studies suggest adequate fiber intake consistently lowers the risk of CVD and CHD, primarily through a reduction in low-density lipoprotein (LDL) levels. [27] This is supported further by recent clinical trials and meta-analyses that support the cholesterol-lowering properties of soluble dietary fiber that have repeatedly shown to lower total and LDL levels reducing the risk of CVD. [1,27] Several trials and observational studies have shown a beneficial effect of increased fiber intake (both soluble and insoluble) on the control and possibly prevention of HTN. [26]

Fiber: Metabolic Syndrome

Metabolic syndrome (MetS) is a cluster of cardiometabolic risk factors, including elevated fasting plasma glucose (FPG) or T2D, abdominal obesity, high blood pressure, low HDL cholesterol and hypertriglyceridemia. [23] Individuals with MetS have 5-times the risk of developing DM, and those with DM have 2-5 times the risk of suffering from future CVD. [23] Several forms of dietary fiber have been used as complementary or alternative agents in the management of manifestations of metabolic syndrome. [26]

Fiber: Weight Management

Fiber plays a role in satiation and satiety by slowing gastric emptying and decreasing the rate of glucose absorption in the small intestine, which may lead to decreased caloric intake and

assist in weight management. Prospective cohort studies report that people who consume more fiber tend to weigh less than people who consume lesser amounts. [27] Furthermore, epidemiologic studies suggest an inverse relation of dietary fiber intake and body weight, which is supported by cross-sectional studies and large observational studies as well. [26]

Fiber: Colonic Health

As stated, the gut microflora is vastly diverse and plays an important role in human health. A plant-based dietary pattern has been shown to positively alter the gut microflora and resistant starch (fiber) appears to be a key factor for this alteration. [3] An important mechanism of action for dietary fiber is fermentation in the colon and changes in gut microflora. Prebiotic fiber, a class of fiber may act to beneficially alter the colonic microflora. [27]

Fiber: Immune Function

There is also some evidence of increased resistance to illness or infection with fiber intake. For instance, oligofructose (fiber) consumption was found to reduce febrile illness associated with diarrhea or respiratory events and reduced antibiotic use in infants. Also, certain fibers such as B-glucans, have been shown to interact with immune cells, therefore stimulating the immune system directly. [27] Soluble, non-viscous fiber has been found to be useful in alleviating symptoms of inflammatory conditions, such as irritable bowel syndrome (IBS). [27] Overall, higher fiber intakes have been linked with lower mortality, particularly from circulatory, digestive and non-CVD/non-cancer inflammatory diseases. [27]

Chapter 3 - Sustainability of Plant-Based Dietary Patterns

Sustainability

"Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." [6] This statement by the World Commission on Environment and Development links the 3 pillars often used to define sustainability. These pillars include, ecology (global environmental degradation), economy (poverty) and society (rapid population growth) each with their underlying components. [6]

Sustainability: Environmental Sustainability (Ecology)

Environmental sustainability is a subset of ecological sustainability which refers specifically to the intersection of human activities and ecological systems. [28] Components of environmental sustainability include energy input and output use, [7,29] pollution, land and water use, soil erosion, and biodiversity loss. [29] Sabaté and Soret [7] recognize two important dimensions regarding environmental sustainability including efficiency and environmental protection. Efficiency is a measure of how natural resources are used to obtain the foods of a given diet and is quantified by the efficiency ratio, which is the ratio of inputs to outputs. Environmental protection addresses the preservation of ecological systems that allow life on earth: the biosphere Environmental indicators measure it. Both the efficient use of natural resources and avoidance of environmental degradation in the production, preparation, and disposing of food are key components to environmental sustainability. [7]

Sustainability: Sustainable Diets (Ecology)

Human food production and consumption play a pivotal role in sustainability; therefore, sustainable diets are heavily interconnected with environmental sustainability. In 2010, the Food and Agriculture Organization of the United Nations (FAO) defined sustainable diets as "those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources". [7,29,30] Furthermore, Fanzo et al [31] identified the determinants of sustainable diets as follows: nutritional adequacy, environmental sustainability, cultural acceptability, and low-cost accessibility. [7,31]

Sustainability: Food Demand (Economy)

Economic concerns for sustainability include the prevalence of poverty, but contrarily the global increase in wealth, human population growth leading to increased food demand will compromise food security, food safety and food sustainability. [6] Recent analyses say that a 100-110% increase in global crop supply will be needed by 2005-2050. [6,10] World market price projections of the International Food Policy Research Institute showed that world grain prices may increase 30-50% before 2050. [32] However, more recent sources suggested "Global food prices are predicted to rise by 70-90% by 2030. [6,33]

Sustainability: Population Growth (Society)

Additionally, the social components of sustainability include knowledge, political participation, race, gender, equity, and population growth. [6,29] Sustainability has become an integral consideration of the dietary guidelines of many countries in recent decades. [29] Numerous governmental, non-governmental, multi-lateral, and research institutions have acknowledged the

importance of sustainability in forming food and nutrition policy. [29] The world population is expected to reach 9 billion by the year 2050. That is a 28% increase from the current 7 billion. [7] Approximately one billion people are obese and approximately 1 billion go hungry. [6] It is increasingly logical that nutrition should not only promote health but sustainability as well. [6] The United States population doubled in the past 60 years to 285 million and is projected to double again in the next 70 years to 570 million. [34] This growth rate will put an even greater strain on an already-limited supply of energy, land and water resources. [34]

Sustainability: Agricultural Production (Energy Use)

Agriculture is the basis of the food system. It is defined as the practice of producing crops and raising livestock, and that involves managing resources to capture solar energy and transferring of it to people for their use. [7] The energy inputs of the food system include the use of natural resources during agricultural/food production. [7] While the desired output of the food system is food, there are undesirable outputs produced during this process. [7] Greenhouse gas emissions (GHGEs) are an example of undesirable, highly prevalent and commonly measured byproduct of the food system. An efficiency ratio of inputs to outputs is used to quantify the efficiency of the food system. Environmental impacts are measured using a Life Cycle Assessment (LCA), which commonly uses GHGEs as a metric of impact. [7,29] Both the efficient use of natural resources and avoidance of environmental degradation are key components to environmental sustainability. [7]

In the past, agriculture was more sustainable as the inputs (energy, rain water, and animal waste) were comparatively low to the outputs (food produced). [7,35] By efficiency standards it was a sustainable food system. Previous practices resulted in a net gain in energy obtained from food than was expended on its production. Current agricultural practice inputs mainly consist of

nonrenewable energy. [7,36] While this has greatly increased food production, it has also resulted in a substantial energy imbalance. [7] As food production intensified with the use of fossil fuel energy, the ratio increased for the energy input to energy output. [7,37] From the energy standpoint, the industrial food system is inefficient, and because most of the energy inputs are from non-renewable resources such as fossil fuels, the current system is unsustainable. [7,36]

Sustainability: Agricultural Production (Environmental Impacts)

Because food production appropriates major shares of all ice-free land, freshwater, and energy production, it is one of the main drivers of environmental degradation and resource depletion. [6] As global food production and consumption continue to increase, so will the associated environmental impacts. Environmental impacts of food production include both resource depletion and pollution on all scales from local to global including biodiversity, climate change, and human health. [6] These may occur directly from carbon dioxide emissions from fossil fuel use on the farm or in the supply chain, nitrous oxide emissions resulting from fertilizer application, and methane emissions from animals, or indirectly as a result of land use changing. [7]

Sustainability: Animal Food Production vs. Plant Food Production

Both the public and scientific communities are increasingly aware of the environmental impact and sustainability of protein food production and the consequences of food choices on climate change. [5] While the environmental footprint of food groups varies widely, evidence shows meat and dairy products are responsible for a larger share of natural resource utilization and pollution impacts compared with plant foods. [12] Animal food production by factory farming is a major factor of biodiversity loss, climate change and freshwater depletion. [6,7] The top 3 environmental impacts of biodiversity loss, nitrogen cycle disruption and climate change are

strongly interlinked, rather than independent of one another, and protein production links these 3 impacts. [6,38]

Modern husbandry is based on intensive feeding of grain crops to animals. [7,36] For example, in the United States, more than 9 billion livestock are maintained to supply the animal protein consumed each year, which outweighs the US human population by about 5 times. [34] Given that approximately 6 kilograms of plant protein is required to yield one kilogram of meat protein, this high production of animal protein will require a more resources to be expended. [6,34] While some livestock, such as poultry and hogs, only consume grains, dairy cattle, beef cattle and lambs consume both grains and forage. It was estimated that the US livestock population consumes more than 7 times as much grain as is consumed directly by the entire American population. The amount of grains fed to United States livestock is sufficient to feed about 840 million people who follow a plant-based diet. [34]

Sustainability: Animal Food Production vs. Plant Food Production (Energy Use)

Fossil energy is expended in livestock production systems and this is depicted by a ratio of kcal fossil fuel to kcal protein produced. Broiler chicken is most efficient with an input of 4 kcal of fossil energy for each 1 kcal of broiler protein. Egg production is 39:1, beef 40:1, lamb 57:1. [34] If these animals were fed on only good-quality pasture, the energy inputs could be reduced by about half. Average fossil energy input for all animal protein production systems studied is 25 kcal fossil energy input per 1 kcal of protein produced. Grain protein production, based on corn and assuming 9% protein in the corn, is approximately 2.2kcal of fossil energy input per 1 kcal of plant protein produced. An average fossil energy input for animal protein production is more than 11 times greater than grain protein production. [7,34] The energy input in

nitrogen fertilizer alone is responsible for 2% of world energy consumption and for 37% of all energy expenditure in United States agriculture, thus causing significant climate change. Nitrogen is crucial to terrestrial and aquatic biodiversity loss, climate change, human health and many other issues. [6]

Based on current livestock population, about 8 million tons of animal protein is produced annually. With an average distribution assumed, this protein is sufficient to supply about 77g of animal protein daily per American. With an additional 35g of available plant protein consumed per person, a total of 112g of protein is available per capita in the United States per day. [34] The Recommended Daily Allowance (RDA) for adults per day is 56g of protein from a mixed diet. Therefore, based on this data, each American consumes about twice the RDA for protein equivalent to an excess of ~1000 kcal per day. [34] A lower caloric intake is associated with health benefits, but as Dooren et al [39] concluded a reduced energy intake along with reduced consumption of meat, dairy, coffee, tea and alcohol are associated with lower environmental impacts. [29]

Jones et al [29] conducted a systematic review of the measurement of sustainable diets, which examined the components of a sustainable diet as well as the data and measurement of sustainability. Components of environmental sustainability include pollution (GHGEs, food production waste and eutrophication); land use and water use, both input and output energy use, [7,29] soil erosion, and biodiversity loss. [29] GHGEs are food system byproducts that have global warming potential. [7] Life Cycle Assessment (LCA) that estimates the environmental impact of a product through greater than or equal to one "life stages" of its production, use, and recycling commonly with the use of GHGEs as a metric of impact. [29] GHGEs of diets were by far the most common component measured (n=71 studies; 63% of sample). Land use (n=32 studies; 28% of

sample) and consumption of animal source foods, especially meat (n=30 studies; 27% of sample) were the second and third most frequently cited components. Energy use and water consumption associated with the production and processing of foods in diets, agricultural management practices (whether food was procured locally), and the nutritional quality of diets also commonly cited. [29]

Sustainability: Animal Food Production vs. Plant Food Production (Pollution-Greenhouse Gas Emissions: GHGEs)

Approximately half of all food-related GHGEs are generated during farming. These include nitrous oxide, methane from livestock, and carbon dioxide from agriculturally induced change in land use, especially deforestation. Nitrous oxide is primarily generated from fertilizer used on the land, and methane from the digestive processes of ruminant animals. Nitrous oxide and methane account for 80% of all agricultural GHGEs. [7] Popp et al [40] assessed that non-CO_2 GHGEs from agriculture are expected to increase in the next 40 years, especially with increase in meat consumption. [29] Another study by Scarborough et al [41] provided further support by showing the inverse as climate change impacts were both reduced when consumption of all meat and dairy products was reduced. [29] Also, the study by Soret et al [12] shows diets lower in animal products are associated with lower GHGEs. [29] Westhoek et al [42] took it further to find that reducing meat and dairy consumption would reduce nitrogen emissions, GHGEs, and land use for crops, improve air and water quality. [29] Stehfest et al [43] assessed the impact of consuming less meat and found it would dramatically reduce land use and emissions of methane and nitrous oxide, and would allow for greater carbon uptake through regrowth of vegetation. [29] Tilman and Clark [44] provided further support that consumption of meat protein is associated with increased GHGEs, as well as refined sugars, and recognized plant-based diets as optimal alternatives. [29]

Sustainability: Plant-Based Dietary Pattern vs. Meat-Based Dietary Pattern (Pollution-GHGEs)

Berners-Lee et al [45] contrasted six meatless daily meal scenarios with the average United Kingdom diet. Under the different scenarios meat was replaced with either dairy products or plant-based alternatives. [29] They also computed GHGEs from 61 food categories. With one exception, each food with GHGEs greater than 10kg CO_2 equivalents/kg of product is meat or dairy food. [7] Additionally, they concluded that reducing food waste and choosing plant-based foods, seasonal produce and produce transported by ship can reduce GHGEs. [29] They also concluded that at isocaloric amounts, the mean United States diet was associated with 1485 kg CO_2-equivalent greater emissions than the plant-based diet. [29] Eshel et al [46] then found environmental impacts per calorie of dairy, poultry, pork and eggs are lower than beef, but plant foods show lower impacts than animal derived calories. [29] Finally, Meier and Christen [47] found that plant-based dietary patterns are expected to have the largest positive environmental impacts. [29]

Sustainability: Animal Food Production (Pollution-Waste & Eutrophication)

Annually, 7 billion livestock in the United States meat industry generate 1.4 billion tons of waste or 5 tons of waste for every US citizen. [7,36] These waste products contain high concentrations of nitrogen and phosphorous, which are the primary contributors to eutrophication, as well as potassium compounds. Eutrophication, as defined by the National Oceanic and Atmospheric Association (NOAA), is the excessive presence of nutrients such as nitrogen and phosphorous in bodies of water such as estuaries and coastal waters due to runoff from fertilizer as well as household and industry waste. [48] Sixty-five percent of United States

estuaries and coastal water bodies are moderately to severely degraded by excessive nutrient inputs. This leads to algal blooms and low-oxygen (hypoxic) waters that can kill fish and sea grass leading to massive dead zones and inevitable repercussions on aquatic biodiversity. [6,48] Eutrophication can also produce CO2, which lowers the PH of seawater leading to ocean acidification. This slows the growth of fish and shellfish. [48] Traces of metals, antibiotics and greater than 100 zoonotic pathogens that may contaminate food and water supplies posing a threat to human health. [7,49] Chemical run off and animal waste is damaging both land and water. The chemical pollution may cause acidification, algal blooms and dead zones in lakes and coastal areas; soil quality degradation; habitat change; and biodiversity loss. [7,36,50,51] Pollution from livestock enterprises affects both terrestrial and aquatic ecosystems. [6,52]

Sustainability: Animal Food Production vs. Plant Food Production (Land and Water Use)

The United States food production system uses about 50% of the total US land area, 80% of the freshwater, and 17% of the fossil energy used in the country. [34] Agricultural production, including livestock production, consumes more fresh water than any other activity in the United States. The amount of water required to produce various foods and forage crops ranges from 500 to 2000 L of water per kilogram of crop produced. In order to produce 1kg of fresh beef about 13 kg of grain and 30 kg of hay may be required. This much forage and grain requires about 100,000L of water to produce 100 kg of hay and 5400L for 4 kg of grain. On rangeland for forage production, more than 200,000L of water are needed to produce 1 kg of beef. [34] Producing 1 kg of animal protein requires about 100 times more water than producing 1 kg of grain protein. [34] Peters et al [53] found that higher per capita land requirements were associated with more meat

overall in the diet, while Temme et al [54] established that shifting from an animal-based to a plant-based diet reduces land use. [29]

Sustainability: Animal Food Production (Soil Health)

More than 99.2% of United States food is produced on land. With continued use and productivity of the land the concern of rapid rate of soil erosion and degradation through the United States and the world is heightened. Each year about 90% of US cropland loses soil at a rate 13 times above the sustainable rate per year. [34,55] Approximately 60% of US pastureland is being over-grazed and is subject to accelerated erosion. It takes ~500 years to replace 1 inch of lost soil. [34,55] This span of time is obviously not reasonable for a farmer to wait for soil to be replaced. Thus, commercial fertilizers are used to replace nutrients in the soil, however this requires a great deal of input from fossil energy, and as previously discussed, has negative environmental implications. [34]

Sustainability: Animal Food Production (Biodiversity)

Biodiversity refers to the variety of organisms that exist and interact with one-another in an ecosystem. Biodiversity plays an important role in environmental health as well as public health. It was recently shown to have a positive effect in natural ecosystems by reducing disease. [6,56] Animal food production by means of factory farming is a major driver of biodiversity loss as nearly one-third of global diversity loss is attributable to livestock production. [6] Nitrogen is crucial to terrestrial and aquatic biodiversity loss, which are affected greatly by livestock production. [6]

Earth-System Regulation Process and Thresholds

To quantify sustainability in terms of the carrying capacity of the planet, the article by Rockström et al [17] defined and established boundary values that should not be transgressed for

the most important anthropogenic (environmental pollution or pollutant originated from human activity) environmental issues. [6] Many human activities, including industrial agriculture, have reached a level that could damage the systems that keep Earth in a desirable state of ecological balance. The outcome could be irreversible and, in some cases, lead to abrupt environmental change. [7] Rockström et al [17] identified 9 Earth-system self-regulatory processes and associated thresholds that, if crossed, could generate unacceptable environmental change. They also noted that 3 of those boundaries, climate change, rate of biodiversity loss, and interference with the nitrogen cycle, have already been trespassed. These systems are interrelated with one another therefore if one is out of balance the other boundaries are at risk as well. [7] Intensive livestock production was shown to play a crucial role in all 3 of the "planetary boundaries" that have already been overstepped by humanity (i.e. biodiversity loss, nitrogen cycle disruption, and carbon cycle disruption). [6,38] This conclusion was confirmed by exhaustive review of European protein impacts and options for their reduction. [6,57]

Environmental Sustainability & Public Health

Climate change is not only a major environmental concern, but it is also a public health concern as it threatens food security. [12] "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and health life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security." [6,58] As stated in the definition provided above by The World Summit on Food Security, food security and nutrition, among other components of environmental sustainability, are increasingly intertwined and should be addressed in an integrated way. [6] Population growth coupled with the increased wealth, development, urbanization, trade, transnational food

corporations, retailing growth, food industry marketing and consumer attitudes and behaviors has led to an increased demand of animal-based foods such as meat and dairy in spite of the abundance of evidence supporting the unsustainability of a primarily animal-based diet. [7] Since 1963, there has been a 62% increase worldwide in meat consumption, but a much greater increase of approximately 300% has occurred in developing nations. The simultaneous population growth and demand for animal-based products places an even greater strain on the already vulnerable environment. Additionally, food security is at further risk with the threat of lower food yields because of substantial climate change. [6] In order to achieve environmental sustainability and food security these challenges within the current food system require radical changes in the way food is produced, processed, stored, distributed, accessed, as well as the types of food consumed. [7] There is a plentitude of evidence supporting the fact decreased consumption of animal products can improve human and environmental health independently as well as benefit food security. [6,12] Decreasing the consumption of meat and other animal products will free up large amounts of food such as soy and grains that could be consumed directly by humans. [7] Foley et al [13] recently estimated the potential to increase the global food supply by shifting 16 major crops from the current mix of uses (i.e. human consumption, livestock feed, and biofuels) to human food consumption only: they estimated a 28% increase in food availability, or the equivalent of a 49% increase in dietary energy for human consumption. Decreased consumption of meat would also greatly benefit the environment. As previously stated, industrial livestock production contributes to environmental degradation. [7] Therefore, the modification of diets should be included as a strategy for climate change mitigation and public health improvements because consumers have immediate control over the consumption of particular foods and can be influenced by appropriate actions from policy makers. [12] Although shifting from the current

meat-based dietary pattern to a plant-based dietary pattern has foreseeable challenges based on the current industry, policies, human perceptions, knowledge and behavior, this does not need to be an “all or nothing” approach. Steps can be taken incrementally to introduce a plant-based dietary pattern while being helpful in solving environmental sustainability and food security problems. [7]

Chapter 4 - Public Perceptions of Plant-Based Dietary Patterns

The 2015 Dietary Guidelines recommended a higher consumption of vegetables, fruits, whole grains, low-fat or nonfat dairy, seafood, legumes and nuts; lower in red and processed meat; and low in sugar-sweetened foods and drinks and refined grains. [19] Despite strong evidence supporting both health and sustainability benefits of adapting a plant-based dietary pattern, most Americans' the current dietary intake of foods available in plant-based dietary patterns is far below the recommended servings based on national dietary guidelines. [3]

Societal demands, including consumer preferences, which are a result of consumer perceptions, are a prevailing force to the food system. [7,17] Sabaté and Soret [7] state that the life cycle of food is determined by the production, processing, transportation, storage, retail and disposal practices used; and that consumer demands in a given society define these interactions within the food system. A number of factors such as consumer taste preferences; culinary traditions; established social norms; economic forces, such as the livestock industry; perceptions of nutritional adequacy regarding plant-based and meat-based dietary patterns, and barriers to altering personal behaviors will determine consumer demands and dietary patterns. [4,7] For example, the adequacy of meatless diets is a recurrent theme in the nutrition literature. Even though evidence supports the adequacy and benefits of a plant-based dietary pattern the concept of eating meat as the paramount protein source is deeply ingrained in the psyche and culture of Western countries, as well as other cultures and nations. [7] With the higher concentration of essential nutrients in animal products, meat and dairy foods in large proportions are considered essential in the daily diet for adequate nutrition, and consumption of plant-based foods are considered inadequate. This nutritional paradigm has begun to shift as evidence supports most plant-based diets as healthier than meat-based diets and yield greater longevity and lower chronic

diseases. [7,59-63] Furthermore, there is growing evidence linking red meat and processed meat consumption with detrimental health outcomes. [7]

People may still face barriers to altering their behavior, even if they do try to eat a healthier diet. It has been argued that behavioral change will only occur when the benefits outweigh the barriers to entry. [4] The influence of these perceived benefits will impact the belief that a plant-based dietary pattern is important and could foster the adoption of this life style. [4]

There is currently a lack of research focusing on perceptions and social-cognitive origins of beliefs about plant-based diets and consumer preferences for sustainable dietary alternatives. [4,16,29] The examination of these perceptions and origins also pertains to the plant-based dietary pattern, which may or may not include a modest consumption of meat. [4] Despite paramount importance of consumer demand in shaping the realization of sustainable diet recommendations, far fewer studies assessed consumer preferences for sustainable dietary alternatives than studies that assessed the environmental impacts of diets. [29] Understanding public perceptions and preferences as well as the psychosocial and socio-demographic factors associated with both plant-based and meat-based dietary food patterns; including the foods found in these dietary patterns will be useful for designing successful approaches in transitioning dietary and agricultural practices in a more healthful and sustainable direction. [4,7]

Interventions

Shifting from the current meat-based dietary pattern to a plant-based dietary pattern has foreseeable challenges based on the current industry, policies, human perceptions, knowledge and behavior, but this does not need to be an "all or nothing" approach. Possible methods of intervention to assist in the shift from an animal-based to plant-based dietary pattern include consumer education focused on the health and environmental merits of plant-based diets, the

promotion of food guidelines based on health and sustainability criteria, developing attractive and culturally acceptable plant-based meat-alternative foods, and realigning current fiscal policy (food subsidies and taxation) with efficiency and environmental criteria. [7,64-68]

Additionally, according to the Royal Society, [69] "stakeholder dialogue is a must, and a framework to help consumers, producers, and policy makers out of a deadlock and into negotiation is available." [6,70] Little political effort is devoted to this issue and the food industry primarily focuses on food safety with increasing attention on sustainability, but there is a fair deal of "green washing" within the industry. [6] Meaning disinformation regarding sustainability efforts within the organization is publicized. [6] Therefore, human, perception, preferences, behavior and policy are catalysts for agricultural and dietary shift and steps can be taken incrementally to introduce a plant-based dietary pattern and will be very helpful in solving human and environmental health problems. [7]

Chapter 5 - Perceptions of Meat and Dairy Foods and Plant-Based Alternatives Among College Students Survey

This exploratory study included the administration and general review of a survey to compliment the literature review exploring the health and environmental benefits associated with a plant-based dietary pattern, as well as public perceptions and preferences regarding plant-based and meat-based dietary food patterns; including the foods found in these dietary patterns, such as meat, dairy and plant-based alternatives. The survey was developed using previously validated statements from the study "Perceptions and practices of self-defined current vegetarian, former vegetarian, and nonvegetarian women" by Susan I. Barr, PhD, RDN, and Gwen E. Chapman, PhD, RDN, in order to assess perceptions of meat and dairy foods. Additionally, two statements were created with the assistance of Dr. Susan Barr to address perceptions plant-based meat and dairy alternatives. Furthermore, additional questions yielded student demographic and background information including students age, gender, ethnicity/race, educational attainment, area of study (i.e. college, department and major), dietary eating pattern (i.e. omnivorous, vegetarian, plant-based, vegan, lacto-vegetarian, ovo-vegetarian or pescatarian, with definitions of each dietary eating pattern provided), and urban vs. rural background. The Qualtrics program was used to create the survey, which was distributed to current Kansas State University students including the various colleges throughout the University. The data was then retrieved via Qualtrics in order to make general observations regarding student perceptions compared to their demographic and background information.

Perceptions of Meat and Dairy Foods and Plant-Based Alternatives Among College Students Survey: University Population vs Survey Sample Population

The Kansas State University student population at the time the survey was distributed was 19,081 and the survey sample student population was 5,300. The survey sample was determined via a stratified random sample such that it would be representative of the Kansas State University student population. Out of the 5,300 surveys distributed, 564-surveys were started with 556 responses and a 12% completion rate. There were some dropouts throughout the survey, as denoted in the tables, with 528 respondents remaining for a number of the statements/ demographic information.

The survey sample population of 5,300 was determined via a stratified random sample based on criteria such as age, gender, race/ethnicity, college etc. and representing 27.78% of the total Kansas State University population. Thus the survey sample student population appears to be representative of the university population. Males appear to be underrepresented while females appear to be overrepresented. There were 32.77% male survey respondents compared to the 51.22% male university population, and there were 67.23% female survey respondents compared to the 48.7% female university population. The College of Human Ecology appears to be fairly represented with 19.13% in the sample population compared to the 11.64% university population. The College of Agriculture appears to be fairly represented as well with 14.77% in the sample population compared to 13.6% in the university population. The College of Architecture, Planning and Design appear to be fairly represented with 1.7% in the sample population compared to 3.28% in the university population. The College of Arts and Sciences appears to be fairly represented with 22.92% in the sample population compared to the 28.5% university population. The College of Business Administration appears to be fairly represented

with 16.29% in the sample population compared to 12.83% in the university population. The College of Education appears to be fairly represented with 8.9% in the sample population compared to 7.26% in the university population. The College of Engineering also appears to be fairly represented with 16.1% in the sample population compared to 19.68% in the university population. Finally, The College of Veterinary Medicine was not represented in the sample population with 0% responding compared to the 2.36% in the university population.

Table 1 Student perceptions regarding "I like the flavor of red meat"

Statement	Demographic	Agree %	Neutral %	Disagree %
I like the flavor of red meat		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (541)	(N=474); 87.61%	(N=28); 5.18%	(N=39); 7.21%
	Age (N=528)			
	18-25 (N=470)	(N=414); 88.09%	(N=19); 4.04%	(N=37); 7.87%
	26-30 (N=35)	(N=30); 85.71%	(N=3); 8.57%	(N=2); 5.72%
	31-35 (N=11)	(N=9); 81.82%	(N=2); 18.18%	(N=0); 0%
	36-40 (N=9)	(N=9); 100%	(N=0); 0%	(N=0); 0%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=162); 93.64%	(N=6); 3.47%	(N=5); 2.89%
	Female (N=355)	(N=303); 85.35%	(N=18); 5.07%	(N=34); 9.58%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Asian (N=17)	(N=11); 64.7%	(N=1); 5.88%	(N=5); 29.41%
	Black or African American (N=15)	(N=9); 60%	(N=2); 13.33%	(N=4); 26.67%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=418); 90.87%	(N=17); 3.70%	(N=25); 5.43%
	Hispanic (N=25)	(N=18); 72%	(N=3); 12%	(N=4); 16%
	Other (N=8)	(N=6); 75%	(N=1); 12.50%	(N=1); 12.50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=61); 91.04%	(N=2); 2.99%	(N=4); 5.98%

	Sophomore (N=111)	(N=97); 87.38%	(N=7); 6.31%	(N=7); 6.30%
	Junior (N=116)	(N=97); 83.62%	(N=5); 4.31%	(N=14); 12.07%
	Senior (N=165)	(N=151); 91.51%	(N=5); 3.03%	(N=9); 5.45%
	Master's Level (N=47)	(N=41); 87.24%	(N=2); 4.26%	(N=4); 8.51%
	PhD Level (N=22)	(N=18); 81.82%	(N=3); 13.64%	(N=1); 4.55%
	College (N=528)			
	College of Human Ecology (N=101)	(N=84); 83.16%	(N=8); 7.92%	(N=9); 8.91%
	College of Agriculture (N=78)	(N=72); 92.31%	(N=4); 5.13%	(N=2); 2.56%
	College of Architecture, Planning and Design (N=9)	(N=7); 77.78%	(N=0); 0%	(N=2); 22.22%
	College of Arts and Sciences (N=121)	(N=105); 86.78%	(N=9); 7.44%	(N=7); 5.79%
	College of Business Administration (N=86)	(N=77); 89.53%	(N=0); 0%	(N=9); 10.47%
	College of Education (N=47)	(N=41); 87.23%	(N=2); 4.26%	(N=4); 8.51%
	College of Engineering (N=85)	(N=78); 91.77%	(N=1); 1.18%	(N=6); 7.06%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=445); 91.56%	(N=17); 3.50%	(N=24); 4.94%
	Vegetarian (N=8)	(N=3); 37.50%	(N=0); 0%	(N=5); 62.50%
	Plant-Based (N=26)	(N=13); 50%	(N=7); 26.92%	(N=6); 23.08%
	Vegan (N=1)	(N=0)	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0)	(N=0); 0%	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=1); 33.33%	(N=0); 0%	(N=2); 66.67%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			

	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=190); 94.06%	(N=5); 2.48%	(N=7); 3.47%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=114); 89.06%	(N=6); 4.69%	(N=8); 6.25%
	Disagree (N=197)	(N=160); 81.22%	(N=13); 6.60%	(N=24); 12.18%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=248); 85.52%	(N=16); 5.52%	(N=26); 8.97%
	Rural (N=237)	(N=216); 91.14%	(N=8); 3.38%	(N=13); 5.49%

* Loss of respondent (s)

Table 2 Student perceptions regarding "Fish and poultry are the best "meat" choices"

Question	Demographic	Agree %	Neutral %	Disagree %
Fish and poultry are the best “meat” choices		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=273); 50.47%	(N=152); 28.10%	(N=116); 21.44%
	Age (N=528)			
	18-25 (N=470)	(N=234); 49.79%	(N=129); 27.45%	(N=107); 22.76%
	26-30 (N=35)	(N=18); 51.43%	(N=11); 31.43%	(N=6); 17.14%
	31-35 (N=11)	(N=8); 72.73%	(N=2); 18.18%	(N=1); 9.09%
	36-40 (N=9)	(N=4); 44.44%	(N=5); 55.56%	(N=0); 0%
	>40 (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=86); 49.71%	(N=45); 26.01%	(N=42); 24.28%
	Female (N=355)	(N=179); 50.42%	(N=104); 29.30%	(N=72); 20.28%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0)
	Asian (N=17)	(N=11); 64.71%	(N=4); 23.53%	(N=2); 11.76%
	Black or African American (N=15)	(N=9); 60%	(N=5); 33.33%	(N=1); 6.67%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=222); 48.26%	(N=133); 28.91%	(N=105); 22.83%
	Hispanic (N=25)	(N=17); 68%	(N=4); 16%	(N=4); 16%
	Other (N=8)	(N=4); 50%	(N=2); 25%	(N=2); 25%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=38); 56.72%	(N=11); 16.42%	(N=18); 26.87%
	Sophomore (N=111)	(N=50); 45.04%	(N=40); 36.04%	(N=21); 18.92%
	Junior (N=116)	(N=61); 52.59%	(N=26); 22.41%	(N=29); 25%
	Senior (N=165)	(N=77); 46.66%	(N=53); 32.12%	(N=35); 21.21%
	Master's Level (N=47)	(N=28); 59.58%	(N=10); 21.28%	(N=9); 19.15%
	PhD Level (N=22)	(N=11); 50%	(N=9); 40.91%	(N=2); 9.09%
	College (N=528)			
	College of Human Ecology (N=101)	(N=59); 58.41%	(N=26); 25.74%	(N=16); 15.84%
	College of Agriculture (N=78)	(N=26); 33.33%	(N=29); 37.18%	(N=23); 29.48%
	College of Architecture, Planning and Design (N=9)	(N=3); 33.33%	(N=4); 44.44%	(N=2); 22.22%
	College of Arts and Sciences (N=121)	(N=63); 52.07%	(N=31); 25.62%	(N=37); 22.31%

	College of Business Administration (N=86)	(N=46); 53.49%	(N=20); 23.26%	(N=20); 23.25%
	College of Education (N=47)	(N=25); 53.19%	(N=14); 29.79%	(N=8); 17.03%
	College of Engineering (N=85)	(N=42); 49.41%	(N=25); 29.41%	(N=18); 21.18%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=238); 48.97%	(N=138); 28.40%	(N=110); 22.63%
	Vegetarian (N=8)	(N=4); 50%	(N=3); 37.50%	(N=1); 12.50%
	Plant-Based (N=26)	(N=18); 69.23%	(N=5); 19.23%	(N=3); 11.54%
	Vegan (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=2); 66.67%	(N=1); 33.33%	(N=0); 0%
	Other (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=202)	(N=92); 45.54%	(N=63); 31.19%	(N=47); 23.27%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=70); 54.69%	(N=36); 28.13%	(N=22); 17.19%
	Disagree (N=197)	(N=102); 51.78%	(N=50); 25.38%	(N=45); 22.84%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=153); 52.76%	(N=76); 26.21%	(N=61); 21.03%
	Rural (N=237)	(N=111); 46.84%	(N=73); 30.80%	(N=53); 22.36%

* Loss of respondent (s)

Table 3 Student perceptions regarding "Red meat can be part of a healthy diet"

Statement	**Demographic**	**Agree %**	**Neutral %**	**Disagree %**
Red meat can be part of a healthy diet		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=545); 83.91%	(N=54); 9.98%	(N=33); 6.10%
	Age (N=528)			
	18-25 (N=470)	(N=395); 84.04%	(N=46); 9.79%	(N=29); 6.17%
	26-30 (N=35)	(N=29); 82.86%	(N=3); 8.57%	(N=3); 8.57%
	31-35 (N=11)	(N=8); 72.73%	(N=3); 27.27%	(N=0); %
	36-40 (N=9)	(N=7); 77.78%	(N=1); 11.11%	(N=1); 11.11%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=142); 82.08%	(N=19); 10.98%	(N=12); 6.94%
	Female (N=355)	(N=300); 84.51%	(N=34); 9.58%	(N=21); 5.92%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Asian (N=17)	(N=9); 52.94%	(N=4); 23.53%	(N=4); 23.52%
	Black or African American (N=15)	(N=8); 53.33%	(N=6); 40%	(N=1); 6.67%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A

	White (N=460)	(N=399); 86.74%	(N=36); 7.83%	(N=25); 5.43%
	Hispanic (N=25)	(N=17); 68%	(N=5); 20%	(N=3); 12%
	Other (N=8)	(N=7); 87.5%	(N=1); 12.50%	(N=0); 0%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=57); 85.07%	(N=6); 8.96%	(N=4); 5.97%
	Sophomore (N=111)	(N=91); 81.98%	(N=13); 11.71%	(N=7); 6.31%
	Junior (N=116)	(N=88); 75.86%	(N=18); 15.52%	(N=10); 8.62%
	Senior (N=165)	(N=148); 89.7%	(N=10); 6.06%	(N=7); 4.24%
	Master's Level (N=47)	(N=40); 85.11%	(N=3); 6.38%	(N=4); 8.51%
	PhD Level (N=22)	(N=18); 81.82%	(N=3); 13.64%	(N=1); 4.55%
	College (N=528)			
	College of Human Ecology (N=101)	(N=81); 80.2%	(N=14); 13.86%	(N=6); 5.94%
	College of Agriculture (N=78)	(N=70); 89.74%	(N=5); 6.41%	(N=3); 3.84%
	College of Architecture, Planning and Design (N=9)	(N=6); 66.66%	(N=1); 11.11%	(N=2); 22.22%
	College of Arts and Sciences (N=121)	(N=104); 85.95%	(N=11); 9.09%	(N=6); 4.96%
	College of Business Administration (N=86)	(N=71); 82.56%	(N=9); 10.47%	(N=6); 6.97%
	College of Education (N=47)	(N=38); 80.85%	(N=5); 10.64%	(N=4); 8.51%
	College of Engineering (N=85)	(N=71); 83.52%	(N=8); 9.41%	(N=6); 7.06%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A

	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=420); 86.42%	(N=44); 9.05%	(N=22); 4.53%
	Vegetarian (N=8)	(N=3); 37.50%	(N=4); 50%	(N=1); 12.50%
	Plant-Based (N=26)	(N=16); 61.54%	(N=4); 15.38%	(N=6); 23.07%
	Vegan (N=1)	(N=0); %	(N=0); %	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); %	(N=0); %	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); %	(N=1); 33.33%	(N=2); 66.66%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=181); 89.6%	(N=12); 5.94%	(N=9); 4.46%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=104); 81.25%	(N=16); 12.50%	(N=8); 6.25%
	Disagree (N=197)	(N=156); 79.19%	(N=25); 12.69%	(N=16); 8.12%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=232); 80%	(N=37); 12.76%	(N=21); 7.24%
	Rural (N=237)	(N=209); 88.19%	(N=16); 6.75%	(N=12); 5.06%

* Loss of respondent (s)

Table 4 Student perceptions regarding "Red meat contains important nutrients"

Statement	**Demographic**	**Agree %**	**Neutral %**	**Disagree %**
Red meat contains important nutrients		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=442); 81.70%	(N=82); 15.16%	(N=17); 3.14%
	Age (N=528)			
	18-25 (N=470)	(N=378); 80.42%	(N=75); 15.96%	(N=17); 3.62%
	26-30 (N=35)	(N=32); 91.43%	(N=3); 8.57%	(N=0); 0%
	31-35 (N=11)	(N=11); 100%	(N=0); 0%	(N=0); 0%
	36-40 (N=9)	(N=7); 77.78%	(N=2); 22.22%	(N=0); 0%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=150); 86.7%	(N=21); 12.14%	(N=2); 1.16%
	Female (N=355)	(N=281); 79.15%	(N=59); 16.62%	(N=15); 4.22%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); 0%
	Asian (N=17)	(N=11); 64.7%	(N=4); 23.53%	(N=2); 11.76%
	Black or African American (N=15)	(N=9); 60%	(N=5); 33.33%	(N=1); 6.67%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A

	White (N=460)	(N=380); 82.61%	(N=67); 14.57%	(N=13); 2.83%
	Hispanic (N=25)	(N=22); 88%	(N=2); 8%	(N=1); 4%
	Other (N=8)	(N=8); 100%	(N=0); 0%	(N=0); 0%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=54); 80.59%	(N=12); 17.91%	(N=1); 1.49%
	Sophomore (N=111)	(N=91); 81.99%	(N=17); 15.32%	(N=3); 2.70%
	Junior (N=116)	(N=92); 79.31%	(N=19); 16.38%	(N=5); 4.31%
	Senior (N=165)	(N=133); 80.61%	(N=28); 16.97%	(N=4); 2.43%
	Master's Level (N=47)	(N=82); 82.97%	(N=4); 8.51%	(N=4); 8.52%
	PhD Level (N=22)	(N=22); 100%	(N=0); 0%	(N=0); 0%
	College (N=528)			
	College of Human Ecology (N=101)	(N=85); 84.16%	(N=15); 14.85%	(N=1); 0.99%
	College of Agriculture (N=78)	(N=71); 91.02%	(N=6); 7.69%	(N=1); 1.28%
	College of Architecture, Planning and Design (N=9)	(N=5); 55.56%	(N=3); 33.33%	(N=1); 11.11%
	College of Arts and Sciences (N=121)	(N=94); 77.68%	(N=20); 16.53%	(N=7); 5.78%
	College of Business Administration (N=86)	(N=67); 77.9%	(N=16); 18.60%	(N=3); 3.49%
	College of Education (N=47)	(N=38); 80.85%	(N=7); 14.89%	(N=2); 4.26%
	College of Engineering (N=85)	(N=70); 82.36%	(N=13); 15.29%	(N=2); 2.36%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A

	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); %	(N=0); %
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=406); 83.53%	(N=71); 14.61%	(N=9); 1.85%
	Vegetarian (N=8)	(N=3); 37.50%	(N=3); 37.50%	(N=2); 25.00%
	Plant-Based (N=26)	(N=19); 73.07%	(N=4); 15.38%	(N=3); 11.54%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Other (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=177); 87.62%	(N=19); 9.41%	(N=6); 2.98%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=98); 76.56%	(N=25); 19.53%	(N=5); 3.90%
	Disagree (N=197)	(N=155); 78.68%	(N=36); 18.27%	(N=6); 3.05%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=215); 74.14%	(N=64); 22.07%	(N=11); 3.79%
	Rural (N=237)	(N=215); 90.72%	(N=16); 6.75%	(N=6); 2.53%

* Loss of respondent (s)

Table 5 Student perceptions regarding "Diets with red meat are healthier than those without"

Statement	Demographic	Agree %	Neutral %	Disagree %
Diets with red meat are healthier than those without		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=149); 27.54%	(N=215); 39.74%	(N=177); 32.72%
	Age (N=528)			
	18-25 (N=470)	(N=133); 28.3%	(N=184); 39.15%	(N=153); 32.55%
	26-30 (N=35)	(N=11); 31.42%	(N=13); 37.14%	(N=11); 31.43%
	31-35 (N=11)	(N=2); 18.18%	(N=5); 45.45%	(N=4); 36.36%
	36-40 (N=9)	(N=0); 0%	(N=5); 55.56%	(N=4); 44.44%
	>40 (N=3)	(N=0); 0%	(N=2); 66.67%	(N=1); 33.33 %
	Gender (N=528)			
	Male (N=173)	(N=54); 31.21%	(N=68); 39.31%	(N=51); 29.48%
	Female (N=355)	(N=92); 25.92%	(N=141); 39.72%	(N=122); 34.36%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33 %	(N=1); 33.33%	(N=1); 33.33%
	Asian (N=17)	(N=2); 11.76%	(N=4); 23.53%	(N=11); 64.71%

	Black or African American (N=15)	(N=1); 6.67%	(N=7); 46.67%	(N=7); 46.66%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=133); 28.92%	(N=188); 40.87%	(N=139); 30.22%
	Hispanic (N=25)	(N=8); 32%	(N=7); 28%	(N=10); 40%
	Other (N=8)	(N=1); 12.5%	(N=2); 25%	(N=5); 62.5%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=21); 31.35%	(N=26); 38.81%	(N=20); 29.85%
	Sophomore (N=111)	(N=31); 27.93%	(N=46); 41.44%	(N=34); 30.63%
	Junior (N=116)	(N=36); 31.04%	(N=37); 31.90%	(N=43); 37.07%
	Senior (N=165)	(N=44); 26.67%	(N=73); 44.24%	(N=48); 29.09%
	Master's Level (N=47)	(N=8); 17.03%	(N=19); 40.43%	(N=20); 42.55%
	PhD Level (N=22)	(N=6); 27.28%	(N=8); 36.36%	(N=8); 36.36%
	College (N=528)			
	College of Human Ecology (N=101)	(N=12); 11.88%	(N=43); 42.57%	(N=46); 45.54%
	College of Agriculture (N=78)	(N=34); 43.59%	(N=28); 35.90%	(N=16); 20.52%
	College of Architecture, Planning and Design (N=9)	(N=0); %	(N=3); 33.33%	(N=6); 66.67%
	College of Arts and Sciences (N=121)	(N=32); 26.45%	(N=49); 40.5%	(N=40); 33.06%
	College of Business Administration (N=86)	(N=25); 29.07%	(N=37); 43.02%	(N=24); 27.91%
	College of Education (N=47)	(N=12); 25.54%	(N=22); 46.81%	(N=13); 27.66%

	College of Engineering (N=85)	(N=31); 36.47%	(N=26); 30.59%	(N=28); 32.95%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=143); 29.42%	(N=199); 40.95%	(N=144); 29.63%
	Vegetarian (N=8)	(N=1); 12.50%	(N=1); 12.50%	(N=6); 75%
	Plant-Based (N=26)	(N=2); 7.69%	(N=7); 26.92%	(N=17); 65.38%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.67%
	Other (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.67%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=66); 32.67%	(N=79); 39.11%	(N=57); 28.22%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=32); 25%	(N=52); 40.63%	(N=44); 34.37%

	Disagree (N=197)	(N=47); 23.86%	(N=78); 39.59%	(N=72); 36.55%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=68); 23.45%	(N=117); 40.34%	(N=105); 36.21%
	Rural (N=237)	(N=77); 32.48%	(N=92); 38.82%	(N=68); 28.69%

* Loss of respondent (s)

Table 6 Student perceptions regarding "Trimmed red meat is as healthful as fish or poultry"

Statement	Demographic	Agree %	Neutral %	Disagree %
Trimmed red meat is as healthful as fish or poultry		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=207); 38.27%	(N=175); 32.35%	(N=159); 29.39%
	Age (N=528)			
	18-25 (N=470)	(N=184); 39.14%	(N=149); 31.70%	(N=137); 29.15%
	26-30 (N=35)	(N=10); 28.57%	(N=15); 42.86%	(N=10); 28.57%
	31-35 (N=11)	(N=4); 36.36%	(N=2); 18.18%	(N=5); 45.45%
	36-40 (N=9)	(N=3); 33.33%	(N=2); 22.22%	(N=4); 44.44%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=67); 38.73%	(N=49); 28.32%	(N=57); 32.94%
	Female (N=355)	(N=137); 38.59%	(N=119); 33.52%	(N=99); 27.89%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Asian (N=17)	(N=5); 29.41%	(N=6); 35.29%	(N=6); 35.30%
	Black or African American (N=15)	(N=6); 40.00%	(N=5); 33.33%	(N=4); 26.67%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=182); 39.57%	(N=145); 31.52%	(N=133); 28.91%
	Hispanic (N=25)	(N=9); 36.00%	(N=9); 36.00%	(N=7); 28.00%
	Other (N=8)	(N=2); 25.00%	(N=2); 25.00%	(N=4); 50.00%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=29); 43.29%	(N=17); 25.37%	(N=21); 31.35%
	Sophomore (N=111)	(N=43); 38.74%	(N=37); 33.33%	(N=31); 27.92%
	Junior (N=116)	(N=40); 34.48%	(N=38); 32.76%	(N=38); 32.76%
	Senior (N=165)	(N=64); 38.78%	(N=57); 34.55%	(N=44); 26.67%
	Master's Level (N=47)	(N=19); 40.43%	(N=13); 27.66%	(N=15); 31.92%
	PhD Level (N=22)	(N=9); 40.91%	(N=6); 27.27%	(N=7); 31.82%
	College (N=528)			
	College of Human Ecology (N=101)	(N=29); 28.71%	(N=33); 32.67%	(N=39); 38.61%
	College of Agriculture (N=78)	(N=41); 52.56%	(N=19); 24.36%	(N=18); 23.08%
	College of Architecture, Planning and Design (N=9)	(N=2); 22.22%	(N=4); 44.44%	(N=3); 33.33%
	College of Arts and Sciences (N=121)	(N=38); 31.4%	(N=49); 40.50%	(N=34); 28.1%
	College of Business Administration (N=86)	(N=38); 44.18%	(N=23); 26.74%	(N=25); 29.07%
	College of Education (N=47)	(N=19); 40.42%	(N=17); 36.17%	(N=11); 23.41 %
	College of Engineering (N=85)	(N=36); 42.36%	(N=23); 27.06%	(N=26); 30.59%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=200); 41.15%	(N=153); 31.48%	(N=133); 27.37%
	Vegetarian (N=8)	(N=0); 0%	(N=3); 37.50%	(N=5); 62.50%
	Plant-Based (N=26)	(N=2); 7.70%	(N=9); 34.62%	(N=15); 57.69%
	Vegan (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Other (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=93); 46.04%	(N=47); 23.27%	(N=62); 30.69%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=49); 38.28%	(N=49); 38.28%	(N=30); 23.44%
	Disagree (N=197)	(N=61); 30.96%	(N=72); 36.55%	(N=64); 32.49%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=100); 34.49%	(N=97); 33.45%	(N=93); 32.07%
	Rural (N=237)	(N=104); 43.88%	(N=71); 29.96%	(N=62); 26.16%

* Loss of respondent (s)

Table 7 Student perceptions regarding "I am concerned about the amount of fat in red meat"

Statement	Demographic	Agree %	Neutral %	Disagree %
I am concerned about the amount of fat in red meat		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=176); 32.53%	(N=78); 14.42%	(N=287); 53.05%
	Age (N=528)			
	18-25 (N=470)	(N=152); 32.34%	(N=66); 14.04%	(N=252); 53.62%
	26-30 (N=35)	(N=12); 34.28%	(N=7); 20.00%	(N=16); 45.72%
	31-35 (N=11)	(N=6); 54.54%	(N=1); 9.09%	(N=4); 36.36%
	36-40 (N=9)	(N=4); 44.44%	(N=1); 11.11%	(N=4); 44.44%
	>40 (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Gender (N=528)			
	Male (N=173)	(N=45); 26.01%	(N=25); 14.45%	(N=103); 59.53%
	Female (N=355)	(N=130); 36.62%	(N=51); 14.37%	(N=174); 49.02%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Asian (N=17)	(N=10); 58.82%	(N=2); 11.76%	(N=5); 29.41%
	Black or African American (N=15)	(N=2); 13.34%	(N=6); 40.00%	(N=7); 46.67%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A

	White (N=460)	(N=146); 31.74%	(N=59); 12.83%	(N=255); 55.43%
	Hispanic (N=25)	(N=12); 48%	(N=7); 28%	(N=6); 24%
	Other (N=8)	(N=2); 25%	(N=2); 25%	(N=4); 50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=27); 40.30%	(N=4); 5.97%	(N=36); 53.73%
	Sophomore (N=111)	(N=37); 33.34%	(N=15); 13.51%	(N=59); 53.16%
	Junior (N=116)	(N=33); 28.44%	(N=17); 14.66%	(N=66); 56.90%
	Senior (N=165)	(N=46); 27.88%	(N=28); 16.97%	(N=91); 55.15%
	Master's Level (N=47)	(N=20); 42.55%	(N=11); 23.40%	(N=16); 34.04%
	PhD Level (N=22)	(N=12); 54.55%	(N=1); 4.55%	(N=9); 40.91%
	College (N=528)			
	College of Human Ecology (N=101)	(N=53); 52.47%	(N=19); 18.81%	(N=29); 28.71%
	College of Agriculture (N=78)	(N=13); 16.67%	(N=9); 11.54%	(N=56); 71.80%
	College of Architecture, Planning and Design (N=9)	(N=5); 55.56%	(N=1); 11.11%	(N=3); 33.33%
	College of Arts and Sciences (N=121)	(N=39); 32.23%	(N=24); 19.83%	(N=58); 47.93%
	College of Business Administration (N=86)	(N=22); 25.58%	(N=7); 8.14%	(N=57); 66.28%
	College of Education (N=47)	(N=10); 21.28%	(N=12); 25.53%	(N=25); 53.19%
	College of Engineering (N=85)	(N=32); 37.65%	(N=4); 4.71%	(N=49); 57.65%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=151); 31.07%	(N=66); 13.58%	(N=269); 55.35%
	Vegetarian (N=8)	(N=7); 87.50%	(N=1); 12.50%	(N=0); 0%
	Plant-Based (N=26)	(N=11); 42.31%	(N=8); 30.77%	(N=7); 26.93%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Other (N=3)	(N=2); 66.66%	(N=0); 0%	(N=1); 33.33%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=64); 31.68%	(N=20); 9.90%	(N=118); 58.42%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=42); 32.81%	(N=22); 17.19%	(N=64); 50.00%
	Disagree (N=197)	(N=69); 35.02%	(N=34); 17.26%	(N=94); 47.71%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=107); 36.90%	(N=49); 16.90%	(N=134); 46.20%
	Rural (N=237)	(N=68); 28.69%	(N=27); 11.39%	(N=142); 59.92%

* Loss of respondent (s)

Table 8 Student perceptions regarding "Meat alternatives (tofu, legumes, lentils, nuts) are healthier than red meat"

Statement	**Demographic**	**Agree %**	**Neutral %**	**Disagree %**
Meat alternatives (tofu, legumes, lentils, nuts) are healthier than red meat		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=540)*	(N=239); 44.26%	(N=134); 24.81%	(N=167); 30.92%
	Age (N=528)			
	18-25 (N=470)	(N=200); 42.65%	(N=120); 25.59%	(N=149); 31.77%
	26-30 (N=35)	(N=19); 54.29%	(N=9); 25.71%	(N=7); 20.00%
	31-35 (N=11)	(N=9); 81.82%	(N=1); 9.09%	(N=1); 9.09%
	36-40 (N=9)	(N=4); 44.44%	(N=2); 22.22%	(N=3); 33.33%
	>40 (N=3)	(N=0);0 %	(N=1); 33.33%	(N=2); 66.66%
	Gender (N=528)			
	Male (N=173)	(N=82); 47.67%	(N=41); 23.84%	(N=49); 28.48%
	Female (N=355)	(N=150); 42.26%	(N=92); 25.92%	(N=113); 31.83%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Asian (N=17)	(N=12); 70.59%	(N=3); 17.65%	(N=2); 11.76%

	Black or African American (N=15)	(N=8); 53.34%	(N=6); 40.00%	(N=1); 6.67%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=459) *	(N=197); 42.92%	(N=113); 24.62%	(N=149); 32.46%
	Hispanic (N=25)	(N=11); 44.00%	(N=6); 24.00%	(N=8); 32.00%
	Other (N=8)	(N=3); 37.50%	(N=4); 50.00%	(N=1); 12.50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=27); 40.30%	(N=16); 23.88%	(N=24); 35.82%
	Sophomore (N=111)	(N=46); 41.44%	(N=33); 29.73%	(N=32); 28.83%
	Junior (N=116)	(N=56); 48.28%	(N=24); 20.69%	(N=36); 31.03%
	Senior (N=165)	(N=66); 40.25%	(N=44); 26.83%	(N=54); 32.92%
	Master's Level (N=47)	(N=27); 57.44%	(N=9); 19.15%	(N=11); 23.41%
	PhD Level (N=22)	(N=10); 45.46%	(N=7); 31.82%	(N=5); 22.73%
	College (N=528)			
	College of Human Ecology (N=101)	(N=57); 56.43%	(N=22); 21.78%	(N=22); 21.78%
	College of Agriculture (N=78)	(N=18); 23.07%	(N=18); 23.08%	(N=42); 53.85%
	College of Architecture, Planning and Design (N=9)	(N=7); 77.78%	(N=2); 22.22%	(N=0); 0%
	College of Arts and Sciences (N=121)	(N=54); 44.63%	(N=37); 30.58%	(N=30); 24.80%
	College of Business Administration (N=86)	(N=38); 44.19%	(N=20); 23.26%	(N=28); 32.56%
	College of Education (N=46)*	(N=14); 30.43%	(N=18); 39.13%	(N=14); 30.44%

	College of Engineering (N=85)	(N=43); 50.58%	(N=16); 18.82%	(N=26); 30.58%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=201); 41.45%	(N=124); 25.57%	(N=160); 32.99%
	Vegetarian (N=8)	(N=8); 100%	(N=0); 0%	(N=0); 0%
	Plant-Based (N=26)	(N=17); 65.39%	(N=8); 30.77%	(N=1); 3.85%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Other (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=81); 40.10%	(N=48); 23.76%	(N=73); 36.14%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=57); 44.53%	(N=34); 26.56%	(N=37); 28.90%

	Disagree (N=196)*	(N=94); 47.96%	(N=51); 26.02%	(N=51); 26.02%
	Urban vs. Rural (N=527)			
	Urban (N=289)*	(N=134); 46.37%	(N=78); 26.99%	(N=77); 26.64%
	Rural (N=237)	(N=98); 41.35%	(N=54); 22.78%	(N=85); 35.87%

* Loss of respondent (s)

Table 9 Student perceptions regarding "Dairy products taste good"

Question	Demographic	Agree %	Neutral %	Disagree %
Dairy products taste good		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=504); 94.91%	(N=10); 1.88%	(N=17); 3.20%
	Age (N=528)			
	18-25 (N=470)	(N=446); 94.9%	(N=7); 1.49%	(N=17); 3.62%
	26-30 (N=35)	(N=34); 97.14%	(N=1); 2.86%	(N=0); 0%
	31-35 (N=11)	(N=10); 90.91%	(N=1); 9.09%	(N=0); 0%
	36-40 (N=9)	(N=8); 88.89%	(N=1); 11.11%	(N=0); 0%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=166); 95.96%	(N=5); 2.89%	(N=2); 1.16%
	Female (N=355)	(N=335); 94.37%	(N=5); 1.41%	(N=15); 4.22%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.67%	(N=1); 33.33%	(N=0); 0%
	Asian (N=17)	(N=15); 88.23%	(N=1); 5.88%	(N=1); 5.88%
	Black or African American (N=15)	(N=14); 93.34%	(N=0); 0%	(N=1); 6.67%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=438); 95.21%	(N=7); 1.52%	(N=15); 3.26%
	Hispanic (N=25)	(N=24); 96%	(N=1); 4%	(N=0); 0%
	Other (N=8)	(N=8); 100%	(N=0); 0%	(N=0); 0%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=66); 98.51%	(N=1); 1.49%	(N=0); 0%
	Sophomore (N=111)	(N=104); 93.69%	(N=4); 3.6%	(N=3); 2.7%
	Junior (N=116)	(N=108); 93.1%	(N=2); 1.72%	(N=6); 5.17%
	Senior (N=165)	(N=158); 95.76%	(N=0); 0%	(N=7); 4.24%
	Master's Level (N=47)	(N=45); 95.75%	(N=1); 2.13%	(N=1); 2.13%
	PhD Level (N=22)	(N=20); 63.64%	(N=2); 9.09%	(N=0); 0%
	College (N=528)			
	College of Human Ecology (N=101)	(N=93); 92.08%	(N=4); 3.96%	(N=4); 3.96%
	College of Agriculture (N=78)	(N=74); 94.87%	(N=1); 1.28%	(N=3); 3.84%
	College of Architecture, Planning and Design (N=9)	(N=8); 88.89%	(N=0); 0%	(N=1); 11.11%
	College of Arts and Sciences (N=121)	(N=120); 99.17%	(N=1); 0.83%	(N=0); 0%

	College of Business Administration (N=86)	(N=81); 94.19%	(N=1); 1.16%	(N=4); 4.65%
	College of Education (N=47)	(N=43); 91.49%	(N=2); 4.26%	(N=2); 4.26%
	College of Engineering (N=85)	(N=81); 95.3%	(N=1); 1.18%	(N=3); 3.53%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=464); 95.48%	(N=9); 1.85%	(N=13); 2.67%
	Vegetarian (N=8)	(N=7); 87.5%	(N=1); 12.5%	(N=0); 0%
	Plant-Based (N=26)	(N=24); 92.31%	(N=0); 0%	(N=2); 7.69%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=2); 66.66%	(N=0); 0%	(N=1); 33.33%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=202)	(N=194); 96.04%	(N=3); 1.49%	(N=5); 2.48%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=119); 92.97%	(N=5); 3.91%	(N=4); 3.13%
	Disagree (N=197)	(N=187); 94.93%	(N=2); 1.02%	(N=8); 4.06%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=270); 93.1%	(N=8); 2.76%	(N=12); 4.13%
	Rural (N=237)	(N=230); 97.05%	(N=2); 0.84%	(N=5); 2.11%

* Loss of respondent (s)

Table 10 Student perceptions regarding "Dairy products are good sources of protein and nutrients"

Statement	Demographic	Agree %	Neutral %	Disagree %
Dairy products are good sources of protein and nutrients		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=417); 78.53%	(N=80); 15.07%	(N=34); 6.40%
	Age (N=528)			
	18-25 (N=470)	(N=363); 77.23%	(N=75); 15.96%	(N=32); 6.81%
	26-30 (N=35)	(N=33); 94.29%	(N=1); 2.86%	(N=1); 2.86%
	31-35 (N=11)	(N=9); 81.82%	(N=1); 9.09%	(N=1); 9.09%
	36-40 (N=9)	(N=7); 77.78%	(N=2); 22.22%	(N=0); 0%
	>40 (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=143); 82.66%	(N=24); 13.87%	(N=6); 3.46%
	Female (N=355)	(N=272); 76.62%	(N=55); 15.49%	(N=28); 7.89%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); 0%
	Asian (N=17)	(N=15); 88.24%	(N=2); 11.76%	(N=0); 0%
	Black or African American (N=15)	(N=11); 73.33%	(N=3); 20%	(N=1); 6.67%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=364); 79.13%	(N=66); 14.35%	(N=30); 6.52%
	Hispanic (N=25)	(N=18); 72%	(N=5); 20%	(N=2); 8%
	Other (N=8)	(N=6); 75%	(N=1); 12.5%	(N=1); 12.5%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=56); 83.58%	(N=8); 11.94%	(N=3); 4.48%
	Sophomore (N=111)	(N=83); 74.78%	(N=21); 18.92%	(N=7); 6.31%
	Junior (N=116)	(N=88); 75.86%	(N=20); 17.24%	(N=8); 6.89%
	Senior (N=165)	(N=127); 76.97%	(N=22); 13.33%	(N=16); 9.7%
	Master's Level (N=47)	(N=40); 85.1%	(N=7); 14.89%	(N=0); 0%
	PhD Level (N=22)	(N=21); 95.45%	(N=1); 4.55%	(N=0); 0%
	College (N=528)			
	College of Human Ecology (N=101)	(N=77); 76.24%	(N=15); 14.85%	(N=9); 8.91%
	College of Agriculture (N=78)	(N=68); 87.18%	(N=8); 10.26%	(N=2); 2.56%
	College of Architecture, Planning and Design (N=9)	(N=4); 44.44%	(N=3); 33.33%	(N=2); 22.22%
	College of Arts and Sciences (N=121)	(N=92); 76.03%	(N=18); 14.88%	(N=11); 9.09%
	College of Business Administration (N=86)	(N=64); 74.42%	(N=19); 22.09%	(N=3); 3.49%
	College of Education (N=47)	(N=38); 80.85%	(N=6); 12.77%	(N=3); 6.38%
	College of Engineering (N=85)	(N=71); 83.53%	(N=10); 11.76%	(N=4); 4.7%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=388); 79.83%	(N=68); 13.99%	(N=30); 6.17%
	Vegetarian (N=8)	(N=6); 75%	(N=2); 25%	(N=0); 0%
	Plant-Based (N=26)	(N=16); 61.54%	(N=7); 26.92%	(N=3); 11.54%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Other (N=3)	(N=2); 66.67%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=166); 82.18%	(N=25); 12.38%	(N=11); 5.45%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=97); 75.78%	(N=26); 20.31%	(N=5); 3.91%
	Disagree (N=197)	(N=151); 76.65%	(N=28); 14.21%	(N=18); 9.14%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=220); 75.86%	(N=46); 15.86%	(N=24); 8.28%
	Rural (N=237)	(N=194); 81.86%	(N=33); 13.92%	(N=10); 4.22%

* Loss of respondent (s)

Table 11 Student perceptions regarding "It is easy to get enough calcium without dairy products"

Statement	Demographic	Agree %	Neutral %	Disagree %
It is easy to get enough calcium without dairy products		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=173); 32.58%	(N=110); 20.72%	(N=248); 46.71%
	Age (N=528)			
	18-25 (N=470)	(N=143); 30.42%	(N=99); 21.06%	(N=228); 48.51%
	26-30 (N=35)	(N=15); 42.85%	(N=6); 17.14%	(N=14); 40.00%
	31-35 (N=11)	(N=8); 72.73%	(N=3); 27.27%	(N=0);0 %
	36-40 (N=9)	(N=5); 55.55%	(N=1); 11.11%	(N=3); 33.33%
	>40 (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Gender (N=528)			
	Male (N=173)	(N=49); 28.33%	(N=48); 27.75%	(N=76); 43.93%
	Female (N=355)	(N=123); 34.64%	(N=62); 17.46%	(N=170); 47.89%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=0); 0%	(N=2); 66.67%	(N=1); 33.33%
	Asian (N=17)	(N=6); 35.29%	(N=3); 17.65%	(N=8); 47.05%
	Black or African American (N=15)	(N=4); 26.67%	(N=5); 33.33%	(N=6); 40%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=148); 32.17%	(N=89); 19.35%	(N=223); 48.47%
	Hispanic (N=25)	(N=10); 40%	(N=8); 32%	(N=7); 28%
	Other (N=8)	(N=4); 50%	(N=3); 37.50%	(N=1); 12.50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=14); 20.89%	(N=10); 14.93%	(N=43); 64.18%
	Sophomore (N=111)	(N=36); 32.43%	(N=29); 26.13%	(N=46); 41.44%
	Junior (N=116)	(N=40); 34.49%	(N=27); 23.28%	(N=49); 42.24%
	Senior (N=165)	(N=51); 30.91%	(N=33); 20%	(N=81); 49.09%
	Master's Level (N=47)	(N=23); 48.94%	(N=6); 12.77%	(N=18); 38.29%
	PhD Level (N=22)	(N=8); 36.36%	(N=5); 22.73%	(N=9); 40.91%
	College (N=528)			
	College of Human Ecology (N=101)	(N=39); 38.61%	(N=21); 20.79%	(N=41); 40.59%
	College of Agriculture (N=78)	(N=17); 21.79%	(N=17); 21.79%	(N=44); 56.41%
	College of Architecture, Planning and Design (N=9)	(N=3); 33.33 %	(N=1); 11.11%	(N=5); 55.56%
	College of Arts and Sciences (N=121)	(N=48); 39.67%	(N=27); 22.31%	(N=46); 38.01%
	College of Business Administration (N=86)	(N=25); 29.07%	(N=16); 18.60%	(N=45); 52.33%
	College of Education (N=47)	(N=11); 23.41 %	(N=13); 27.66%	(N=23); 48.94%
	College of Engineering (N=85)	(N=29); 34.11%	(N=15); 17.65%	(N=41); 48.24%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=142); 29.22%	(N=106); 21.81%	(N=238); 48.97%
	Vegetarian (N=8)	(N=5); 62.50%	(N=2); 25%	(N=1); 12.50%
	Plant-Based (N=26)	(N=18); 69.24%	(N=2); 7.69%	(N=6); 23.08%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=63); 31.19%	(N=39); 19.31%	(N=100); 49.51%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=43); 33.60%	(N=28); 21.88%	(N=57); 44.53%
	Disagree (N=197)	(N=65); 32.99%	(N=43); 21.83%	(N=89); 45.18%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=101); 34.83%	(N=52); 17.93%	(N=137); 47.24%
	Rural (N=237)	(N=71); 29.95%	(N=58); 24.47%	(N=108); 45.57%

* Loss of respondent (s)

Table 12 Student perceptions regarding "Diets with dairy are too high in saturated fat and cholesterol"

Statement	Demographic	Agree %	Neutral %	Disagree %
Diets with dairy are too high in saturated fat and cholesterol		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=113); 21.28%	(N=158); 29.76%	(N=260); 48.97%
	Age (N=528)			
	18-25 (N=470)	(N=102); 21.70%	(N=143); 30.43%	(N=225); 47.87%
	26-30 (N=35)	(N=8); 22.86%	(N=5); 14.29%	(N=22); 62.85%
	31-35 (N=11)	(N=1); 9.09%	(N=3); 27.27%	(N=7); 63.64%
	36-40 (N=9)	(N=2); 22.22%	(N=5); 55.56%	(N=2); 22.22%
	>40 (N=3)	(N=0); 0%	(N=0); 0%	(N=3); 100%
	Gender (N=528)			
	Male (N=173)	(N=27); 15.60%	(N=61); 35.26%	(N=85); 49.13%
	Female (N=355)	(N=86); 24.23%	(N=95); 26.76%	(N=174); 49.01%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Asian (N=17)	(N=5); 29.41%	(N=5); 29.41%	(N=7); 41.17%
	Black or African American (N=15)	(N=5); 33.34%	(N=4); 26.67%	(N=6); 40%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=93); 20.22%	(N=137); 29.78%	(N=230); 50%
	Hispanic (N=25)	(N=9); 36%	(N=7); 28%	(N=9); 36%
	Other (N=8)	(N=0); 0%	(N=2); 25%	(N=6); 75%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=12); 17.91%	(N=21); 31.34%	(N=34); 50.75%
	Sophomore (N=111)	(N=22); 19.82%	(N=36); 32.43%	(N=53); 47.75%
	Junior (N=116)	(N=25); 21.55%	(N=33); 28.45%	(N=58); 50%
	Senior (N=165)	(N=40); 24.25%	(N=50); 30.30%	(N=75); 45.45%
	Master's Level (N=47)	(N=9); 19.15%	(N=15); 31.91%	(N=23); 48.94%
	PhD Level (N=22)	(N=5); 22.73%	(N=1); 4.55%	(N=16); 72.73%
	College (N=528)			
	College of Human Ecology (N=101)	(N=30); 29.70%	(N=26); 25.74%	(N=45); 44.55%
	College of Agriculture (N=78)	(N=4); 5.12%	(N=21); 26.92%	(N=53); 67.95%
	College of Architecture, Planning and Design (N=9)	(N=2); 22.22%	(N=3); 33.33%	(N=4); 44.44%
	College of Arts and Sciences (N=121)	(N=31); 25.62%	(N=36); 29.75%	(N=54); 44.63%
	College of Business Administration (N=86)	(N=24); 27.90%	(N=27); 31.40%	(N=35); 40.69%
	College of Education (N=47)	(N=7); 14.89%	(N=14); 29.79%	(N=26); 55.32%
	College of Engineering (N=85)	(N=15); 17.65%	(N=29); 34.12%	(N=41); 48.23%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=92); 18.93%	(N=146); 30.04%	(N=248); 51.03%
	Vegetarian (N=8)	(N=5); 62.5%	(N=2); 25%	(N=1); 12.5%
	Plant-Based (N=26)	(N=12); 46.15%	(N=5); 19.23%	(N=9); 34.61%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=2); 66.67%	(N=1); 33.33%
	Other (N=3)	(N=2); 66.67%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=29); 14.36%	(N=54); 26.73%	(N=119); 58.91%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=29); 22.66%	(N=50); 39.06%	(N=49); 38.28%
	Disagree (N=197)	(N=54); 27.41%	(N=52); 26.40%	(N=91); 46.19%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=67); 23.11%	(N=87); 30%	(N=136); 46.90%
	Rural (N=237)	(N=46); 19.41%	(N=68); 28.69%	(N=123); 51.9%

* Loss of respondent (s)

Table 13 Student perceptions regarding "A diet with dairy products is healthier than without"

Statement	Demographic	Agree %	Neutral %	Disagree %
A diet with dairy products is healthier than without		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=281); 52.92%	(N=149); 28.06%	(N=101); 19.02%
	Age (N=528)			
	18-25 (N=470)	(N=252); 53.62%	(N=126); 26.81%	(N=92); 19.57%
	26-30 (N=35)	(N=18); 51.43%	(N=12); 34.29%	(N=5); 14.29%
	31-35 (N=11)	(N=4); 36.36%	(N=4); 36.36%	(N=3); 27.27%
	36-40 (N=9)	(N=4); 44.44%	(N=5); 55.56%	(N=0); 0%
	>40 (N=3)	(N=2); 66.67%	(N=1); 33.33%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=111); 64.16%	(N=38); 21.97%	(N=24); 13.87%
	Female (N=355)	(N=169); 47.61%	(N=110); 30.99%	(N=76); 21.40%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); 0%
	Asian (N=17)	(N=8); 47.06%	(N=6); 35.29%	(N=3); 17.64%
	Black or African American (N=15)	(N=3); 20%	(N=6); 40%	(N=6); 40%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=248); 53.91%	(N=125); 27.17%	(N=87); 18.92%
	Hispanic (N=25)	(N=15); 60%	(N=7); 28%	(N=3); 12%
	Other (N=8)	(N=5); 62.5%	(N=2); 25%	(N=1); 12.5%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=43); 64.18%	(N=17); 25.37%	(N=7); 10.45%
	Sophomore (N=111)	(N=57); 21.35%	(N=29); 26.13%	(N=25); 22.52%
	Junior (N=116)	(N=60); 51.73%	(N=34); 29.31%	(N=22); 18.96%
	Senior (N=165)	(N=88); 53.34%	(N=43); 26.06%	(N=34); 20.61%
	Master's Level (N=47)	(N=20); 42.55%	(N=18); 38.30%	(N=9); 19.15%
	PhD Level (N=22)	(N=12); 54.54%	(N=7); 31.82%	(N=3); 13.64%
	College (N=528)			
	College of Human Ecology (N=101)	(N=35); 34.65%	(N=40); 39.60%	(N=26); 25.74%
	College of Agriculture (N=78)	(N=53); 67.95%	(N=17); 21.79%	(N=8); 10.26%
	College of Architecture, Planning and Design (N=9)	(N=4); 44.44%	(N=2); 22.22%	(N=3); 33.33%
	College of Arts and Sciences (N=121)	(N=55); 45.46%	(N=37); 30.58%	(N=29); 23.97%
	College of Business Administration (N=86)	(N=52); 60.47%	(N=19); 22.09%	(N=15); 17.44%
	College of Education (N=47)	(N=27); 57.44%	(N=14); 29.79%	(N=6); 12.77%
	College of Engineering (N=85)	(N=53); 62.35%	(N=19); 22.35%	(N=13); 15.3%

	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=268); 55.14%	(N=136); 27.98%	(N=82); 16.87%
	Vegetarian (N=8)	(N=4); 50%	(N=3); 37.5%	(N=1); 12.5%
	Plant-Based (N=26)	(N=6); 23.08%	(N=8); 30.77%	(N=12); 46.15%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Other (N=3)	(N=2); 66.67%	(N=0); 0%	(N=1); 33.33%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=127); 62.87%	(N=47); 23.27%	(N=28); 13.87%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=53); 41.41%	(N=46); 35.94%	(N=29); 22.66%
	Disagree (N=197)	(N=99); 50.26%	(N=55); 27.92%	(N=43); 21.82%

	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=144); 49.65%	(N=90); 31.03%	(N=56); 19.31%
	Rural (N=237)	(N=136); 57.38%	(N=57); 24.05%	(N=44); 18.56%

* Loss of respondent (s)

Table 14 Student perceptions regarding "I think that using fortified dairy alternatives (e.g. soy, almond, rice, etc.) is healthier than using regular dairy products"

Statement	Demographic	Agree %	Neutral %	Disagree %
I think that using fortified dairy alternatives (e.g., soy, almond, rice, etc.) is healthier than using regular dairy products.		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=189); 35.59%	(N=161); 30.32%	(N=181); 34.09%
	Age (N=528)			
	18-25 (N=470)	(N=164); 34.9%	(N=147); 31.28%	(N=159); 33.83%
	26-30 (N=35)	(N=14); 40%	(N=8); 22.86%	(N=13); 37.14%
	31-35 (N=11)	(N=6); 54.54%	(N=2); 18.18%	(N=3); 27.27%
	36-40 (N=9)	(N=4); 44.44%	(N=2); 22.22%	(N=3); 33.33%
	>40 (N=3)	(N=0); 0%	(N=0); 0%	(N=3); 100%
	Gender (N=528)			
	Male (N=173)	(N=47); 27.16%	(N=67); 38.73%	(N=59); 34.1%
	Female (N=355)	(N=141); 39.72%	(N=92); 25.92%	(N=122); 34.36%
	Ethnicity (Race) (N=528)			

	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Asian (N=17)	(N=8); 47.06%	(N=6); 35.29%	(N=3); 17.64%
	Black or African American (N=15)	(N=8); 53.34%	(N=4); 26.67%	(N=3); 20%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=156); 33.92%	(N=139); 30.22%	(N=165); 35.87%
	Hispanic (N=25)	(N=13); 52%	(N=6); 24%	(N=6); 24%
	Other (N=8)	(N=2); 25%	(N=3); 37.5%	(N=3); 37.5%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=23); 34.33%	(N=19); 28.36%	(N=25); 37.31%
	Sophomore (N=111)	(N=38); 34.24%	(N=37); 33.33%	(N=36); 32.43%
	Junior (N=116)	(N=41); 35.34%	(N=37); 31.9%	(N=38); 32.76%
	Senior (N=165)	(N=58); 35.15%	(N=47); 28.48%	(N=60); 36.37%
	Master's Level (N=47)	(N=22); 46.81%	(N=11); 23.40%	(N=14); 29.79%
	PhD Level (N=22)	(N=6); 27.28%	(N=8); 36.36%	(N=8); 36.37%
	College (N=528)			
	College of Human Ecology (N=101)	(N=49); 48.51%	(N=25); 24.75%	(N=27); 26.73%
	College of Agriculture (N=78)	(N=14); 17.95%	(N=15); 19.23%	(N=49); 62.82%

	College of Architecture, Planning and Design (N=9)	(N=5); 55.55%	(N=4); 44.44%	(N=0); 0%
	College of Arts and Sciences (N=121)	(N=48); 39.67%	(N=40); 33.06%	(N=33); 27.27%
	College of Business Administration (N=86)	(N=27); 31.4%	(N=35); 40.7%	(N=24); 27.91%
	College of Education (N=47)	(N=13); 27.66%	(N=15); 31.91%	(N=19); 40.43%
	College of Engineering (N=85)	(N=31); 36.48%	(N=25); 29.41%	(N=29); 34.11%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=156); 32.1%	(N=153); 31.48%	(N=177); 36.42%
	Vegetarian (N=8)	(N=6); 75%	(N=1); 12.5%	(N=1); 12.5%
	Plant-Based (N=26)	(N=18); 69.23%	(N=5); 19.23%	(N=3); 11.54%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume			

	dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=56); 27.72%	(N=54); 26.73%	(N=92); 45.54%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=49); 38.28%	(N=46); 35.94%	(N=33); 25.78%
	Disagree (N=197)	(N=83); 42.13%	(N=59); 29.95%	(N=55); 27.92%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=115); 39.66%	(N=93); 32.07%	(N=82); 28.28%
	Rural (N=237)	(N=73); 30.81%	(N=65); 27.43%	(N=99); 41.78%

* Loss of respondent (s

Chapter 6 – Discussion

Student Taste Preferences

As aforementioned, consumer taste preferences are a factor that will determine consumer demands and dietary patterns. [4,7] Furthermore, the methods of intervention to assist in the shift from an animal-based to plant-based dietary pattern include consumer education focused on the health and environmental merits of plant-based diets and developing attractive and culturally acceptable plant-based meat-alternative foods. [7,64-68] The population chosen for this exploratory study have current and future potential to influence the plant-based food industry, both as consumers and as possible future stakeholders within the food industry. In reviewing the statements, "I like the flavor of red meat" and "Dairy products taste good" will assist in evaluating student taste preferences, which may provide some insight into consumer demands as well as possible interventions that could be implemented in developing attractive and acceptable plant-based meat and dairy-alternative foods. Using the flavor profile as closely as possible to entice the consumption of these alternatives, may address behavioral change that will occur when the benefits outweigh the barriers to entry. [4] Meaning if consumers are aware of the health and environmental benefits and would like to adopt a plant-based dietary pattern, but the plant-based food alternatives do not match their taste preferences they likely will not adopt this dietary food pattern. Findings regarding student taste preferences are as follows:

Regarding the statement "I like the flavor of red meat" the total number of respondents were more likely to agree with a rate of 87.61%. Students in the age group 18-25 years were also more likely to agree with a rate of 88.09%. Respondents in the college of Human Ecology were slightly less likely to agree (83.16%) compared to respondents in the college of agriculture (92.31%). Respondents who consume an omnivorous dietary eating pattern were more likely to

agree (91.56%) compared to respondents who consume a vegetarian dietary eating pattern (37.50%). Both respondents from an urban and rural community were more likely to agree with this statement as well (85.52% and 91.14% respectively).

Regarding the statement "Dairy products taste good" the total number of respondents were more likely to agree with an agreeance rate of 94.91%. The students with the lowest number agreeing were those at a PhD level in school (63.64%) and students with the highest number agreeing were those at a freshman level school (98.51%). Students in the College of Human Ecology and the College of Agriculture were more likely to agree (92.08% and 94.87% respectively) while those in the College of Architecture, Planning and Design were less likely to agree (88.89%). Respondents who consume an omnivorous dietary eating pattern were more likely to agree (95.48%) compared to respondents who consume a vegetarian dietary eating pattern (87.5%). Respondents who claim to have a high agricultural knowledge were more likely to agree (96.04%) compared to those who disagreed to claiming to have a high agricultural knowledge (94.93%).

The total number of students were more likely to agree with the statements "I like the flavor of red meat" (87.61%) and "Dairy products taste good" (94.91%). These high rates indicate student taste preferences for meat and dairy foods. Therefore, as previously mentioned the development of attractive and acceptable plant-based meat and dairy-alternative foods that match the flavor profile as closely as possible to meat and dairy foods will be an important factor to consider in order to entice the consumption of these plant-based alternatives.

Perceived Healthfulness and Nutritional Adequacy of Red Meat, Dairy, and Plant-Based Meat and Dairy Alternatives

Despite strong evidence supporting both health and sustainability benefits of adapting a plant-based dietary pattern most Americans' current dietary intake of foods available in plant-based dietary patterns is far below the recommended servings based on national dietary guidelines. [3] The perceived healthfulness and nutritional adequacy of foods, education regarding health and environmental benefits as well as barriers to change human behavior, such as consumer taste preferences, may contribute to this shortcoming. This survey included statements to assist in assessing student's perceived healthfulness and nutritional adequacy of red meat and dairy as well as plant-based meat and dairy alternatives.

As previously stated, there is strong evidence from both epidemiologic and clinical studies supporting a plant-based dietary pattern for their health benefits. Plant-based dietary patterns in which very low amounts of meat and processed meat are being consumed appear to be associated with greater longevity and lower cardiometabolic risk; additionally, while there is evidence linking red meat intake (particularly processed meat) and increased risk of CHD, cancer and T2D, [2,18] it appears that plant-based dietary patterns may contain small intakes of meat, fish and dairy products and still offer health benefits such as protection against CVD, cancer and overall mortality. [2,4] A plant-based diet when compared to a meat-centered diet is lower in cholesterol, saturated fat and animal protein; higher in antioxidants (such as vitamin C and E), folate, fiber, phytochemicals and carotenoids; and has been shown to be significantly associated with a reduced risk of cardiovascular disease (CVD), type 2 diabetes (T2D) and all-cause mortality. [3,4]

Additionally, the adequacy of meatless diets is a recurrent theme in the nutrition literature. Even though evidence supports the adequacy and benefits of a plant-based dietary pattern the concept of eating meat as the paramount protein source is deeply ingrained in the psyche and culture of Western countries, as well other cultures and nations. [7] With the higher concentration of essential nutrients in animal products, meat and dairy foods in large proportions are considered essential in the daily diet for adequate nutrition, and consumption of plant-based foods are considered inadequate. This nutritional paradigm has begun to shift as evidence supports most plant-based diets as healthier than meat-based diets and yield greater longevity and lower chronic diseases. [7,59-63]

Furthermore, dairy foods are most widely publicized as being the best source of calcium and vital for maintaining bone health. However, foods that are generally consumed more frequently and in higher amounts in plant-based dietary patterns, such as fruits and vegetables play an important role in bone health. Studies show that an increased fruit and vegetable intake has a positive effect on the calcium economy and markers of bone metabolism. [1] Green leafy vegetables, calcium-fortified plant foods such as fruit juices, soy milk, rice milk and breakfast cereals can provide ample amounts of dietary calcium. [1]

The statements reviewed to assess student's perceived healthfulness and nutritional adequacy of red meat, dairy as well as plant-based meat and dairy alternatives included: "Diets with red meat are healthier than those without", "Fish and poultry are the best "meat" choices", "Red meat can be part of a healthy diet", "Trimmed red meat is as healthful as fish or poultry", "I am concerned about the amount of fat in red meat", "Diets with dairy are too high in saturated fat and cholesterol", "Red meat contains important nutrients", "Dairy products are good sources of protein and nutrients", "A diet with dairy products is healthier than without", "Meat

alternatives (tofu, legumes, lentils, nuts) are healthier than red meat", "I think that using fortified dairy alternatives (e.g. soy, almond, rice, etc.) is healthier than using regular dairy products" and "It is easy to get enough calcium without dairy products".

Regarding the statement "Diets with red meat are healthier than those without" the total number of respondents were less likely to agree with a 27.54% agreeance rate. Respondents in the age group 18-25 years were less likely to agree with an agreeance rate of 28.30%. Students at the Master's level had the lowest number agreeing (17.03%) and students at the freshman level had the highest number agreeing (31.35%). It was interesting to note that only 11.88% of respondents in the College of Human Ecology agreed that "Diets with red meat are healthier than those without" compared to respondents in the College of Agriculture who had the highest number agreeing at 43.59%. Vegetarian and Plant-Based respondents had the highest number disagreeing (75% and 65.30% respectively) and the omnivorous respondents had the lowest number disagreeing with 29.63% disagreeing. Respondents with a rural background were more likely to agree (32.48%) than respondents with an urban background (23.45%).

Regarding the statement "Fish and poultry are the best "meat" choices" of the total number of respondents, students were more likely to agree with 50.47% agreeing. Respondents in the age group 18-25 years were more likely to agree (49.79%). Both male and female respondents were more likely to agree (49.71% and 50.42% respectively). Students at the Master's level in school had the highest number agreeing (59.58%) followed by students at the freshman level (56.72%) and those at the sophomore level were less likely to agree (45.04%). Students in the College of Human Ecology were more likely to agree (58.41%) compared to students in the College of Agriculture and the College of Architecture, Planning and Design (33.33% for both colleges). Respondents consuming a plant-based dietary pattern were more

likely to agree (69.23%) compared to respondents consuming an omnivorous dietary pattern (48.97%). Respondents with an urban background are more likely to agree (52.76%) compared to those with a rural background (46.84%).

Regarding the statement "Red meat can be part of a healthy diet" the total number of respondents were more likely to agree with 83.91% agreeance. Respondents in the age group 18-25 years were more likely to agree (84.04%). Students with Senior level status were more likely to agree (89.7%) and students with junior level status were less likely to agree (75.86%). Students in the College of Human Ecology were less likely to agree (80.2%) compared to students in the College of Agriculture and the College of Architecture (89.74%). Respondents consuming an omnivorous dietary pattern were more likely to agree (86.42%) compared to respondents consuming a plant-based and vegetarian dietary eating pattern (61.54% and 37.50% respectively). Respondents who claimed to have high agricultural knowledge were more likely to agree (89.6%) compared to those who disagreed to have high agricultural knowledge (79.19%). Students with a rural background were more likely to agree (88.19%) compared to students with an urban background (80%).

Regarding the statement "I am concerned about the amount of fat in red meat" the total number of respondents were less likely to agree (53.05%) disagreeance. Students in the age group 18-25 years were less likely to agree (53.62%) disagreeance. Male respondents were less likely to agree (59.53%) disagreeance compared to female respondents (49.02%) disagreeance. Students at the PhD level in school were more likely to agree (54.55%) compared to freshman (40.30%). Students in the College of Human Ecology were more likely to agree (52.47%) compared to students in the College of Agriculture and the College of Architecture (16.67%). Respondents with the highest number agreeing were those who consume a vegetarian dietary

eating pattern (87.50%) while the lowest number agreeing were those who consume an omnivorous dietary pattern (31.07%). Students with an urban background were more likely to agree (36.90%) compared to students with a rural background (28.69%).

Regarding the statement "Trimmed red meat is as healthful as fish or poultry" the total number of respondents were more likely to agree (38.27%). Students in the age group 18-25 years were more likely to agree (39.14%). Respondents at the freshman level in school were more likely to agree (43.29%) compared to respondents at the junior level in school (34.48%). Students in the College of Agriculture had the highest number agreeing (52.56%) while students in the College of Human Ecology and College of Architecture, Planning and Design were less likely to agree (28.71% and 22.22% respectively) in agreeance. Respondents consuming a vegetarian and plant-based dietary eating pattern were more likely to disagree with 62.50% and 57.69% respectively, in disagreeance compared to respondents consuming an omnivorous dietary eating pattern with 27.37% in disagreeance. Students who claimed to have high agricultural knowledge were more likely to agree (46.04%) compared to students who disagreed to having high agricultural knowledge (30.96%) in agreeance. Students with a rural background were more likely to agree (43.88%) compared to students with an urban background (34.49%).

Regarding the statement "Diets with dairy are too high in saturated fat and cholesterol" the total number of respondents were less likely to agree with 48.97% in disagreeance. Students in the age group 18-25 years were less likely to agree with 47.87% in disagreeance. Respondents at the PhD level in school were less likely to agree (72.73%) disagreeance, compared to respondents at the freshman level in school (50.75%) disagreeance. Respondents in the College of Human Ecology were more likely to agree (29.70%) compared to respondents in the College of Agriculture (5.12%). Students who consume vegetarian and plant-based dietary eating

patterns were more likely to agree (62.5% and 46.15% respectively) compared to students who consume an omnivorous dietary eating pattern (18.93%). Respondents with a rural background were more likely to agree (43.69%) compared to respondents with an urban background (23.11%).

Regarding the statement "Red meat contains important nutrients" the total number of respondents were more likely to agree (81.70%). Respondents in the age groups 18-25 years, 26-30 years and 31-35 years were all more likely to agree (80.42%, 91.43% and 100% respectively). Male respondents were more likely to agree with 86.7% compared to female respondents (79.15%). Students at a PhD level of school were more likely to agree (100%) compared to students at a Master's, senior, junior, sophomore and freshman level in school (82.97%, 80.61%, 79.31%, 81.99% and 80.50%) respectively. Respondents in the College of Agriculture were more likely to agree (91.02%) compared to respondents in the College of Human Ecology and the College of Architecture, Planning and Design (84.16% and 55.56%) respectively. Students who claim to have a high agricultural knowledge were more likely to agree (87.62%) compared to students who disagreed to have high agricultural knowledge (78.68%). Respondents with a rural background were more likely to agree (90.72%) compared to respondents with an urban background (74.14%).

Regarding the statement "Dairy products are good sources of protein and nutrients" the total number of respondents were more likely to agree with 78.53% agreeing. Students in the age group 18-25 years are more likely to agree (77.23%). The respondents at the PhD level of school had the highest number agreeing with 95.45% compared to respondents at the sophomore level of school with 74.78% agreeing. Students in the College of Agriculture were more likely to agree (87.18%) compared to students in the College of Human Ecology and the College of

Architecture, Planning and Design (76.24% and 44.44% respectively). Students who consume a plant-based dietary eating pattern were less likely to agree (61.54%) agreeing and student who consume an omnivorous dietary eating pattern were more likely to agree (79.83%). Students who claim to have a high agricultural knowledge were more likely to agree (82.18%) compared to students who disagreed to have high agricultural knowledge (76.65%). Students with a rural background were more likely to agree (81.86%) compared to students with an urban background (75.86%).

Regarding the statement "A diet with dairy products is healthier than without" the total number of respondents were more likely to agree (52.92%). Respondents in the age group 18-25 years were more likely to agree (53.62%). Male students were more likely to agree (64.16%) compared to female students (47.61%). Students at the freshman level of school were more likely to agree (64.18%) compared to those at the sophomore level (21.35%). Respondents with the lowest number agreeing were in the College of Human Ecology (34.65%) compared to respondents with the highest number agreeing which were in the College of Agriculture (67.95%). Students who consume an omnivorous dietary eating pattern were more likely to agree (55.14%) compared to students who consume a plant-based dietary eating pattern (23.08%) agreeing. Students who claim to have a high agricultural knowledge were more likely to agree (62.87%) compared to students who disagreed to have high agricultural knowledge (50.26%) agreeing. Students with a rural background were more likely to agree (57.38%) compared to students with an urban background (49.65%).

Regarding the statement "Meat alternatives (tofu, legumes, lentils, nuts) are healthier than red meat" the total number of respondents were more likely to agree (44.26%). Respondents in the age group 18-25 years were more likely to agree (42.65%). Male students were more likely to

agree (47.67%) compared to female students (42.26%). Students at the Master's level in school were more likely to agree (57.44%) compared to students at the freshman and senior level in school (40.30% and 40.25% respectively). Students in the College of Agriculture were less likely to agree (23.07%) compared to students in the College of Human Ecology and the College of Architecture, Planning and Design (56.43% and 77.78% respectively). Students who consume an omnivorous dietary eating pattern were less likely to agree (41.45%) compared to students who consume a plant-based and vegetarian dietary eating pattern (65.39% and 41.45% respectively). Students who claim to have a high agricultural knowledge were less likely to agree (40.10%) compared to students who disagreed to have high agricultural knowledge (47.96%) agreeing. Students with an urban background were more likely to agree (46.37%) compared to students with a rural background (41.35%).

Regarding the statement "I think that using fortified dairy alternatives (i.e. soy, almond, rice, etc.) is healthier than using regular dairy products" the total number of respondents were slightly more likely to agree (35.59%) compared to the total number of respondents who were less likely to agree (34.09%). Students in the age group 18-25 years were less likely to agree (34.9%) compared to respondents in the 31-35 years and 36-40 years age group (54.54% and 44.44% respectively), Male students were less likely to agree (27.16%) compared to female students (39.72%). Master's level students were more likely to agree (46.81%) compared to PhD level students (26.28%). Students in the College of Human Ecology and the College of Architecture, Planning and Design were more likely to agree (48.51% and 55.55% respectively) compared to students in the College of Agriculture (17.95%). Students who consume an omnivorous dietary eating pattern were less likely to agree (32.1%) compared to plant-based and vegetarian dietary eating patterns (69.23% and 75% respectively). Students who claim to have a

high agricultural knowledge were less likely to agree (27.72%) compared to students who disagreed to have high agricultural knowledge (42.13%) agreeing. Students with an urban background were more likely to agree (39.66%) than students with a rural background (30.81%).

Regarding the statement "It is easy to get enough calcium without dairy products" the total number of respondents were more likely to disagree (46.71%). Students in the age group 18-25 years were more likely to disagree (48.51%). Female students were more likely to disagree (47.89%) compared to male students (43.93%). Master's level students were more likely to agree (48.94%) and freshman level students were more likely to disagree with 64.18% in disagreeance. Students in the College of Agriculture were more likely to disagree (56.41%) compared to students in the College of Human Ecology (40.59%). Students who consume a Plant-based and vegetarian dietary eating pattern were more likely to agree (69.24% and 62.50%) compared to students who consume an omnivorous dietary eating pattern (29.22% agree). Students from an urban background are more likely to agree (34.83%) compared to students from a rural background (29.95%).

Notable Findings

As the survey revealed, the total number of students were more likely to agree with the statements "I like the flavor of red meat" (87.61%) and "Dairy products taste good" (94.91%). These very high rates indicate student taste preferences for meat and dairy foods. Therefore, the development of attractive and acceptable plant-based meat and dairy-alternative foods that match the flavor profile as closely as possible to meat and dairy foods will be an important factor to consider in trying to entice the consumption of these plant-based alternatives.

It is also interesting to note that the most consistent and notable discrepancies among various statements were between the students in the College of Human Ecology and students in

the College of Agriculture. For example, only 11.88% of respondents in the College of Human Ecology were more likely to agree "Diets with red meat are healthier than those without" compared to respondents in the College of Agriculture who had the highest number agreeing at 43.59%. Students in the College of Human Ecology were more likely to agree "Fish and poultry are the best "meat" choices" (58.41%) compared to students in the College of Agriculture (33.33%). Students in the College of Human Ecology were more likely to agree with the statement "I am concerned about the amount of fat in red meat" (52.47%) compared to students in the College of Agriculture and the College of Architecture (16.67%). Students in the College of Agriculture had the highest number agreeing with the statement "Trimmed red meat is as healthful as fish or poultry" (52.56%) while students in the College of Human Ecology were less likely to agree (28.71%). Regarding the statement "Diets with dairy are too high in saturated fat and cholesterol" respondents in the College of Human Ecology were more likely to agree (29.70%) compared to respondents in the College of Agriculture (5.12%). Students in the College of Agriculture were more likely to agree with the statement "Red meat contains important nutrients" (91.02%) compared to respondents in the College of Human Ecology (84.16%). Regarding the statement "Dairy products are good sources of protein and nutrients" students in the College of Agriculture were more likely to agree (87.18%) compared to students in the College of Human Ecology (76.24%). Respondents with the lowest number agreeing with the statement "A diet with dairy products is healthier than without" were in the College of Human Ecology (34.65%) compared to respondents with the highest number agreeing which were in the College of Agriculture (67.95%). Regarding the statement "Meat alternatives (tofu, legumes, lentils, nuts) are healthier than red meat" students in the College of Agriculture were less likely to agree (23.07%) compared to students in the College of Human Ecology (56.43%).

Students in the College of Human Ecology were more likely to agree with the statement "I think that using fortified dairy alternatives (e.g. soy, almond, rice, etc.) is healthier than using regular dairy products" (48.51%) compared to students in the College of Agriculture (17.95%). Regarding the statement "It is easy to get enough calcium without dairy products" students in the College of Agriculture were more likely to disagree (56.41%) compared to students in the College of Human Ecology (40.59%).

There were also consistent and notable discrepancies among various statements between students with an urban background and students with a rural background. For example, regarding the statement "Diets with red meat are healthier than those without" respondents with a rural background were more likely to agree (32.48%) than respondents with an urban background (23.45%). Students with an urban background are more likely to agree "Fish and poultry are the best "meat" choices" (52.76%) compared to students with a rural background (46.84%). Students with an urban background were more likely to agree with the statement "I am concerned about the amount of fat in red meat" (36.90%) compared to students with a rural background (28.69%). Students with a rural background were more likely to agree with the statement "Trimmed red meat is as healthful as fish or poultry" (43.88%) compared to students with an urban background (34.49%).

The suggested discrepancies between student perceptions and preferences help provide some insight to possible methods of intervention to assist in the shift from an animal-based to plant-based dietary pattern. Such possible interventions may include additional education focused on the health and environmental merits of plant-based diets and the promotion of food guidelines based on health and sustainability criteria along with the development of plant-based meat and dairy food-alternatives, matching the flavor profile of meat and dairy foods as closely

as possible to meet consumer taste preferences. This also provides some insight as to where additional education and potential interventions may be most effective. For instance, it appears students in the College of Agriculture and students who have a rural background may benefit from additional education regarding the health and environmental benefits associated with a plant-based dietary pattern as the majority of students in the College of Agriculture and students with an urban background were less likely to agree with statements that tended to support a more positive perception of plant-based foods and more likely to agree with statements that tended to support a positive perception of meat and dairy foods.

This newfound knowledge may assist in transitioning our dietary and agricultural practices in a more healthful and sustainable direction. However, a statistical analysis would be necessary to determine statistical significance and further support these observations.

Chapter 7- Conclusion

As the need, interest, and participation in plant-based dietary patterns continue to grow, it is important to further investigate health and environmental implications and public perception because human behavior and policy are the catalysts for agricultural and dietary shift. There is currently a lack of research focusing on attitudes and perceptions of plant-based diets, [16] and how the examination of these beliefs pertains to our interest of the broader plant-based dietary pattern. [4] Without an understanding of the psychosocial and socio-demographic factors (as examined via the survey) associated with meat and dairy consumption and perceptions, it is not possible to begin to develop educational strategies, strategies needed to enable the public in learning of the possible benefits of plant-based dietary patterns. [4] Therefore, the investigation of individuals' perceptions of meat and dairy foods, in particular, will assist in identifying perceptions and socio-demographic factors. This newfound understanding will be useful for designing successful approaches in transitioning from an animal-based dietary pattern to a plant-based dietary pattern.

In conclusion, based on the general findings of this exploratory study it appears that taste preferences for meat and dairy foods are very high. Thus, the development of attractive and acceptable plant-based meat and dairy-alternative foods that match the flavor profile as closely as possible to meat and dairy foods will be an important factor to consider in order to entice the consumption of these plant-based alternatives. Furthermore, it appears students in the College of Agriculture and students who have a rural background may benefit from additional education regarding the health and environmental benefits associated with a plant-based dietary pattern as the majority of students in the College of Agriculture and students with an rural background were less likely to agree with statements that tend to support a more positive perception of plant-based foods and more likely to agree with statements that tended to support a positive perception

of meat and dairy foods. The suggested discrepancies between student perceptions and preferences help provide some insight to possible methods of intervention and where to provide these interventions to assist in the shift from an animal-based to plant-based dietary pattern. Such possible interventions may include additional education focused on the health and environmental merits of plant-based dietary patterns, and the promotion of food guidelines. These guidelines should be based on health and sustainability criteria along with the development of plant-based meat and dairy food-alternatives, matching the flavor profile of meat and dairy foods as closely as possible to meet consumer taste preferences.

This newfound knowledge may assist in transitioning our dietary and agricultural practices in a more healthful and sustainable direction via methods mentioned above. However, a statistical analysis would be necessary to determine statistical significance and further support these observations.

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Appendix A - Perceptions of Meat & Dairy Foods Survey

Perceptions of Meat and Dairy Foods Among College Students

Start of Block: Consent

Q1

Hello, All!

My name is Brittany Dennis, and I am a graduate student in Food, Nutrition, Dietetics, and Health. For my Master's Project, I am studying perceptions and knowledge of meat and dairy foods among college students. This survey should take approximately 10 minutes to complete and 40 students who complete this survey will be randomly selected to win a $10 Chipotle gift card. Thank you very much for your participation!

Page Break

Q2

Research

This survey is for research purposes to get a better understanding of the perceptions and knowledge of meat and dairy foods among college students. Please keep in mind there are no right or wrong answers and your responses will remain confidential and only used for the purpose of this study. There are no expected risks to you for participating in the survey. The survey is anonymous and your participation is voluntary. You have the right to withdraw from the study at any time by exiting the survey.

Page Break

Q3

Prize Drawing!

If you wish to have the opportunity to be selected for the $10 Chipotle gift card, there will be a link at the end of this survey that will lead you to a separate survey where you will input your contact information. This will keep your survey responses separate from your contact information thus maintaining your anonymity. If you have any questions, comments or concerns please feel free to contact Dr. Linda Yarrow (lyarrow@ksu.edu) or me Brittany (bdennis@ksu.edu).

Page Break

Q4

Consent

By answering the next question you affirm that you are at least 18 years of age and voluntarily agree to participate in this survey.

- ○ I agree to participate in this survey. (1)
- ○ I do not agree to participate in this survey. (2)

End of Block: Consent

Start of Block: Perceptions of Meat

Q5 I like the flavor of red meat

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q6 Fish and poultry are the best “meat” choices

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q7 Red meat can be part of a healthy diet

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q8 Diets with red meat are healthier than those without

- Strongly agree (1)

- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q9 Eating red meat makes me feel heavy and sluggish

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q10 Red meat contains important nutrients

- ○ Strongly agree (1)
- ○ Somewhat agree (2)

- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q11 Trimmed red meat is as healthful as fish or poultry

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q12 There are toxins in animal fat

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)

- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q13 Red meats have unnatural hormones

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q14 I think red meat has antibiotics

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)

○ Strongly disagree (5)

X→

Q15 Red meat is difficult to digest

○ Strongly agree (1)

○ Somewhat agree (2)

○ Neither agree nor disagree (3)

○ Somewhat disagree (4)

○ Strongly disagree (5)

X→

Q16 I am concerned about the amount of fat in red meat

○ Strongly agree (1)

○ Somewhat agree (2)

○ Neither agree nor disagree (3)

○ Somewhat disagree (4)

○ Strongly disagree (5)

Q17 Meat alternatives (tofu, legumes, lentils, nuts and seeds, etc) are healthier than red meat.

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

End of Block: Perceptions of Meat

Start of Block: Perceptions of Dairy Foods

Q18 Dairy products cause gas and bloating in most people

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q19 Dairy products taste good

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q20 It is easy to get enough calcium without dairy products

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q21 Dairy products are too fattening to use often

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q22 Diets with dairy are too high in saturated fat and cholesterol

- Strongly agree (1)
- Somewhat agree (2)
- Neither agree nor disagree (3)
- Somewhat disagree (4)
- Strongly disagree (5)

Q23 Dairy products are good sources of protein and nutrients

- Strongly agree (1)

- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q24 Dairy products are not needed by adults

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

Q25 A diet with dairy products is healthier than without

- ○ Strongly agree (1)
- ○ Somewhat agree (2)

- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q26 Dairy products contain unnatural hormones

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)
- ○ Strongly disagree (5)

X→

Q27 Dairy products contain antibiotics

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)

○ Somewhat disagree (4)

○ Strongly disagree (5)

X→

Q28 Dairy products give me mucus

○ Strongly agree (1)

○ Somewhat agree (2)

○ Neither agree nor disagree (3)

○ Somewhat disagree (4)

○ Strongly disagree (5)

X→

Q29 I think that using fortified dairy alternatives (e.g., soy, almond, rice, etc.) is healthier than using regular dairy products.

○ Strongly agree (1)

○ Somewhat agree (2)

○ Neither agree nor disagree (3)

○ Somewhat disagree (4)

○ Strongly disagree (5)

End of Block: Perceptions of Dairy Foods

Start of Block: Demographic/Background Questions

Q30 What is your age group?

○ 18-25 (1)

○ 26-30 (2)

○ 31-35 (3)

○ 36-40 (4)

○ >40 (5)

Q31 What Gender do you identify with?

○ Male (1)

○ Female (2)

Q32 What is your ethnicity?

○ American Indian or Native Alaskan (1)

- ○ Asian (2)
- ○ Black or African American (3)
- ○ Native Hawaiian or Other Pacific Islander (4)
- ○ White (5)
- ○ Hispanic (6)
- ○ Other (7)

Q33 What is your academic level in school?

- ○ Freshman (1)
- ○ Sophomore (2)
- ○ Junior (3)
- ○ Senior (4)
- ○ Master's Level (5)
- ○ PhD Level (6)

Q34 In which college at Kansas State University are your currently enrolled? (If you are enrolled in more than one choose the one you consider to be your primary college)

- ○ College of Human Ecology (1)
- ○ College of Agriculture (2)
- ○ College of Architecture, Planning and Design (3)
- ○ College of Arts and Sciences (4)
- ○ College of Business Administration (5)
- ○ College of Education (6)
- ○ College of Engineering (7)
- ○ College of Veterinary Medicine (8)
- ○ Gerontology (9)
- ○ Other (Please List) (10) _____

Q35 What is your academic department?

For Example: Food, Nutrition, Dietetics and Health (FNDH), Animal Science, etc.

_____

Q36 What is your major?

_____

Q37 What do you consider your dietary eating pattern to be?

- ○ Omnivorous: A diet comprised of both plant and animal products. (1)
- ○ Vegetarian: A diet that excludes meat, fish and fowl, but does include dairy products and eggs. (2)
- ○ Plant-Based: A mainly vegetarian diet, but will sometimes consume meat. (3)
- ○ Vegan: A diet that excludes all animal products (meat, fish, fowl, dairy and eggs) may also exclude gelatin, honey. (4)
- ○ Lacto-Vegetarian: A vegetarian diet that excludes all types of meat and eggs, but still includes dairy products. (5)
- ○ Ovo-Vegetarian: A vegetarian diet that excludes all types of meat and dairy products, but will still include eggs. (6)
- ○ Pescatarian: A vegetarian diet that excludes meat and fowl, but will still include fish. (7)
- ○ Other (Please Specify) (8) _____

Q38 I consider myself to have a high agricultural knowledge.

- ○ Strongly agree (1)
- ○ Somewhat agree (2)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (4)

○ Strongly disagree (5)

Q39 Have you ever been involved in an agricultural organization such as FFA or 4-H?

○ Yes (1)

○ No (2)

Q40 Do you consider the area in which you were primarily raised to be urban or rural?

○ Urban (1)

○ Rural (2)

Q41 Which of the following best describes the area in which you primarily were raised? If there were multiple locations, please think about the area in which you spent the most time.

○ City/town with less than 10,000 people (1)

○ City/town with 10,000-99,000 people (2)

○ City/town with 100,000-999,000 people (3)

○ City/town with 1,000,000 or more people (4)

○ Unknown (5)

End of Block: Demographic/Background Questions

Start of Block: Link to Prize Drawing!

Q42

Prize Drawing!

Thank you so much for your participation in this survey!
If you wish to have the opportunity to be selected for the gift card to Chipotle follow the link below to enter your contact information so that your name can be entered for the drawing. Again, thank you very much!

Chipotle Prize Drawing

End of Block: Link to Prize Drawing!

Start of Block: Default Question Block

Q1 In order to be eligible to be selected for a $10 Chipotle Gift Card please provide the following contact information so that we may get in contact with you so you may receive your gift code if you are chosen.

○ First Name (1) _____

○ Last Name (2) _____

○ E-mail (Required) (3) _____

○ Alternative E-mail (4) _____

Appendix B - Perceptions of Meat & Dairy Foods Supplemental Tables

Table 15 Student perceptions regarding "I think red meat has antibiotics"

Question	Demographic	Agree %	Neutral %	Disagree %
I think red meat has antibiotics		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=154); 28.46%	(N=218); 40.30%	(N=169); 31.24%
	Age (N=528)			
	18-25 (N=470)	(N=134); 28.51%	(N=191); 40.64%	(N=145); 30.85%
	26-30 (N=35)	(N=7); 20.00%	(N=12); 34.29%	(N=16); 45.71%
	31-35 (N=11)	(N=5); 45.45%	(N=4); 36.36%	(N=2); 18.18%
	36-40 (N=9)	(N=4); 44.44%	(N=4); 44.44%	(N=1); 11.11%
	>40 (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); %
	Gender (N=528)			
	Male (N=173)	(N=52); 30.06%	(N=76); 43.93%	(N=45); 26.01%
	Female (N=355)	(N=99); 27.89%	(N=137); 38.59%	(N=119); 33.52%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%

	Asian (N=17)	(N=4); 23.53%	(N=8); 47.06%	(N=5); 29.41%
	Black or African American (N=15)	(N=8); 53.33%	(N=3); 20.00%	(N=4); 26.66%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=125); 27.17%	(N=188); 40.87%	(N=147); 31.96%
	Hispanic (N=25)	(N=9); 36%	(N=12); 48%	(N=4); 16%
	Other (N=8)	(N=4); 50%	(N=1); 12.50%	(N=3); 37.50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=20); 29.86%	(N=29); 43.28%	(N=18); 26.87%
	Sophomore (N=111)	(N=34); 30.63%	(N=51); 45.95%	(N=26); 23.42%
	Junior (N=116)	(N=33); 28.44%	(N=46); 39.66%	(N=37); 31.90%
	Senior (N=165)	(N=46); 27.88%	(N=62); 37.58%	(N=57); 34.55%
	Master's Level (N=47)	(N=11); 23.40%	(N=18); 38.30%	(N=18); 38.29%
	PhD Level (N=22)	(N=7); 31.82%	(N=7); 31.82%	(N=8); 36.36%
	College (N=528)			
	College of Human Ecology (N=101)	(N=32); 31.68%	(N=43); 42.57%	(N=26); 25.74%
	College of Agriculture (N=78)	(N=19); 24.36%	(N=16); 20.51%	(N=43); 55.13%
	College of Architecture, Planning and Design	(N=2); 22.22%	(N=6); 66.67%	(N=1); 11.11%

	(N=9)			
	College of Arts and Sciences (N=121)	(N=45); 37.19%	(N=42); 34.71%	(N=34); 28.10%
	College of Business Administration (N=86)	(N=25); 29.07%	(N=37); 43.02%	(N=24); 27.91%
	College of Education (N=47)	(N=9); 19.15%	(N=26); 55.32%	(N=12); 25.53%
	College of Engineering (N=85)	(N=19); 22.36%	(N=42); 49.41%	(N=24); 28.23%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=137); 28.19%	(N=195); 40.12%	(N=154); 31.68%
	Vegetarian (N=8)	(N=3); 37.50%	(N=4); 50.00%	(N=1); 12.50%
	Plant-Based (N=26)	(N=9); 34.62%	(N=10); 38.46%	(N=7); 26.92%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=2); 66.67%	(N=1); 33.33%
	Other (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume			

	dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=57); 28.22%	(N=64); 31.68%	(N=81); 40.10%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=34); 26.56%	(N=60); 46.88%	(N=34); 26.57%
	Disagree (N=197)	(N=60); 30.46%	(N=89); 45.18%	(N=48); 24.36%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=85); 29.31%	(N=134); 46.21%	(N=71); 24.48%
	Rural (N=237)	(N=65); 27.43%	(N=79); 33.33%	(N=93); 39.24%

* Loss of respondent (s)

Table 16 Student perceptions regarding "There are toxins in animal fat"

Question	Demographic	Agree %	Neutral %	Disagree %
There are toxins in animal fat		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=184); 34.01%	(N=210); 38.82%	(N=147); 27.17%
	Age (N=528)			
	18-25 (N=470)	(N=161); 34.26%	(N=184); 39.15%	(N=125); 26.6%
	26-30 (N=35)	(N=9); 25.72%	(N=11); 31.43 %	(N=15); 42.86%
	31-35 (N=11)	(N=5); 45.45%	(N=5); 45.45%	(N=1); 9.09%
	36-40 (N=9)	(N=3); 33.33%	(N=4); 44.44%	(N=2); 22.22%
	>40 (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Gender (N=528)			
	Male (N=173)	(N=54); 31.21%	(N=70); 40.46%	(N=49); 28.32%
	Female (N=355)	(N=125); 35.21%	(N=135); 38.03%	(N=95); 26.76%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.67%	(N=0); 0%	(N=1); 33.33%
	Asian (N=17)	(N=5); 29.41%	(N=7); 41.18%	(N=5); 29.41%
	Black or African American (N=15)	(N=9); 60.00%	(N=3); 20.00%	(N=3); 20.00%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=149); 32.39%	(N=182); 39.57%	(N=129); 28.04%
	Hispanic (N=25)	(N=12); 48.00%	(N=7); 28.00%	(N=6); 24.00%
	Other (N=8)	(N=2); 25.00%	(N=6); 75.00%	(N=0); 0%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=23); 34.33%	(N=25); 37.31%	(N=19); 28.36%
	Sophomore (N=111)	(N=42); 37.83%	(N=46); 41.44%	(N=23); 20.73%
	Junior (N=116)	(N=40); 34.48%	(N=53); 45.69%	(N=23); 19.83%
	Senior (N=165)	(N=53); 32.12%	(N=53); 59.00%	(N=59); 35.76%
	Master's Level (N=47)	(N=13); 27.66%	(N=21); 44.68%	(N=13); 27.66%
	PhD Level (N=22)	(N=8); 36.37%	(N=7); 31.82%	(N=7); 31.82%
	College (N=528)			
	College of Human Ecology (N=101)	(N=42); 41.58%	(N=36); 35.64%	(N=23); 22.77%
	College of Agriculture (N=78)	(N=10); 12.82%	(N=25); 32.05%	(N=43); 55.13%
	College of Architecture, Planning and Design (N=9)	(N=4); 44.44%	(N=4); 44.44%	(N=1); 11.11%
	College of Arts and Sciences (N=121)	(N=48); 39.67%	(N=45); 37.19%	(N=28); 23.14%

	College of Business Administration (N=86)	(N=34); 39.54%	(N=37); 43.02%	(N=15); 17.45%
	College of Education (N=47)	(N=20); 42.56%	(N=20); 42.55%	(N=7); 14.90%
	College of Engineering (N=85)	(N=20); 23.53%	(N=38); 44.71%	(N=27); 31.77%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=154); 31.68%	(N=194); 39.92%	(N=138); 28.39%
	Vegetarian (N=8)	(N=5); 62.50%	(N=1); 12.50%	(N=2); 25.00%
	Plant-Based (N=26)	(N=18); 69.23%	(N=6); 23.08%	(N=2); 7.70%
	Vegan (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); %	(N=2); 66.67%	(N=1); 33.33%
	Other (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=202)	(N=54); 26.74%	(N=68); 33.66%	(N=80); 39.60%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=49); 38.28%	(N=52); 40.63%	(N=27); 21.09%
	Disagree (N=197)	(N=76); 38.58%	(N=85); 43.15%	(N=36); 18.28%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=110); 37.93%	(N=112); 38.62%	(N=68); 23.45%
	Rural (N=237)	(N=69); 29.12%	(N=93); 39.24%	(N=75); 31.65%

* Loss of respondent (s)

Table 17 Student perceptions regarding "Red meats have unnatural hormones"

Question	Demographic	Agree %	Neutral %	Disagree %
Red meats have unnatural hormones		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=541)	(N=125); 23.11%	(N=195); 36.04%	(N=221); 40.85%
	Age (N=528)			
	18-25 (N=470)	(N=104); 22.12%	(N=172); 36.60%	(N=194); 41.28%
	26-30 (N=35)	(N=8); 22.85%	(N=8); 22.86%	(N=19); 54.28%
	31-35 (N=11)	(N=5); 45.45%	(N=3); 27.27%	(N=3); 27.27%
	36-40 (N=9)	(N=4); 44.44%	(N=4); 44.44%	(N=1); 11.11%
	>40 (N=3)	(N=1); 33.33%	(N=2); 66.67%	(N=0); 0%
	Gender (N=528)			
	Male (N=173)	(N=42); 24.28%	(N=59); 34.10%	(N=72); 41.62%
	Female (N=355)	(N=80); 22.54%	(N=130); 36.62%	(N=145); 40.84%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.67%	(N=0); 0%	(N=1); 33.33%
	Asian (N=17)	(N=4); 23.53%	(N=8); 47.06%	(N=5); 29.41%
	Black or African American (N=15)	(N=6); 40%	(N=8); 53.33%	(N=1); 6.67%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=99); 21.52%	(N=163); 35.43%	(N=198); 43.04%
	Hispanic (N=25)	(N=8); 32.00%	(N=9); 36.00%	(N=8); 32.00%
	Other (N=8)	(N=3); 37.50%	(N=1); 12.50%	(N=4); 50.00%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=15); 22.39%	(N=27); 40.30%	(N=25); 37.31%
	Sophomore (N=111)	(N=23); 20.72%	(N=48); 43.24%	(N=40); 36.04%
	Junior (N=116)	(N=32); 27.58%	(N=38); 32.76%	(N=46); 39.65%
	Senior (N=165)	(N=31); 18.79%	(N=55); 33.33%	(N=79); 47.88%
	Master's Level (N=47)	(N=14); 29.79%	(N=16); 34.04%	(N=17); 36.17%
	PhD Level (N=22)	(N=7); 31.82%	(N=5); 22.73%	(N=10); 45.46%
	College (N=528)			
	College of Human Ecology (N=101)	(N=26); 25.74%	(N=40); 39.60%	(N=35); 34.65%
	College of Agriculture (N=78)	(N=10); 12.82%	(N=11); 14.10%	(N=57); 73.07%
	College of Architecture, Planning and Design (N=9)	(N=4); 44.44%	(N=3); 33.33%	(N=2); 22.22%
	College of Arts and Sciences (N=121)	(N=40); 33.06%	(N=48); 39.67%	(N=33); 27.27%

	College of Business Administration (N=86)	(N=16); 18.61%	(N=38); 44.19%	(N=32); 37.21%
	College of Education (N=47)	(N=10); 21.28%	(N=19); 40.43%	(N=18); 38.30%
	College of Engineering (N=85)	(N=16); 18.83%	(N=29); 34.12%	(N=40); 47.06%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=103); 21.19%	(N=176); 36.21%	(N=207); 42.60%
	Vegetarian (N=8)	(N=4); 50.00%	(N=3); 37.50%	(N=1); 12.50%
	Plant-Based (N=26)	(N=10); 38.46%	(N=8); 30.77%	(N=8); 30.77%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Other (N=3)	(N=1); 33.33%	(N=1); 33.33%	(N=1); 33.33%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=202)	(N=41); 20.30%	(N=51); 25.25%	(N=110); 54.46%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=30); 23.43%	(N=58); 45.31%	(N=40); 31.25%
	Disagree (N=197)	(N=51); 25.89%	(N=80); 40.61%	(N=66); 33.50%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=83); 28.62%	(N=114); 39.31%	(N=93); 32.07%
	Rural (N=237)	(N=39); 16.46%	(N=74); 31.22%	(N=124); 52.32%

* Loss of respondent (s)

Table 18 Student perceptions regarding "Dairy products contain antibiotics"

Question	Demographic	Agree %	Neutral %	Disagree %
Dairy products contain antibiotics		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=163); 30.7%	(N=229); 43.13%	(N=139); 26.18%
	Age (N=528)			
	18-25 (N=470)	(N=140); 29.79%	(N=209); 44.47%	(N=121); 25.75%
	26-30 (N=35)	(N=11); 31.42%	(N=10); 28.57%	(N=14); 40%
	31-35 (N=11)	(N=6); 54.54%	(N=4); 36.36%	(N=1); 9.09%
	36-40 (N=9)	(N=5); 55.56%	(N=2); 22.22%	(N=2); 22.22%
	>40 (N=3)	(N=0); 0%	(N=2); 66.67%	(N=1); 33.33%
	Gender (N=528)			
	Male (N=173)	(N=53); 30.64%	(N=79); 45.66%	(N=41); 23.7%
	Female (N=355)	(N=109); 30.7%	(N=148); 41.69%	(N=98); 27.61%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=0); 0%	(N=3); 100%	(N=0); 0%
	Asian (N=17)	(N=7); 41.18%	(N=7); 41.18%	(N=3); 17.64%
	Black or African American (N=15)	(N=6); 40%	(N=5); 33.33%	(N=4); 26.66%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=132); 28.7%	(N=203); 44.13%	(N=125); 27.18%
	Hispanic (N=25)	(N=13); 52%	(N=9); 36%	(N=3); 12%
	Other (N=8)	(N=4); 50%	(N=0); 0%	(N=4); 50%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=21); 31.35%	(N=30); 44.78%	(N=16); 23.88%
	Sophomore (N=111)	(N=31); 27.93%	(N=61); 54.95%	(N=19); 17.12%
	Junior (N=116)	(N=39); 33.62%	(N=49); 42.24%	(N=28); 24.14%
	Senior (N=165)	(N=48); 29.09%	(N=67); 40.61%	(N=50); 30.31%
	Master's Level (N=47)	(N=17); 36.17%	(N=13); 27.66%	(N=17); 36.17%
	PhD Level (N=22)	(N=6); 27.27%	(N=7); 31.82%	(N=9); 40.91%
	College (N=528)			
	College of Human Ecology (N=101)	(N=33); 32.67%	(N=41); 40.59%	(N=27); 26.73%
	College of Agriculture (N=78)	(N=18); 23.07%	(N=20); 25.64%	(N=40); 51.28%
	College of Architecture, Planning and Design (N=9)	(N=5); 55.55%	(N=4); 44.44%	(N=0); 0%
	College of Arts and Sciences (N=121)	(N=46); 38.01%	(N=48); 39.67%	(N=27); 22.32%

	College of Business Administration (N=86)	(N=26); 30.24%	(N=43); 50%	(N=17); 19.76%
	College of Education (N=47)	(N=8); 17.03%	(N=29); 61.7%	(N=10); 21.28%
	College of Engineering (N=85)	(N=25); 29.41%	(N=42); 49.41%	(N=18); 21.18%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=142); 29.22%	(N=211); 43.42%	(N=133); 27.36%
	Vegetarian (N=8)	(N=3); 37.5%	(N=4); 50%	(N=1); 12.5%
	Plant-Based (N=26)	(N=14); 53.84%	(N=8); 30.77%	(N=4); 15.39%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=0); 0%	(N=1); 100%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=0); 0%	(N=3); 100%	(N=0); 0%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=202)	(N=58); 28.72%	(N=71); 35.15%	(N=73); 36.14%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=43); 33.6%	(N=57); 44.53%	(N=28); 21.88%
	Disagree (N=197)	(N=61); 30.96%	(N=99); 50.25%	(N=37); 18.78%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=96); 33.11%	(N=137); 47.24%	(N=57); 19.66%
	Rural (N=237)	(N=65); 27.43%	(N=90); 37.97%	(N=82); 34.6%

* Loss of respondent (s)

Table 19 Student perceptions regarding "Dairy products cause gas and bloating in most people"

Question	Demographic	Agree %	Neutral %	Disagree %
Dairy products cause gas and bloating in most people		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=530)*	(N=297); 56.04%	(N=99); 18.68%	(N=134); 25.28%
	Age (N=528)			
	18-25 (N=470)	(N=270); 57.45%	(N=90); 19.15%	(N=110); 23.40 %
	26-30 (N=35)	(N=16); 47.06%	(N=4); 11.76%	(N=14); 41.17%
	31-35 (N=11)	(N=5); 45.45%	(N=2); 18.18%	(N=4); 36.36%
	36-40 (N=9)	(N=4); 44.44%	(N=1); 11.11%	(N=4); 44.44%
	>40 (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Gender (N=528)			
	Male (N=173)	(N=79); 45.67%	(N=42); 24.28%	(N=52); 30.06%
	Female (N=355)	(N=216); 61.02%	(N=56); 15.82%	(N=82); 23.16%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=2); 66.66%	(N=0); 0%	(N=1); 33.33%
	Asian (N=16)*	(N=7); 43.75%	(N=3); 18.75%	(N=6); 37.50%

	Black or African American (N=15)	(N=10); 66.66%	(N=3); 20.00%	(N=2); 13.34%
	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=251); 54.57%%	(N=87); 18.91%	(N=122); 26.52%
	Hispanic (N=25)	(N=21); 84.00%	(N=3); 12.00%	(N=1); 4.00%
	Other (N=8)	(N=4); 50.00%	(N=2); 25.00%	(N=2); 25.00%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=43); 64.18%	(N=12); 17.91%	(N=12); 17.91%
	Sophomore (N=111)	(N=62); 55.85%	(N=24); 21.62%	(N=25); 22.53%
	Junior (N=116)	(N=64); 55.18%	(N=22); 18.97%	(N=30); 25.86%
	Senior (N=165)	(N=91); 55.16%	(N=31); 18.79%	(N=43); 26.06%
	Master's Level (N=47)	(N=26); 55.32%	(N=3); 6.38%	(N=18); 38.29%
	PhD Level (N=21)*	(N=9); 42.86%	(N=6); 28.57%	(N=6); 28.57%
	College (N=528)			
	College of Human Ecology (N=101)	(N=54); 53.46%	(N=23); 22.77%	(N=24); 23.76%
	College of Agriculture (N=78)	(N=25); 32.05%	(N=13); 16.67%	(N=40); 51.28%
	College of Architecture, Planning and Design (N=9)	(N=6); 66.66%	(N=2); 22.22%	(N=1); 11.11%
	College of Arts and Sciences (N=120)*	(N=79); 65.83%	(N=21); 17.50%	(N=20); 16.67%

	College of Business Administration (N=86)	(N=46); 53.49%	(N=19); 22.09%	(N=21); 24.42%
	College of Education (N=47)	(N=30); 63.83%	(N=9); 19.15%	(N=8); 17.02%
	College of Engineering (N=85)	(N=54); 63.53%	(N=11); 12.94%	(N=20); 23.53%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=485)*	(N=262); 54.02%	(N=93); 19.18%	(N=130); 26.81%
	Vegetarian (N=8)	(N=6); 75%	(N=1); 12.50%	(N=1); 12.50%
	Plant-Based (N=26)	(N=20); 76.93%	(N=4); 15.38%	(N=2); 7.69%
	Vegan (N=1)	(N=0); 0%	(N=0); 0%	(N=1); 100%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Other (N=3)	(N=3); 100%	(N=0); 0%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			

	Agree (N=201)*	(N=84); 41.79%	(N=41); 20.40%	(N=76); 37.81%
	Neutral (Neither Agree nor Disagree) (N=128)	(N=84); 65.63%	(N=25); 19.53%	(N=19); 14.84%
	Disagree (N=197)	(N=126); 63.96%	(N=32); 16.24%	(N=39); 19.80%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=179); 61.72%	(N=48); 16.55%	(N=63); 21.73%
	Rural (N=237)	(N=115); 48.73%	(N=50); 21.19%	(N=71); 30.08%

* Loss of respondent (s)

Table 20 Student perceptions regarding "Dairy products are not needed by adults"

Question	Demographic	Agree %	Neutral %	Disagree %
Dairy products are not needed by adults		(1=Strongly Agree & 2= Somewhat Agree)	(3=Neither Agree nor Disagree)	(4=Somewhat Disagree & 5=Strongly Disagree)
	Total Respondents (N=531)*	(N=83); 15.63%	(N=74); 13.94%	(N=374); 70.43%
	Age (N=528)			
	18-25 (N=470)	(N=72); 15.32%	(N=63); 13.40%	(N=335); 71.28%
	26-30 (N=35)	(N=7); 20%	(N=4); 11.43%	(N=24); 68.57%
	31-35 (N=11)	(N=2); 18.18%	(N=2); 18.18%	(N=7); 63.63%
	36-40 (N=9)	(N=1); 11.11%	(N=3); 33.33%	(N=5); 55.55%
	>40 (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.67%
	Gender (N=528)			
	Male (N=173)	(N=24); 13.88%	(N=31); 17.92%	(N=118); 68.21%
	Female (N=355)	(N=58); 16.34%	(N=42); 11.83%	(N=255); 71.83%
	Ethnicity (Race) (N=528)			
	American Indian or Native Alaskan (N=3)	(N=0); 0%	(N=1); 33.33%	(N=2); 66.66%
	Asian (N=17)	(N=2); 11.76%	(N=1); 5.88%	(N=14); 82.36%
	Black or African American (N=15)	(N=3); 20%	(N=3); 20%	(N=9); 60%

	Native Hawaiian or Other Pacific Islander (N=0)	N/A	N/A	N/A
	White (N=460)	(N=70); 15.22%	(N=62); 13.48%	(N=328); 71.31%
	Hispanic (N=25)	(N=4); 16%	(N=4); 16%	(N=17); 68%
	Other (N=8)	(N=3); 37.5%	(N=2); 25%	(N=3); 37.5%
	Academic Level in School (N=528)			
	Freshman (N=67)	(N=6); 8.96%	(N=8); 11.94%	(N=53); 79.11%
	Sophomore (N=111)	(N=16); 14.42%	(N=15); 13.51%	(N=80); 72.07%
	Junior (N=116)	(N=21); 18.1%	(N=15); 12.93%	(N=80); 68.96%
	Senior (N=165)	(N=27); 16.36%	(N=22); 13.33%	(N=116); 70.3%
	Master's Level (N=47)	(N=8); 17.02%	(N=11); 23.40%	(N=28); 59.57%
	PhD Level (N=22)	(N=4); 18.19%	(N=2); 9.09%	(N=16); 72.73%
	College (N=528)			
	College of Human Ecology (N=101)	(N=19); 18.81%	(N=13); 12.87%	(N=69); 68.31%
	College of Agriculture (N=78)	(N=7); 8.98%	(N=11); 14.10%	(N=60); 76.93%
	College of Architecture, Planning and Design (N=9)	(N=2); 22.22%	(N=1); 11.11%	(N=6); 66.66%
	College of Arts and Sciences (N=121)	(N=19); 15.7%	(N=23); 19.01%	(N=79); 65.29%
	College of Business Administration (N=86)	(N=11); 12.79%	(N=12); 13.95%	(N=63); 73.25%
	College of Education (N=47)	(N=6); 12.77%	(N=8); 17.02%	(N=33); 70.21%

	College of Engineering (N=85)	(N=17); 20%	(N=5); 5.88%	(N=63); 74.11%
	College of Veterinary Medicine (N=0)	N/A	N/A	N/A
	Gerontology (N=0)	N/A	N/A	N/A
	Other: (N=1) Biology	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Dietary Eating Pattern (N=528)			
	Omnivorous (N=486)	(N=62); 12.76%	(N=66); 13.58%	(N=358); 73.66%
	Vegetarian (N=8)	(N=3); 37.5%	(N=1); 12.5%	(N=4); 50%
	Plant-Based (N=26)	(N=11); 42.31%	(N=5); 19.23%	(N=10); 38.46%
	Vegan (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Lacto-Vegetarian (N=1)	(N=1); 100%	(N=0); 0%	(N=0); 0%
	Ovo-Vegetarian (N=0)	N/A	N/A	N/A
	Pescatarian (N=3)	(N=2); 66.67%	(N=0); 0%	(N=1); 33.33%
	Other (N=3)	(N=2); 66.66%	(N=1); 33.33%	(N=0); 0%
	Omnivorous w/Celiac Disease			
	Whole 30/Paleo			
	Meat and Vegetables, but does not consume dairy			
	High Agricultural Knowledge (N=527)			
	Agree (N=202)	(N=21); 10.4%	(N=30); 14.85%	(N=151); 74.75%
	Neutral (Neither Agree nor Disagree)	(N=31); 24.22%	(N=18); 14.06%	(N=79); 61.72%

	(N=128)			
	Disagree (N=197)	(N=30); 15.23%	(N=25); 12.69%	(N=142); 72.08%
	Urban vs. Rural (N=527)			
	Urban (N=290)	(N=53); 18.27%	(N=39); 13.45%	(N=198); 68.28%
	Rural (N=237)	(N=29); 12.23%	(N=34); 14.35%	(N=174); 73.41%

* Loss of respondent (s)

Appendix C - IRB Approval Form

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Dr. Linda Yarrow
Food, Nutrition, Dietetics, and Health
206 Justin Hall

Proposal Number: 8701

FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 04/10/2017

RE: Proposal Entitled, "Perceptions of Meat and Dairy Foods Among College Students"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, 1601 Vattier St., Manhattan, KS 66506-1103 | 785-532-3224 | fax: 785-532-3278 | comply@ksu.edu | k-state.edu/research/comply

Appendix D – University Population vs Survey Sample Population Flowchart

Table 21 University Population vs Survey Sample Population Flowchart

Total University Population/Students
19,081
↓
Initial Outreach
5,300
↓
Survey Started
564
↓
Responses
556
↓
Survey Completion (*Dropouts throughout survey)
528
↓
Completion Rate
12%

Appendix E – Representation of University Population vs Survey Sample Population/Respondents

Table 22 Representation of University Population vs Survey Sample Population/Respondents

	University Population	University Population %	University Sample/Respondents	University Sample %/Response %
Total	19,081		5300 / 556	5300/19081=27.78% / 556/5300=10.49%
Gender				
Male	9774	9774/19081=51.22%	173	173/*528= 32.77%
Female	9307	9307/19081=48.7%	355	355/*528= 67.23%
College				
College of Human Ecology				
Undergraduate	2035			
Graduate	186			
Total	2221	2221/19081=11.64%	101	101/*528=19.13%
College of Agriculture				
Undergraduate	2271			
Graduate	326			
Total	2597	2597/19081=13.6%	78	78/*528=14.77%
College of Architecture, Planning and Design				
Undergraduate	415			
Graduate	211			
Total	626	626/19081=3.28%	9	9/*528= 1.70%

College of Arts and Sciences				
Undergraduate	4709			
Graduate	729			
Total	5438	5438/19081=28.50%	121	121/*528=22.92%
College of Business Administration				
Undergraduate	2316			
Graduate	132			
Total	2448	2448/19081=12.83%	86	86/*528=16.29%
College of Education				
Undergraduate	1048			
Graduate	338			
Total	1386	1386/19081=7.26%	47	47/*528=8.90%
College of Engineering				
Undergraduate	3424			
Graduate	332			
Total	3756	3756/19081=19.68%	85	85/*528=16.10%
College of Veterinary Medicine				
Undergraduate N/A	N/A			
Graduate	450			
Total	450	450/19081=2.36%	0	0%