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PERCEPTIONS OF GREEN EATING BEHAVIORS ON COLLEGE CAMPUSES IN  
AN URBAN VS RURAL SETTING

BY

GABRIELLA G NOWICKI

A thesis submitted in partial fulfillment of the requirements for the

Master of Science

Major in Nutrition and Exercise Sciences

Specialization in Nutritional Sciences

South Dakota State University

2019

PERCEPTIONS OF GREEN EATING BEHAVIORS ON COLLEGE CAMPUSES IN  
AN URBAN VS RURAL SETTING

Gabriella G Nowicki

This thesis is approved as a creditable and independent investigation by a candidate for the Master of Science in Nutrition and Exercise Sciences degree and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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## ABBREVIATIONS

GE	Green Eating
GetFRUVED	Get your Fruits and Vegetables
MSA	Metropolitan Statistical Area
OR	Odds Ratio
SFS	Sustainable Food System
USDA	United States Department of Agriculture

## ABSTRACT

PERCEPTIONS OF GREEN EATING BEHAVIORS ON COLLEGE CAMPUSES IN  
AN URBAN VS RURAL SETTING

GABRIELLA G NOWICKI

2019

**Background:** Green Eating is a multidisciplinary approach to health in economic, public health, and environmental issues. GE has an evident impact on the quality of life in young adults, especially those on college campuses. Current evidence already supports an improved dietary intake in those who adopt GE behaviors.

**Objective:** To determine if a university's campus location affects first-year students' exposure to green eating. We hypothesize that first-year students on university campuses located in urban settings are more likely to report GE awareness and practices than in rural settings.

**Methods:** First-year students were recruited for the GetFruved study in late summer 2015 via email and data collection begun early fall 2015. The total number of participants was 1,149.

**Analysis:** A cross-sectional, secondary analysis was completed. Green eating variables were dichotomized into 'Always/Often' and 'Sometimes/Rarely/Never' and logistic regression was used to determine the relationship between green eating and self-reported region while controlling for gender, vegetarian status, and residence hall status.

**Results:** Of the 25 green eating questions analyzed, 17 were significantly associated with region. Those who live in the NE are 83% more likely to consider themselves a green



eater as compared to those in the Midwest ( $p=0.008$ ). SW is four times (4.02) more likely to purchase meat that is “free-range” or “grass-fed” with NE (2.69) and SE (1.83) to follow. SE was the lone significant region for “how often do you shop at farmers markets” (0.58) and “eating minimal processed food is better for my health” (1.61). Residence hall was only significant for one question ( $p<0.0001$ ): “I eat green when at school during the semester”.

**Conclusions:** Students living in urban areas are more inclined to always/often report positive GE eating behaviors opposed those in rural areas. Positive behaviors toward in GE in young adults can shift the consumer demand from low-cost convenience food to better quality foods and therefore, largely impact their diets.

## CHAPTER I

### *Introduction*

Healthy People 2020, set by the United States Department of Health and Human Services, stresses the consumption of a variety of fruits, vegetables, whole grains, and legumes to encourage the reduction of unhealthy weight gain.<sup>1</sup> National data shows that only 1% of 19-30 year olds eat the recommended amount, 5-9 servings, of fruits and vegetables daily and it is estimated that 5.6 million premature deaths occur annually due to low F/V intake.<sup>2</sup> The dietary behaviors in college students are unique in comparison to all other stages of life due to a newborn independency and the habits formed during this ‘emerging’ adulthood period can last a lifetime.<sup>3</sup> According to the National Center of Education Statistics, approximately 17.5 million undergraduate students are currently enrolled at a university across the United States. It is expected to jump to 19.3 million by the year 2026.<sup>4</sup>

Young adults experience a dramatic series of changes between high school and college. Upon leaving the comfort of home, there is a new-found freedom and independency, and a change from being taken care of to taking care of oneself. First-year students tend to experience more rapid weight gain than other college students.<sup>2</sup> Between unhealthy, abundant, convenient food options on campus to energy-dense and nutrient-poor food in the dorms, remaining a healthy weight can present as a challenge for most. Stress, congested schedules, sleep deprivation, and decreased physical activity, among other factors, all add to the difficulty of living a healthy lifestyle during college.<sup>3</sup>

### ***Definitions***

A clear, fixed definition of Green Eating has yet to be established. For the purpose of this study, GE will be defined as a diet that has a low environmental impact where the individual consumes in-season fruits and vegetables, locally grown foods, fair trade or organic certified items and limiting the intake of processed food. Being a vegetarian or vegan is considered GE but so is choosing meats and dairy that do not contain hormones or antibiotics and is free-range or cage-free. Also, taking an honest proportion of food that will only be consumed falls into the GE category. The food should be respectful to all ecosystems, culturally acceptable, affordable, and nutritionally adequate while being safe and healthy.<sup>1,5</sup>

## CHAPTER 2

### *Literature Review*

When young adults transition to attend college, they face challenges associated with learning to care for themselves opposed to having others care for them. The ‘freshmen 15’ is a popular term used in unison with ‘first-year student’. While there is no research confirming a mean amount of 15 pounds, studies have shown that the majority of freshmen gain anywhere from 2.4 to 7.4 pounds in their first year. Another study showed only 5.4% of participants actually gained 15 or more pounds during that first year. Women, in particular, experience greater weight gain and fear over the ‘freshmen 15’ than their male peers.<sup>6</sup> The issue is not the amount of weight gained during the first year but the habits made that lead to the continuous weight gain over the entirety of their collegiate career. Research has shown that it is not the ‘freshmen 15’ but the ‘college 15’ that should be addressed. Students are heading down the path to obesity by the time of graduation, gaining anywhere from 9 to 27 pounds.<sup>6</sup>

As society becomes more active in preserving the environment and relating the cause of issues such as, obesity, food insecurity, and other health disparities to their diet, the concept of GE has begun to surface in conversations. This literature review determines what current information exists on GE in correlation with college students, and to discover what barriers might benefit or affect attitudes and capability of adopting a GE practice. Finally, it is necessary to see what studies and research has already been found analyzing the differences in urban versus rural GE behaviors to build a hypothesis and support the findings of this study.

### *Students Behavior Toward GE*

One can hypothesize that young adults with positive attitudes toward alternative food production consume more fresh, whole foods with less processed sugars and fats.<sup>5</sup> A study took a group of students at a community college and a public university within the metropolitan area of the Twin Cities, MN. A total of 1,201 students partook and were pre-assessed using Project EAT, which asked questions involving GE. This study labeled GE as: eating organically grown, not processed, locally grown, and purchasing sustainable agriculture. Six percent of the sample were under vegetarian status. They found almost half (49%) of students valued alternative production practices with moderate to high importance and these students also appeared to have a better diet quality than their peers. There was even more importance placed if the students were female, over 25 years old, vegetarian/vegan, and/or living outside of their families' home. What was surprising was that among all categories of importance (low, moderate, and high) the overall levels of fruits, vegetables, dairy, calcium, and fiber did not meet daily recommendations. While this study looked at one urban Midwest college sample, it showed the use of effective messaging of societal and environmental implications with food productions. Since this study used cross-sectional data, it cannot determine if there is a strong positive correlation with alternative food practices and improved dietary quality, but it did reveal that these attitudes were common amongst college students.<sup>5</sup>

A separate study found that college students who attended a course on societal issues related to food and food production, noted increased intake of fruits and vegetables and reduced intake of high-fat dairy, high-fat meats, and sweets. The course had students read essays and watch documentaries on environment, social justice, ethical, cultural,

political, and agriculture issues surrounding food.<sup>5</sup> A previous study found that young adults that have supportive mindsets toward local food systems do not necessarily understand how it translates into their dietary choices and behaviors. Three quarters of young adults believe that organic food is better for a healthy lifestyle and the environment while approximately half, believe that producing food locally can reduce pollution.<sup>7</sup>

Finally, students taking economic and nutrition courses were asked what they knew about terms such as “seasonal” and “local”. What the researchers found was that a large portion of these students had a wide understanding of what seasonal and local foods were and how they related to GE. Because this study was done in 2000, it is possible that this awareness is even more prevalent on college campuses, eighteen years later.<sup>8</sup>

### ***Urban vs Rural Campus Green Eating***

The United States is a vast country with a large mixture of urban and rural college campuses. As of 2013, 47% of the United States is made up of urbanization.<sup>9</sup> That leaves the other half to what is considered to be “rural” areas. North and South Dakota are considered to be in the Top 10 states with least urbanization, both at 0.3%.<sup>9</sup> Those that live in rural areas are already at risk of certain health disparities such as obesity.<sup>10</sup> Rural land makes up the majority of the United States and approximately 20% of the population lives in a rural area. One study found that less than 1 in 4 rural adults consume the proper amount of daily fruits and vegetables.<sup>10</sup>

According to the National Center for Educational Statistics, there were over 4,700 degree-granting institutions in 2014.<sup>4</sup> There is no exact amount of how many of these

institutions are in rural areas and how many are in urban/suburban areas. This topic had the least amount of literature and studies available.

In fact, there is no specific definition of what is considered 'rural'. In fact, over two dozen federal definitions of rural exist. The US Census Bureau Classification looks at population data to create certain categories. An urban area is labeled as having 50,000 population or more, and an urban cluster exists right outside of an urban area, such as a suburban town next to a city. A rural area does not fall into either category.<sup>11</sup> The Office of Management and Budget Metropolitan Area Standards call these categories 'MSAs' or Metropolitan Statistical Areas. These areas are also based off population density. Lastly, the USDA defines locations by urban influence codes (UICs), rural-urban continuum codes (RUCCs), and rural-urban commuting areas (RUCAs). UICs are based off of population density but also the proximity to MSAs. RUCCs are classified by population size, degree of urbanization, and relation to MSAs. RUCAs use community information to distinguish where the categories fall into.<sup>10,11</sup>

Urban communities are already aware of the current need for change in the food systems especially amongst college campuses nestled within them. Urban universities, in particular, are a great avenue for providing the proper education and leadership in sustainable food systems (SFS). A SFS looks to "build stronger regional linkages to sectors within the food system and between the food stem in communities in order to promote public health outcomes, revitalize local economies, repair ecological systems, and foster social justice and equity".<sup>12</sup> A SFS will not only source food from local farmers and be transported with minimal ecological impacts but will also supply stronger

living wages and working conditions for food service workers, while sponsoring more research on sustainability.<sup>12</sup>

Sustainability first made an appearance on campuses in 1990 when presidents of universities across the country came together and agreed that, “universities bear profound responsibilities to increase the awareness, knowledge, technologies, and tools to create an environmentally sustainable future”.<sup>12</sup> Twenty-seven years later and campuses are still facing barriers to install an integrated approach to a SFS. One study reviewing SFS on urban campuses found that they are in a great setting with rich possibilities to implement a strong program.<sup>12</sup>

As stated earlier, Farm to College is a great tool utilized in SFS and so far, over 167 programs already exist with Farm to College.<sup>13</sup> The Real Food Challenge uses campuses and youth to help build awareness towards a stronger, healthier, fair, and green food system. The main goal of this program is to shift one billion dollars of current university food budget toward providing a more SFS or “real food” by 2020.<sup>14</sup> So far, more than 300 institutions have adopted the Real Food Challenge where they incorporate campuses farms, fair trade initiatives, and farm to cafeteria programs on college campuses. The strongest source of sustainability on campuses is in food systems and recycling initiatives such as, trayless dining, availability of fair trade and vegan options, and campus community gardens. According to the College Sustainability Report Card in 2011, 70 out of 87 universities located in large U.S. cities earned a “B” or better in the SFS category. Some barriers approached when looking to implement a SFS can include seasonality, students desire and interest, reliability and cost of vendors, and getting approval from university directors.<sup>12</sup>



Pothukuchi et al., looked at 21 urban public universities located in varying areas of the United States. Each of these institutions are of similar size with similar research commitments and all are within inner city limits. Fourteen of the 21 campuses looked at by this study are located in the top 50 cities based off the 2010 population. The goal was to evaluate and assess the presence of the current SFS at these urban universities. A few universities placed focus on some groups in their SFS mission statements such as low-income, women, minorities, immigrants, first-generation students, and part time students. Nine of the universities adopted a college community farm for at least two seasons and thirteen campuses had one that lasted over two or more seasons. Five campuses held farmers markets when capable. Six campuses reported purchasing produce locally (within 100-200-mile radius). Only three universities had SFS based curricula. Florida International received a grant to develop an organic garden on campus run by faculty and students allowing for a student-led farmers market to appear. University of Pittsburgh created “Plant to Plate” using the food from the garden to be served at dining halls and is also, run by students. Portland State University instituted the Leadership for Sustainability Education Graduate Program where students can graduate with a certificate in SFS and urban agriculture. Wayne State University has a similar program called SEED Wayne, in addition to a campus community garden and a 22-week farmers market.<sup>12</sup> Farmers markets are some of the most popular uses of GE and the Department of Agriculture reported over 1,000 new farmers markets in the year 2010, making it a total of 7,000 registered farmers markets in the U.S.<sup>5</sup> Already, more than 700 degree-granting institutions have signed a pledge to reduce their greenhouse gas emissions and establish goals to integrate a stronger SFS and experiences for their students.<sup>1</sup>

Of all the findings, community gardens within SFS have some of the strongest impact. They provide a low-cost option for students and the community to get involved while growing possibilities for curricular development and research. All in all, SFS span a diverse topic of engaged learning such as with food retail, food & nutrition, soil health and plant biology, and entrepreneurship. With urban campuses, implementing a SFS faces many challenges and requires leaders from students groups, faculty members, and dining service providers to adopt a strong SFS. In fact, the City University of New York (CUNY) has been making strides to be one of the healthiest urban universities since 2016 through the use of vending machines, cafeterias, and meetings with faculty and students. Nicholas Freudenberg, the co-director of the Healthy CUNY initiative, stated in an interview, “For many campus administrators around the country, food is seen more as a revenue stream for strapped universities than as a vehicle for improving health”.<sup>15</sup> This study only reviewed universities in inner cities that already had a pre-existing commitment to SFS. Essentially, a university, whether in urban or rural settings, will not implement a strong SFS unless those that are in that community have the same commitments and values. Such as, students who value GE will push for a better SFS. This specific study reviewed ways SFS can be outlined and strengths of those policies.<sup>12</sup>

### ***Challenges of Green Eating***

An ongoing study looked at what leads individuals to incorporate a GE into their lifestyle. By using a theoretic model, the factors influencing young adult’s eating choices can be recognized (see figure 1). Using this model, one can determine an individual’s readiness to follow GE.<sup>16</sup> Another study pinpointed three main reasons why students would adopt GE: personal health, environmental protection, and social values.<sup>1</sup> A review

of American consumers revealed the qualities that they look for when purchasing food; ease of access, ease of preparation, and U.S. grown were among these qualities.<sup>8</sup>

There is the claim that health food is more expensive than convenience food. This is because there is more of a consumer demand for low cost foods. For college students, especially, cost is a challenge. One of the healthy food program directors at CUNY said, “Most students are on a tight budget and healthier foods can be more expensive”.<sup>15</sup>

Another study surveying females experiences with the ‘freshmen 15’ revealed one female student stating: “Vegetables and fruits are a lot more expensive while Top Ramen is like 19 cents...freshmen don’t have as much money”.<sup>6</sup> Food cost is also cheaper in large supermarkets which may not always be close by in rural areas. Transportation cost plays a role in the price of food, too, especially for those in rural communities.<sup>10</sup>

A typical aspect of being a college student, is lack of time. With a heavy, demanding, course workload among extracurricular activities and jobs, physical activity and eating properly can fall short on the priority list. A report presented that 37.6% of college students exercised three times or less a week and 34% worked 20 hours or more a week.<sup>13</sup> One student who participated in this study expressed the difficulty of eating healthy when she was in classes all day and went on to say, “Everything you see around the city (in terms of places to eat) is junk food so in those days that I go to school, I buy my own food”.<sup>17</sup>

Surprisingly, not much rebuttable literature has been published about the specific challenges related to healthy eating especially on college campuses. This is something that is discussed in blogs, forums, and even in everyday life but there is little, specific evidence-based research.

### *Food Insecurity on Campuses*

It is a rite of passage in one's college years to become the cliché of a starving college student. Living off of ramen and free snacks from RA programs has become the norm, often a running joke within the college environment. In reality, it is a much bigger problem and not recognized enough in society. In 2015, 15.8 million households fell into the food insecure category.<sup>18</sup> Food security is not only an issue in the United States, but more importantly, college campuses. The USDA labels food security in a variety of levels. Food secure ranges from high food security to marginal food security. Food insecurity ranges from low food insecurity to very low food insecurity. A low food insecure person involves a reduced caloric intake, not having access to healthy food, a lack of variety in one's diet, experiencing hunger without eating, and reduced weight.<sup>18</sup>

Food insecurity has no face. There is no gender, race, religion, and age that are exempt from experiencing food insecurity. However, college students are more vulnerable than the rest of the population due to limited time, low pay, and high expenses and there are a few studies looking into these issues. A study revealed that 21% of students were considered food insecure and 24% were at risk of becoming food insecure. A more recent study revealed that 56% of students were food insecure and 33% were very low food insecure in over 70 community colleges.<sup>18</sup>

Food insecurity is a silent topic on campuses. Adolescents that deal with food insecurity deal with a negative impact on academic performance, mental and social health, and strong dietary changes. One study found that students that are food insecure are more likely to report a lower GPA of 2.0-2.49.<sup>18</sup> Another study conducted 27 interviews with food insecure students and five focus groups filled with food secure

students. A large majority of the sample were female, African Americans. Students who experience food insecurity often do not mention it around friends, feel awkward when ordering at restaurants, and wallow in an emotional burden and negative self-worth. Of the 27 students that participated, 18% had at least one job on and off campus and some even resorted to donating plasma as a main source of income. A small percentage of the participants (22%) relied on their parents for monetary support when finances got tight. Some even had to choose between going to class or working to pay for food.<sup>18</sup>

Of those participants, they reported they bought groceries from Wal-Mart, Kroger, Sack N Save, Aldi's, and Dollar General. These stores were chosen according to location to their residence/campus and cost of food. These stores were also preferred so that the students could purchase low cost food but in large quantities. The participants noted that the food they purchased was not only based off price but how easily the items were to prepare, such as, rice, beans, noodles, and peanut butter. Students, also, participated in events on campus that offered free food which were considered "snacks" and not a nutritious meal.<sup>18</sup>

When it came to academic performance, 30% of participants stated that they had difficulty concentrating in classes and had a drop-in GPA. Another 12% noted lack of energy and concentration due to hunger. When it came to extra-curricular activities and physical activity, food insecurity also inhibited students. Many claimed that they wished to partake in extra activities but due to work or minimal caloric intake, they felt sluggish or incapable.<sup>18</sup>

A few interventions have been done to address food insecurity. This study in particular looked at five current solutions: a campus food pantry, food recovery from

dining halls, reduced meal plans, meal vouchers, and work for food programs. Twenty-three percent of the participants with food insecurity noted how important a food pantry was to them due to the availability of cheap and healthy food. The importance of monitoring food waste on campus was also stressed by the students. One participant proposed collecting any leftover food from the dining halls and giving it those students with food insecurity. Lastly, 40% of the participants brought up a university community garden. One hundred percent of the participants mentioned that they would be willing to work on a campus garden in return for free, fresh produce. One student stated, "...it helps lift your mood when you're being involved and providing food for yourself. A community garden may provide a rewarding experience and access to nutritious, fresh produce".<sup>18</sup>

Some steps have been set in motion to combat food insecurity on campus. Since 2004, the Community Food Security Coalition has established the Farm to College program. This program helps connect campuses with surrounding farms to provide students with fresh, local produce and in turn lower prices for food on campus. The main site for the program has an entire page dedicated to resources to help start your own farm to college program and publications on the success of installing a farm to college program. The resources are broken up into sections for students, farmers, foodservice, and by location. This is a successful program that has helped tie GE on campuses with making room for more food secure individuals.<sup>13</sup>

### ***Conclusion***

The World Health Organization stated that obesity-related problems outweigh malnutrition.<sup>16</sup> There is a high demand to “cure” obesity in American and it starts with the youth. The concern of chronic illness needs to be addressed before it worsens, and the best avenue is through young adults.

GE has an evident impact on the quality of life in young adults, especially those on college campuses. If the majority of college students can be educated and surrounded by GE, consumer belief can be shifted towards more environmentally conscious eating and revolutionize the United States food system. Colleges such as CUNY are leaders in GE and Fruedenberg believes that once students desire for healthier food increases, then college cafeterias will be forced to start meeting the demands.<sup>15</sup>

From physical and mental health to environmental and businesses, Green Eating can benefit all age groups but the ‘emerging’ adults can create the lasting change for generations. More literature and research should be conducted on GE, especially if there is a difference between urban and rural campuses. If there is a difference, it is important to note why and observe what interventions can be used to encourage one or the other.

## CHAPTER III

### *Methodology*

In 2014, the USDA started a Community Based Participatory Research project that uses social marketing and environmental change to assess students on college campuses across the nation. Get your Fruits and Vegetables (GetFRUVED) originated at four intervention sites: University of Tennessee, University of Florida, West Virginia University, and South Dakota State University, and four control sites: Syracuse University, University of Auburn, University of Kansas, and University of Maine. The project is mostly led by students, making it unique and more hands on. There are three objects of the GetFRUVED project: improve dietary intake, increase physical activity, and improving overall stress management skills. Essentially, the goal is to promote health and prevent unwanted weight gain in college students, specifically in the first year.<sup>2,19</sup>

The specific aim for this study is to determine if a university's campus location affects first-year student's exposure to GE. We hypothesize that in the United States, first-year students on university campuses located in urban settings are more likely to report Green Eating awareness and practices than in rural settings. To accomplish this aim and test the hypothesis, a cross-sectional, secondary analysis of the GetFRUVED survey, section 2.28 Green Eating, was completed. This section of the survey contained 25 questions all answered using a Likert scale and also included a "Choose not to answer" response option. The GE survey was part of a separate project written by Dr. Geoffrey Greene regarding perceptions of GE behaviors. The first question included a definition of GE.



### ***Participant Recruitment and Enrollment***

Green eating variables were dichotomized into ‘Always/Often’ and ‘Sometimes/Rarely/Never’. Responses were ran under 2.GLBT4assign\_T1 and selective for sex. This was computed for every question. Since this was baseline data that was collected, the participants were asked which region of the country they associated themselves with. For example, if a participant is attending SDSU but is from Maine, they associate themselves as being from the Northeast and not from the Midwest. This seemed to be more relevant into where their GE behaviors—or lack thereof—originated from. Students listed themselves as being from the Northeast, Northwest, Southwest, Southeast and lastly, Midwest—which was used as the reference value. This is because this region contains the highest concentration of rural areas compared to all other regions.

GetFRUVED data collection began early fall 2015 during the academic semester. All written informed consent was given from the participants. The recruitment of first-year students began in late summer 2015. They were all recruited via email through the institution that they attend. Freshmen interested in the study were given a small survey to determine their eligibility.<sup>2</sup> Participants had to meet five requirements: be enrolled at either a control or intervention university, be 18 years of age or older (for Auburn, 19 years or more), be a first-year student, eat less than 2 servings of fruit and 3 servings of vegetables daily, and be from a group at elevated risk (i.e Body Mass Index (BMI)  $\geq$  25, self-identified as first-generation college student, self-identified overweight or obese parent, low income background, or self-identified as a racial minority).

### ***Data Analysis***

All analyses were conducted using Stata 14 (College Station, TX). Exploratory analysis included chi-square tests. Green eating variables were dichotomized into ‘Always/Often’ and ‘Sometimes/Rarely/Never’ and a logistic regression was used to determine the relationship between green eating and self-reported region while controlling for gender, vegetarian status, and residence hall status.

### ***Results***

The total number of students who completed the eligibility screener was 2,075, but only 1,149 were eligible (63.7% females). Table 1 indicates whether or not self-reported region was significantly associated with higher or lower odds of a GE variable response compared to the Midwest and also, presents p-values for variables that were controlled for.

Significant differences of GE perceptions were seen between individuals who self-reported being from the MW versus those from the NE. Odds of being a ‘green eater’ were 1.83 times higher among those from the NE compared to the Midwest ( $p=0.008$ ). Similarly, the NE were 85% more likely to shop at farmers markets ( $p=0.011$ ). The NE were more than three times likely to choose certified organic foods ( $p<0.001$ ), over two times as likely to buy meat or poultry labeled “free range” or “cage free” ( $p<0.001$ ), close to two times as likely to select meats raised without hormones and/or antibiotics ( $p=0.003$ ), and two times more likely to purchase food labeled fair trade and/or certified organic ( $p=0.017$ ). The NE were 47% more likely to believe that eating green can help protect the planet ( $p=0.042$ ) and 44% more likely to feel proud that eating green can help the environment compared to those in the MW ( $p=0.055$ ).

Compared to those in the MW, the NE have 33% lower odds of believing that eating green is expensive ( $p=0.032$ ) and 43% lower odds of believing that eating green would be too difficult ( $p=0.006$ ). Additionally, compared to the MW, the NE have 32% lower odds of eating green when busy ( $p=0.038$ ), 39% lower odds of eating green when at school during the semester ( $p=0.007$ ), 44% lower odds of eating green when inconvenient ( $p=0.002$ ), 40% lower odds of eating green when going out to eat ( $p=0.006$ ), and 34% lower odds of eating green when in the campus dining room ( $p=0.025$ ).

The SE, compared to the MW, have 42% lower odds of eating locally grown foods ( $p=0.012$ ), but are 91% more likely to choose certified organic foods ( $p=0.012$ ), 83% more likely to buy meat or poultry labeled “free range” or “cage free” ( $p=0.014$ ), 57% more likely to select meats raised without hormones and/or antibiotics ( $p=0.029$ ), and 61% more likely to believe that eating minimal processed foods is better for their health ( $p=0.015$ ).

Lastly, the SW differed from MW for only two of the questions. In comparison with the MW, this region is two and half times more likely to choose certified organic foods ( $p=0.045$ ) and four times more likely to buy meat or poultry labeled “free range” and/or “cage free” ( $p=0.001$ ).

### ***Discussion***

GE is a budding solution to food insecurity, establishing sustainable food systems, slowing climate change, and greatly improving the health of the future: young adults. This study was unique and a first of its kind in establishing the relationship of GE to current, at risk, first-year students and what part of the country they originate from. As

exhibited in previous research, adopting GE behaviors has a positive impact on a person's health, in particular, young adults.<sup>1</sup> Rural health in America, and specifically the Midwest, are facing major health disparities. Previous research found that less than 1 in 4 rural adults consume the proper amount of daily fruits and vegetables.<sup>10</sup> Specifically in the Midwest, 10 of the 12 states have populations with 30% or more considered to be obese.<sup>20</sup> Little research is known and conducted on young adults living in the Midwest and the transitionally state between childhood and adulthood.

The original purpose of this study was to report GE differences between rural and urban college campuses. After inputting the data, the region where the students associated with became more plausible for investigating. The region in which the first-year students associated with is, theoretically, an influence on GE behavior. We concluded that there are significant differences in GE behaviors amongst regions, specifically the NE versus the MW.

The first question (are you a green eater), was perhaps the most important. The NE, being the stand-alone region, had higher odds than the MW possibly due to greater urbanization. Maine is the eleventh rural state with 42% of the population living in rural areas.<sup>21</sup> While there are large rural areas, such as Maine, in the Northeast, urbanization is still the major use of land. Aside from this fact, according to 2010 data, New York has an Urban Density Rank of two, New Jersey six, Maryland twelve, Rhode Island fourteen, and Pennsylvania nineteen.<sup>9</sup> As found in previous literature, urban areas—specifically college campuses—are more conscious of a healthier eating lifestyle and also certain components of GE.<sup>11</sup> This guided my hypothesis, along with personal experiences, to

align with the research pointing toward more positive GE behaviors in urban campuses compared to rural campuses.

Urban dense areas such as, the Northeast are more apt to develop SFS on campuses but also have more positive behaviors toward GE such as shopping at farmers markets and purchasing fair trade and certified organic foods, as displayed in the results. For example, University of Pittsburgh, located in the NE, established the “Plant to Plate” program which utilized food grown on the campus gardens in the dining halls. University presidents and communities believe that a strong SFS will only occur when students share the same values, similar to those of GE.<sup>12</sup> Given that the students who associated with the Northeast, we can be confident that there is significant evidence linking positive GE behaviors with urban areas. As mentioned earlier in the literature, young adults believe that producing/selling food locally can reduce pollution and therefore, makes it more desirable.<sup>7</sup>

GE plays a key role in the planet’s health and drives motivation from others to have interest in this topic. In the United States, food production, specifically with meat and dairy, contribute 15-31% of the total greenhouse gas emissions.<sup>16</sup> By following GE behaviors, (i.e supporting local farms, eating plant-based, and reducing intake of red meat) one can also reduce their carbon footprint drastically. This, alone, can be a driving factor to change one’s diet and lifestyle habits and therefore, adopt GE behaviors. The results showed accordance with this in the NE as they had higher odds of believing that eating green can help protect the planet and feel proud that eating green can help the environment. Essentially, this shows that young adults in the MW could feel differently about food production and therefore, cause a decreased desire to practice GE. Today,

climate change is a hot topic and with the introduction of positive GE behaviors across the country, specifically in the MW, there is the potential to affect greenhouse gas emissions and shift the demand for more climate change focused policies. Young adults, are the future, and soon will be the leaders of our country. By associating strong, positive GE behaviors, with the environmental issues that face our world, young adults can impact the progression of climate change.

In the United States, it is very common to find that rural areas contain food deserts which are defined by the USDA as: "...parts of the country that are vapid of fresh fruit, vegetables, and other healthy whole foods, usually found in impoverished areas. Also, considered, is residents living more than a mile from a supermarket in an urban area and more than 20 miles in a rural area. This is largely due to the lack of grocery stores, farmers' markets, and healthy food providers".<sup>10,22</sup> Back in 2006, the Great Plains region of the Midwest contained the highest concentration of food deserts.<sup>23</sup> Between the lack of availability, cost, and time to travel to grocery stores, buying certain products can present as a challenge in rural areas. Aside from this fact, previous studies have showed students living in an urban area of the MW have valued alternative production practices with moderate to high importance.<sup>5</sup>

Something noteworthy to point out, is the two negative questions involving GE behaviors. For both, the NE showed lower odds of believing that eating green is expensive and would be too difficult. These are two common misconceptions that have an important role in GE. Oddly, the NE also had lower odds for eating green when busy, when at school during the semester, when inconvenient, when going out to eat, and when in the campus dining room. Two of the eight universities that partook in this survey were

from the NE (Syracuse and University of Maine). Entering the first year of college can be daunting and filled with unexpected inconveniences. For example, students from the NE that associated with certain positive GE behaviors might be faced with challenges living away at school. The campus in which they reside might not have a strong SFS or not have dining options that suit their GE desires. Most campuses make first-year students purchase a meal plan which does not allow for a lot of GE options especially on a campus that does not support it or is not feasible given the University's budget/location. Students that lived at a home that practiced GE might have built a strong framework but not given them the tools needed to reproduce these practices by themselves and in a dorm. Lastly, as stated earlier, young adults get caught up with all the newfound freedom and independence of living on campus, that they also get lost in all the buzz of being a college student. Next steps, would involve finding out more about what leads these individuals to these misconceptions and what strategies, aside from listed in the previous literature, could be done to change them. Considering the major obesity epidemic the MW is facing and the results of this study, interventions such as education-based programs should be tested here first to better the relationship and misconceptions of GE to young adults associated from the MW.

Interestingly, NW was the only region without significant findings. This could be because not enough students associated from the region and those that did, were not significant. Something noteworthy, is how similar the NW and MW are when discussing abundance of rural areas. Included in these states are California which is ranked one on the Urban Density Rank scale and Nevada is third but all others NW states fall lower on

the list.<sup>9</sup> Also, none of the universities that partook in the survey were located in the NW region.

Overall, this study revealed relevant comparisons between regions in the United States, in particular, the NW and MW. While the original hypothesis discussed differences between urban and rural, the region acted as a proxy with many similarities. Continued research should be completed following the students through college and marking their dietary habits with the use of the GetFruved program. Follow up research could look at college students that are not risk and their GE behaviors in comparison to this data.

### ***Limitations***

This study included a few limitations. Foremost, the GetFruved study looks at only first-year college students. There is a certain generalizability associated with this since there are young adults who chose not to enter college or attend a trade school. Some students may begin their college career in the spring semester, as well. Also, the students that were eligible all had to meet certain inclusion criteria that did not speak for all first-year college students. Since surveys were used, it is possible they might have been filled out improperly or not fully complete and because the survey was self-reported, recall bias and self-selection bias could have occurred. Also, the survey was completed in early fall which could result in student's behaviors being based off home behaviors and not exposed to the college food environment for long enough. A major limitation was the study was unable to classify which students were 'urban' and 'rural' but was a proxy for associating regions of the United States with GE behaviors. Lastly, ethnicity and major were not described in the data and could be potential confounders. Certain ethnicities are



often at greater risk for developing risk factors associated with obesity and others may have different diet guidelines based off their religions.

### ***Conclusion***

Over the past few decades, the United States has developed an obesogenic environment. This epidemic can affect everyone, starting with the youth. The first-year of a young adult's university career can create non-academic challenges such as unintentional weight gain. A combination of poor eating habits and lack of physical activity contribute to the unwanted weight gain. Between the issues of food insecurity, food availability, and day to day problems, students develop poor eating habits that linger long after graduation. Green Eating has the potential to improve young adults poor dietary habits during their most impressionable years. This study presented findings on how freshmen across college campuses view GE behaviors based on where in the United States they associate with.

### ***Implications***

GE is a multidisciplinary approach in economic, public health, and environmental issues. Most rapid weight gain of young adults occurs during the first-year on a college campus.<sup>2</sup> Available evidence already supports an improved dietary intake in young adults who adopt GE behaviors, which inspired a study done at a NE university to validate a GE tool.<sup>1,5</sup> Positive behaviors toward GE in young adults can shift the consumer demand from low-cost convenience food to better quality foods that align with GE. By adopting GE behaviors, young adults attending college campuses have a stronger opportunity of lowering weight gain and improving not only the climates health but, their own. Previous literature has noted that a strong SFS on campus with the addition of a

school garden has translated to improved health and overall well-being of college students.<sup>5,7,11,14</sup> Increased media attention on “hot topics” such as plant-based eating, farmers markets, and buying organic has spread the success for “natural food” grocery stores.<sup>7</sup> Using the media (and social media) with interventions to reduce food deserts and increase education programs with a stronger SFS, GE can reach a larger audience out in the MW. In turn, a more positive relationship and behaviors with GE can spread through young adults and have a lasting impact on theirs and the environments health.

When looking toward the future, GE has an evident impact on dietary quality, but more research needs to look at what extent and how other view GE, in particular, young adults. Focus groups can be utilized to further analyze how young-adults view GE and what their opinions are within the definition such as, eating organic and plant-based. Also, within these focus groups, one can learn more in depth how young-adults eat within their first years on a college campus and what type of environments support GE.

### ***School Gardens***

There is a profound relationship between childhood dietary behaviors leading into young adulthood.<sup>5,24</sup> One in six children are facing obesity and these habits will continue through young adulthood.<sup>24</sup> A recent meta-analysis estimated that around 5.6 million premature deaths occur annually due to low fruit and vegetable intake.<sup>2</sup> Another meta-analysis pointed out that the odds of youth who are obese are 26% more likely in rural areas than urban.<sup>11</sup> These children are at more risk of carrying that weight into adulthood as it can be more difficult to maintain any weight loss as opposed to maintaining a healthy weight.<sup>24</sup> A diet high in fruits and vegetables is, inevitably, going to lower the chances of obesity. Today, it is a struggle for children to get the recommended (five to

nine) servings of fruits and vegetables—similar to young-adults. According to national data, fewer than half of boys and girls ages 4 to 18 years consume greater than or equal to five servings of fruits and vegetables daily.<sup>25</sup>

One intervention being used to improve fruits and vegetables consumption in children, are school gardens. More than 25 percent of the elementary schools in United States reported having a school garden.<sup>2</sup> These “garden-based nutrition-education programs” help introduce youth to new foods, and teach them how to plant, harvest, and prepare these items. They expose children to a variety of different fruits and vegetables that might not be presented at home or regularly in their diet. These programs have also been found to benefit the teachers eating behaviors, on top of the children’s.<sup>24</sup> Aside from dietary habits, researchers found that school gardens improved environmental attitudes, community spirit, self-confidence, leadership skills, volunteerism, motor skills, scholastic achievement, and overall nutritional attitudes.<sup>25</sup>

There is currently, a large portion of literature on children and F/V intake. One study evaluated a group of youth garden initiatives. The study looked at fruits and vegetable intake, willingness to try new fruits and vegetables, fruits and vegetable preferences, and overall fruit and vegetable knowledge. The results showed that there was a significant correlation between a garden program and daily intake of fruits and vegetables. The intake levels jumped from 1.9 servings to 4.5 servings. At posttest, students were more likely to taste spinach, carrots, peas, broccoli, zucchini, and red bell pepper. The ability of these same students to identify fruits, jumped from 52% to 94% and vegetables from 43% to 86%. Introducing a garden-based nutrition program to youth had an overall positive effect on fruit and vegetable intake.<sup>25</sup> Another study followed a

group of students at the start of planting the garden and throughout the school year. Twenty-three schools participated with third and fourth graders and a full year of a garden. 74 percent of the schools studied were in urban settings. Students' knowledge was assessed by asking a series of questions involving "MyPlate". Their findings concluded that students in garden-based education programs were three times more likely to have a desire to consume vegetables. The students in an urban setting increased their confidence and knowledge in making healthy choices involving fruits and vegetables.<sup>24</sup>

Having a garden on school grounds has been effectively shown to have a positive correlation with fruit and vegetable consumption and overall nutrition and food knowledge. If these behaviors are put into place during childhood, then it can transfer over into young adulthood to reduce childhood obesity and possibly increase awareness of GE.

In terms of young adults, almost half of students enter college without any gardening experience. Current gardening program on campus focus on mental and emotional health opposed to nutrition education.<sup>2</sup> A study looking at gardening experience in college students was conducted in 2015 as a sub-study of the GetFRUVED project. Both childhood and recent gardening experience with F/V intake were assessed. 1,121 participants met requirements to take the survey. Of those, 11.4 percent reported only gardening as a child, 19.2 percent reported only gardening recently, and 20.4 percent reported both gardening as a child and recently. Subsequently, 49 percent claimed they had no form of gardening experience. South Dakota (74.6%) and Maine (66.8%) students reported having the most combined gardening experience. Alabama (35.6%) and Florida (38.3%) had the lowest combined gardening experience.<sup>2</sup>

Loso & colleagues looked at the student's location of those experienced gardening in childhood and recently. Sixty-two percent reported childhood identified home as where they received the most gardening experience. Community gardens (10%), churches (8%), 4-H clubs (4%), and other listed organizations (16%) followed. Family gardening (51%) was the most popular form of receiving experience while teaching students on campus was only 4 percent. With this data, researchers assessed the student's F/V consumption. They found that students who had previous gardening experience were more likely to have higher F/V intake than those who had no experience. Respectively, students who gardened weekly had the highest level of F/V intake. This study was not prospective but offered significant results and the possibility that the frequency/engagement of gardening is associated with F/V intake in young adults.<sup>2</sup> This study shows how a campus garden can positive influence F/V choices and in turn, GE behaviors.

Across college campuses, those that interact with plants and nature on a regular basis, receive positive mental and physical effects, such as decreased stress and higher self-esteem. A survey taken of 373 college students revealed that students who used campus green spaces more frequently, had an overall better-quality of life. A strong green scene on campus such as having a garden, can establish a venerable campus identity, stir alumni sentimentalism, and create a strong sense of community.<sup>26</sup>

## APPENDIX

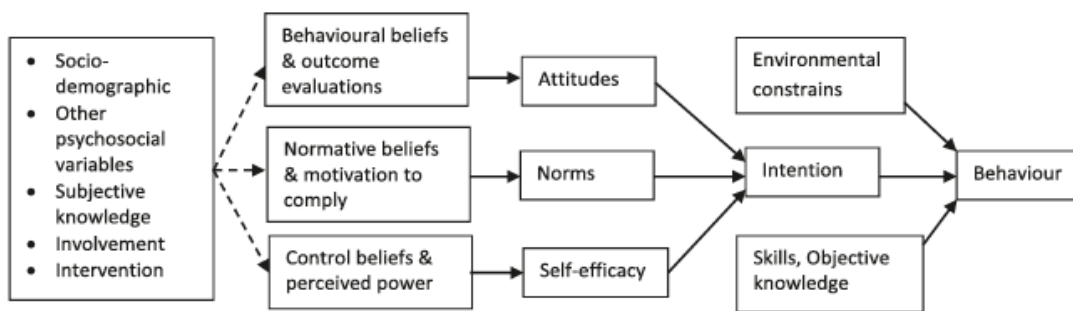
## APPENDIX A

Table 1: Green Eating Behavior, statistical results

Green Eating Behavior	Significant Region(s)	Odds Ratio (95% CI)	p-value	Vegetarian Status (p-value)	Residence Hall (p-value)	Gender (p-value)
Are you a green eater?	NE	1.83 (1.17, 2.86)	0.008	0.000	0.877	0.020
How often do you eat locally grown foods?	SE	0.58 (0.38, 0.88)	0.012	0.374	0.615	0.281
How often do you shop at farmers markets?	NE	1.85 (1.15, 2.98)	0.011	0.031	0.310	0.046
How often do you choose certified organic foods?	NE	3.12 (1.87, 5.21)	0.000	0.000	0.481	0.077
	SE	1.91 (1.15, 3.17)	0.012			
	SW	2.52 (1.02, 6.27)	0.045			
How often do you buy meat or poultry labeled "free range" or "cage free"?	NE	2.69 (1.64, 4.41)	0.000	0.173	0.669	0.007
	SE	1.83 (1.13, 2.97)	0.014			
	SW	4.02 (1.79, 9.05)	0.001			
How often do you select meats raised without hormones/antibiotics?	NE	1.91 (1.26, 2.92)	0.003	0.89	0.202	0.027
	SE	1.57 (1.05, 2.35)	0.029			
How often do you buy food labeled fair trade/certified organic?	NE	2.05 (1.13, 3.69)	0.017	0.003	0.940	0.020
Eating green can be expensive.	NE	0.67 (0.46, 0.97)	0.032	0.299	0.50	0.000
Eating green can help protect the planet.	NE	1.47 (1.01, 2.12)	0.042	0.000	0.689	0.000
Eating green would be too difficult.	NE	0.57 (0.38, 0.85)	0.006	0.037	0.369	0.729
Eating minimal processed foods is better for my health.	SE	1.61 (1.09, 2.36)	0.015	0.109	0.604	0.000
I am proud that I can help the environment by eating green.	NE	1.44 (0.99, 2.07)	0.055	0.000	0.598	0.000
I eat green when I am busy.	NE	0.68 (0.48, 0.98)	0.038	0.074	0.368	0.009
	SE	1.43 (1.02, 2.01)	0.041			
I eat green when at school during the semester.	NE	0.61 (0.42, 0.87)	0.007	0.076	0.000	0.058
I eat green when it is inconvenient.	NE	0.56 (0.39, 0.80)	0.002	0.468	0.273	0.056
I eat green when I go out to eat.	NE	0.60 (0.42, 0.86)	0.006	0.637	0.95	0.103
I eat green when I eat in the dining room.	NE	0.66 (0.46, 0.95)	0.025	0.425	0.487	0.004

**Region:**

- 1: Northeastern **NE**
- 2: Southeastern **SE**
- 3: Midwestern **MW** (reference value)
- 4: Southwestern **SW**
- 5: Northwestern **NW**

**APPENDIX B****Figure 1:**Theoretical model of GE Behaviors<sup>16</sup>

## APPENDIX C

### 2.28 GREEN EATING [25 ITEMS]

This survey is headed by Subproject 16.S (Geoffrey Greene)

Variable Name	Question Text	Label Values
green1	Green Eating is: Eating locally grown foods, limited amounts of processed/fast foods, eating meatless meals at least one day per week, choosing organic foods as much as possible, and only taking what you plan on eating.  Are you a green eater?	1) No, and I do not intend to start within the next 6 months 2) No, but I am thinking about becoming a green eater within the next 6 months 3) No, but I am planning on becoming a green eater within the next 30 days 4) Yes, I am a green eater and have been for less than 6 months 5) Yes, I am a green eater and have been doing so for 6 months or more 6) I choose not to answer
green2	Locally grown foods are grown within 100 miles of your location.  Based on this, how often do you eat locally grown foods?	1) Barely ever to never 2) Rarely (25%) 3) Sometimes (50%) 4) Often (75%) 5) Almost always 6) Choose not to answer
green3	When in season, how often do you shop at farmer's markets?	Same as green2
green4	How often do you choose foods that are labeled certified organic?	Same as green2
green5	How often do you buy meat or poultry products labeled "free range" or "cage free"?	Same as green2
green6	How often do you select meats, poultry, and dairy products that are raised without antibiotics or hormones?	Same as green2
green7	How often do you select foods or beverages that are labeled fair trade certified?	Same as green2
green8	Eating green is not practical in my life right now	1 = Barely ever to never 2 = Rarely (25%) 3 = Sometimes (50%) 4 = Often (75%) 5 = Almost always 9 = Choose not to answer
green9	Eating green can be too expensive	Same as green8
green10	By eating green, I can help protect the planet	Same as green8
green11	Eating green would be too difficult	Same as green8
green12	Eating minimally processed foods is better for my health	Same as green8
green13	By eating green I can improve the quality of my diet	Same as green8
green14	By eating green I can support the local economy	Same as green8
green15	Sustainably produced foods aren't available to me	Same as green8
green16	I am proud that I can help the environment by eating green	Same as green8
green17	I can't find green foods where I shop	Same as green8
	Please rate HOW CONFIDENT you feel that you could eat green...	
green18	...When I am busy	Same as green2
green19	...When I am at school during the semester	Same as green2
green20	...When I am at home	Same as green2
green21	...When it is inconvenient	Same as green2
green22	...When I am with my family	Same as green2
green23	...When I go out to eat	Same as green2
green24	...When I eat in the dining halls or cafeterias	Same as green2
green25	...Over the summer	Same as green2



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