

Food insecurity and the effect on college students: An analysis of food pantries in a college town  
in Appalachia

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## **Abstract**

Food insecurity is especially prevalent in rural areas, and is a growing concern among college students. In 2017, 46.2% of college students experienced food insecurity in the Appalachia region. Food pantries play a role in limiting food insecurity by providing food at little-to-no cost. Yet, the nutritional and energetic contents available, especially as it relates to college-aged adults, is unknown. This study was conducted to assess and analyze the nutritional content of the foods available to college students from pantries located in close proximity to a college campus in the Appalachia region. Using the Healthy Food Pantry Assessment tool, food pantries were scored (0-100; arbitrary units) based on a visit and discussion with food pantry directors. Additionally, nutritional contents of pantry foods were examined in line with the dietary needs of a typical college student. Food pantry 1 scored 39, pantry 2 scored 59, and pantry 3 scored 60. The food that the pantries provided to their clients was aimed to supplement the client for a duration of 14 days. The most prevalent foods provided by the food pantries were vegetables, and the least prevalent foods were dairy products. Overall, the food pantries provided 38% of the total daily calories recommended for a moderately active male aged 20 year for the 14-day period. The food provided less than the recommendations for vitamin C (27%), vitamin D (5%), potassium (29%), and calcium (37%). The food also contained 220% and 342% of the daily recommended sugar and trans fat, respectively. In general, students who rely on food pantries as their sole source of food do not reach recommendations set by the Dietary Guidelines for Americans. To resolve this issue, education of donators, staff, and clients, and policy change is recommended to improve the nutritional contents of the foods available to college students and all other clients who use the food pantries.

*Keywords:* food insecurity, college students, Appalachia, food pantry, nutrition

## **Introduction**

Food insecurity is described as the uncertainty of having, or inability to acquire, enough food to meet the needs of all their members because of insufficient money or other resources for food<sup>1</sup>. While food insecurity is a public health concern for many populations in the United States (U.S.), food insecurity among college students is becoming more prevalent, in part, due to the increasing costs associated with attendance<sup>2</sup> (e.g., tuition, books, supplies, housing, etc.). In fact, food insecurity affects 15% of all college students across America and another 16% are at risk of being food insecure<sup>3</sup>. In some areas of the U.S., such as the rural Appalachian region, food insecurity for college students has been found to be as high as 46.2%<sup>4</sup>. Food insecurity has serious health consequences. Previous research has demonstrated that people who experience food insecurity are more likely to have negative health outcomes such as: decreased nutrient intake, increased mental health problems and depression, diabetes, obesity, hypertension, poor sleep, and lower self-rated health<sup>5</sup>. Additionally, “food insecurity, hunger, or food insufficiency has been associated with lower academic achievement, behavioral and attention problems, and adverse psychosocial development among school- aged and teenage students”<sup>3</sup>.

One way to combat food insecurity and the potentially negative health consequences is through hunger relief organizations such as food pantries. Food pantries often provide a zero- or low-cost alternative to those who are in need of supplemental food. Most pantries receive their food items from a variety of sources, including the U.S. Department of Agriculture’s (USDA) The Emergency Food Assistance Program (TEFAP) and donations from nonprofit organizations, local businesses, and members within the community. The food items collected are often organized so each client can receive one of each food item they choose, or given to clients in pre-made boxes. Individuals are permitted to visit a food pantry only once over an allotted period of

time (e.g., 14 days). Thus, the food boxes provided are designated to supplement an individual's diet over that specific period (e.g., 14 days).

Many supplemental food programs have established nutrition standards in order to encourage a healthy diet. For example, a bill was passed in 2012 to enforce healthy options at school lunches<sup>6</sup>. Rules within the bill include: offer fruits daily at breakfast and lunch, offer vegetables daily at lunch and include specific vegetable subgroups weekly, offer whole-grains among others. Additionally, supplemental foods for those who apply to Women, Infants, and Children (WIC) benefits must adhere to certain nutritional requirements. Some of the foods they provide are: whole wheat bread and whole grains, yogurt, peanut butter, eggs, fruits and vegetables etc. When supplemental food is regulated to follow established nutritional guidelines, the clients are able to receive nutritionally dense and healthy foods. Food pantries, however, are largely unregulated, due to how the food items are obtained and the unpredictability of available foods. Nutritional quality is often poor due to many energy-dense, low-nutrient food options available<sup>7</sup>. Therefore, pantries may not present a nutritionally adequate diet because they are solely reliant on what is donated and supplemented by the government emergency food supply, which itself can be seasonally dependent. This thesis aimed to examine the healthfulness of the food pantry environment and nutritional quality of foods available to college students at three local food pantries.

## **Methods**

### **Setting**

This research took place at three food pantries in a rural northwest county of North Carolina during April 2018. Inhabitants of the county totaled 55,121 people in 2017. According to the U.S. Census Bureau<sup>8</sup>, 94.9% of the county residents are white, with 24.3% of all residents

living in poverty. Further, a North Carolina public university with 18,811 students<sup>9</sup> is located within the county. The three food pantries were selected based on their proximity and accessibility to college students. One pantry was located on campus, while the other two were accessible by bus. Off-campus pantries which were not supported with governmental funds were excluded. Due to the observational nature of the study, no IRB was required.

### Food Pantry Measures

To analyze the healthfulness of the local food pantry environment, the Healthy Food Pantry Assessment Tool (HFPAT) was used. The HFPAT, is a validated observational survey tool created and piloted by Regional Nutrition Education and Obesity Prevention Centers of Excellence (RNECE) at Washington State University Extension, used to measure the food pantry environment as it compares to best practices in food assistance agencies. The tool provides a numeric score on a scale of 0-100. The closer to 100, the more aligned the pantry and its environment is to current healthy best practices found in research literature and in-depth interview results<sup>10</sup>. This tool has five sections pertaining to pantry location and entrance, food available to clients, policies of the food pantry, frozen, chilled, dry storage, and food safety, and services for clients. Per the tool, food available to clients is broken into subcategories: food distribution to clients, fresh fruits and vegetables, frozen fruits, vegetables, and fresh/frozen lean protein, canned fruits, vegetables and lean protein, and low fat dairy, eggs, and grains. For scoring, 0, 1, 2, or 3 points were given to the pantry depending on the answer to the questions in the tool. For example, the answers could range from “none available” (0 points) to “wide variety, 7+ types” (3 points). The points are then tallied for a final assessment score.

The HFPAT was completed at each pantry site during the same two week period. To complete the HFPAT, the food pantry directors, employees, and volunteers were asked a few questions and a tour was given of the pantry. Scores were added up after all survey questions were completed.

### Nutritional Measures

All pantry food items were categorized into ten different food groups to further compare the quality of food given at the pantries. These groups were: dairy, grain products, fruits, vegetables, meats, plant-based proteins, dessert items, snacks, ready-prepared, and cooking ingredients. Pictures of pantry food items were taken and recorded into an Excel spreadsheet. When pictures were taken of the food in the pantry, the pictures included the brand, the size, and the specific name of each food available to clients for pick-up. Then photos of the food items were used to estimate the number of each item available at the time of observation and were categorized as: 0-5, 6-10, 11-20, 21 or more. For example, more than 21 cans of green beans were available at the pantry during the observation, and was therefore categorized as 21 or more. Food items were judged on intent in cooking versus nutritional quality. For example, chicken noodle soup was categorized as a ready-prepared item rather than a meat item. The amount of each food was estimated allowing for a percentage of what types of food the pantry offered and how much.

To analyze the food pantry items for nutritional content, the maximum number of food items that could be collected in a 14-day period were recorded and nutrient content analyzed for macro and micronutrients, total calories, total fat, saturated fat, trans fat, fiber, total sugar, protein, vitamin A, vitamin C, vitamin D, folate, sodium, potassium, iron, and calcium by Esha Food Processor system (version 10.12). The 14-day period was selected based on the time period

that must elapse before a pantry can be revisited. The specific nutrients were chosen because they are commonly under-consumed and/or they are required to be listed on nutrition facts food labels. All nutrients were compared with dietary reference intake recommendations for a moderately active male aged 20 yr.

### Data Analysis

The data was analyzed by descriptive statistics, and nutrient content was calculated and compared using Excel spreadsheets. Pie-charts and tables were created to give a visual representation of the proportions of food groups offered and the nutrients provided in the food boxes. The food pantries were assessed on their availability and variety of foods that clients could receive. The final scores from the HFPAT were used to compare the food pantries and how healthy they are to a “perfect” food pantry (score of 100).

## **Results**

### Food Pantry Environment

Using HFPAT the three pantries were scored on how healthy they are to their clients. Most food pantries score 35-65 on a scale of 0-100. Based on one visit to the food pantries, pantry 1 scored 39, pantry 2 scored 59, and pantry 3 scored 60. All three fall right within the average scores food pantries receive.



**Table 1. Percentage of Food Groups per Food Box per Food Pantry**

<b>Food Groups</b>	<b>Pantry 1 (%)</b>	<b>Pantry 2 (%)</b>	<b>Pantry 3 (%)</b>
Fruit	0.7	10.8	0.3
Vegetable	37.5	18.5	23.0
Grain	13.0	6.9	13.9
Plant-Based Protein	5.5	3.4	5.6
Meat	0	1.5	21.5
Dairy	0	4.8	0.3
Snack	0	10.5	1.2
Ready-Prepared	24.1	22.5	14.2
Dessert	0	17.7	11.8
Cooking Ingredient	18.6	3.4	8.3

Note: Calculations were based upon varieties of food items. Estimations for each food item were made in ranges: 0-5, 6-10, 11-20, 21 or more.

In total, 159 number of foods were analyzed, 62 items from pantry 1 (39%), 49 items from pantry 2 (31%), and 48 items from pantry 3 (30%). Pantry 1 had greatest percentage of ready-prepared items (24.1%) and offered the most vegetables (37.5%) (Table 1). Ready-prepared items include foods like Spaghettios, Chef Boyardee, Top Ramen, and other high carbohydrate, easy meals. Food pantry 2's food box was 18.5% vegetables, provided by its own garden, local farmers, or grocery stores. Another 22.5% of food provided was ready-prepared items (Table 1). Food pantry 3's food box incorporated 11.8% of desserts and 21.5% meat (Table 1).

The most commonly documented food group between the three pantries were vegetables, mostly seen as canned vegetable products, such as corn, green beans, and sweet peas. Even with such a high amount of vegetables available at the food pantries, on average, the food pantries would only meet about 30% of the recommended vegetable intake per day according to USDA

guidelines (Table 2). The least commonly documented food group were dairy products, mostly seen as dried milk. Overall, the pantries met about 4% of the recommended dairy consumption per day per food box (Table 2).

**Table 2. Food Content as Percent Recommendation per Person per Day per Food Box**

<b>Food Groups</b>	<b>Pantry Content (mean +/- SD)</b>	<b>Food Recommendations</b>	<b>% of Recommendation available (mean +/- SD)</b>
Fruit	0.19 +/- 0.15	2 cups	9.52 +/- 7.43
Vegetable	0.88 +/- 0.25	3 cups	29.37 +/- 8.36
Grain	0.38 +/- 0.25	8 ounce equivalents	4.76 +/- 3.14
Plant-Based Protein	0.26 +/- 0.27		
Meat	0.21 +/- 0.19	6.5 ounce equivalents	7.33 +/- 7.07
Dairy	0.12 +/- 0.15	3 cups	3.97 +/- 4.96
Snack	0.19 +/- 0.11		
Ready-Prepared	0.81 +/- 0.49		
Dessert	0.40 +/- 0.30		
Cooking Ingredient	0.36 +/- 0.29		

Food Recommendations based upon current USDA food group guidelines.  
Total protein recommendations are listed under meat and include plant-based protein.

### Nutritional Profile of Food Pantry Items

When compared to nutritional needs for a 20 year old moderately active male, over a 14 day period, calories provided met only 38% of recommended needs (Table 3). Calcium, Potassium, Vitamin C, and Vitamin D did not reach 50% of the dietary reference intake. Saturated Fat, Protein, Folate, Sodium, and Iron all met recommended daily allowances for a diet. The average sugar was almost double what is recommended 220%, and the trans fats were three times 342% what is recommended (Table 3).

**Table 3. Nutrients per Pantry Compared to Dietary Recommendations**

<b>Nutrients</b>	<b>Pantry 1 (n = 62)</b>	<b>Pantry 2 (n = 49)</b>	<b>Pantry 3 (n = 48)</b>	<b>Mean</b>	<b>Recommended DRIs</b>	<b>% Recommendation</b>
Calories (kcal)	1090.12	1329.63	775.41	1065.05	2800	38.04
Total Fat (g)	17.44	41.05	15.32	24.6	120	15.55
Saturated Fat (g)	5.18	16.81	4.43	8.81	40	5.39
Trans Fat (g)	1.23	6.73	2.32	3.43	0	342
Fiber (g)	21.65	17.18	9.76	16.2	38	42.62
Sugar (g)	46.56	67.75	51.06	55.12	25	220.49
Protein (g)	45.44	44.1	35.47	41.67	56	74.41
Vitamin A (mcg)	1645.59	1695.6	248.66	1196.62	900	132.96
Vitamin C (mg)	21.4	38.3	13.64	24.45	90	27.17
Vitamin D (IU)	25.98	52.93	16.99	31.97	600	5.33
Folate (mcg)	405.41	373.25	178.59	319.08	400	79.77
Sodium (mg)	2296.91	2242.38	1345.34	1961.54	2300	85.28
Potassium (mg)	1432.99	1721.9	918.63	1357.84	4700	28.89
Iron (mg)	14.82	10.28	6.71	10.6	8	132.54
Calcium (mg)	383.58	399.35	369.85	384.26	1000	37.43

Recommendations are based upon a 20 year old, moderately active male.  
DRIs (Dietary Reference Intakes)

### **Discussion**

The environments of all three food pantries fall within the average range. They scored 39, 59, and 60 for food pantries 1, 2, and 3, respectively. These scores show that the food pantries can all improve upon different aspects of the pantry. Pantry 1 and 2 both scored the lowest on the availability of fresh and frozen fruits and vegetables and education for patrons. Pantry 3 scored the lowest on frozen fruits and vegetables, policies at the pantry (i.e. documented nutritional

guidelines) and education for the patrons. These issues are due to the amount of resources and space the food pantry has available for storage.

In general, the food pantries available to college students did not provide sufficient nutrients to meet nutritional needs. While food pantries are intended as a supplemental food supply and not to meet 100% of a person's needs, research shows that low-income individuals often rely on supplemental programs for 100% of their food needs<sup>11</sup>. However, many college students are not eligible to participate in WIC or the Supplemental Nutrition Assistance Program (SNAP), meaning food pantries could potentially be their only source of supplemental food.

According to the Dietary Guidelines for Americans (DGA), two cups of fruit and two to three cups of vegetables per day are recommended for optimal health. However, findings from the current study demonstrate that it is not possible to meet the DGA recommendations solely from the food items available at a single pantry. Pantry 2 provided the largest percentage of fruits, but only at 10.8%, and pantry 1 provided the largest percentage of vegetables at 37.5% (Table 1). Fruits and vegetables are typically challenging food items for pantries to supply, especially fresh fruits and vegetables. Collecting and storing fruits and vegetables can be difficult because if it not canned or frozen, leading to much variance in amounts per day depending on the day they receive donations from the grocery stores or farmers markets. The most common vegetables provided were cans of corn, cut green beans, peas. With such availability, one would assume that clients would receive their recommended amount of vegetables in a day, but on the other side, they may be so available because they are often the last food a person would choose. Canned vegetables are easily donated as they are cheap for food drives, and they have a long shelf life, which allows pantries to have a large collection of them. A large fresh vegetable

supply is dependent on the season, and what was grown on the property or what was blemished and donated from the grocery store.

The total calories provided for 14 days was under estimated needs, 38% of recommended needs (Table 2). A consistent calorie deficit increases risk of bone fractures, infertility, developmental problems, a weakened immune system, malnutrition, increased surgical complications, anemia, and chronic fatigue<sup>5</sup>, which would have long term consequences at this young adult age.

While energy provided was under estimated needs, sugar was over-supplied, providing 220% of the recommended grams of sugar (Table 2). Over-consumption of sugar is a common dietary concern in this age group<sup>12</sup>, and this finding has implications for continuing adult over-consumption of added sugar, increasing risks of higher blood pressure, inflammation, weight gain, diabetes, and fatty liver disease which will increase your risk for heart disease<sup>13</sup>. Ready-made foods were a large contributor to the excess sugar provided. While these foods are convenient and easy to donate, they are typically not in line with DGA recommendations. Often seen with ready-made items are increased sodium, increased saturated fat, and a decreased micronutrient content.

Many micronutrients were undersupplied in the food pantry analysis, including calcium, vitamin D, vitamin C, and potassium. All of these nutrients, with the exception of vitamin C have been identified as nutrients of concern in the U.S., due to low consumption of foods which are good sources such as dairy, fruits and vegetables<sup>14</sup>. Pantries are often not reflective of a nutritionally adequate diet because they are solely reliant on what is donated and supplemented by the government emergency food supply, which often times is seasonally dependent.

Calcium and Vitamin D are found mostly in dairy products and fortified foods, and were undersupplied by the food pantries. Since food pantries often receive donations from grocery stores from their expired and seasonal products, they do not receive much or any dairy products. If the pantry is dependent upon donations from the community, there is often no refrigeration storage, therefore little to no donations of dairy products.

The Dietary Guidelines recommends 38 grams of fiber per day for men. The average amount of fiber one could receive from these three food pantries is 16.2 grams of fiber per day which is about 42% of daily needs. Fiber is a nutrient of concern because it is under consumed in the U.S. causing problems associated with increased weight, high or spiking blood sugar, and gut health. The types of foods being distributed by food pantries are falling into typical American diet low in fiber. This issue can be resolved with an increase of fruits, vegetables, and whole grains in the diet.

### **Limitations**

The time span and season over which data were collected were limited. Visitation to the food pantries occurred once, during the months of March and April. The change in food availability during different times of the day, months, and season was not accounted for, making these numbers not a true average of what the food pantries offer on a typical day. This is especially true for the summer months when the food pantries receive many fresh fruits and vegetables from farmers at the farmer's market.

To make the data comparable, we had to assume that the food pantry patrons would be taking one of each item available to them at the single food pantry, and that the food pantry would not allow them to return for 14 days. We analyzed the food available to meet the needs of a 20 year-old moderately active male, assuming that the average college student walks between

classes and has limited access to transportation. There is a chance that the clients who are food-insecure go to multiple or all food pantries that are available to them, or go more than once in the 14-day period. This would change the calories and nutrients that person would receive.

Despite the limitations, this study provides valuable information on the nutritional quality of the food at the food pantries and the physical quality of the food pantry available to college students in the rural Appalachian area. The growing need of a bachelor's degree and increasing cost of college creates an increasing need for supplemental food programs for this age group.

### **Conclusion**

Overall, the patrons who rely on food pantries for their sole source of food are not receiving a healthy diet. The diet is deficient in many micronutrients and providing too much sugar. There should be more emphasis on food insecurity among college students and their dietary intake from relief programs.

This information can be used to improve the healthfulness of these food pantries. This could be informing the public on what to donate during food drives, emphasizing unsweetened canned, or fresh fruits and vegetables, plant-based proteins, and whole-grains. The food pantry could collaborate with nutrition professionals to assist in budgeting their money to buy healthier food options that encompass every food group. Also more education resources could be provided to the food pantry clients to address what healthy foods can be chosen at that food pantry.

The food pantries would benefit from policy change at the federal level. The emergency food supply that is given to the food pantries from TEFAP does not meet the food groups and plays a significant role in the high sugar, high carbohydrate diet provided to the food pantry patrons.

To move this research further, a few questions should be answered. The nutritional analysis should be completed for a female, and for college students with a different activity level. The next research should also measure the actual amount of food gathered by the food pantry patrons, how often they go, and how much they rely on this as their sole food would lead to more accurate results. Also, looking deeper into exactly how these food pantries can educate the donators on what to give and which method is best received. All of this information can allow researchers, donators, and food pantry managers or workers better understand how to effectively provide clients with nutritionally adequate food when food insecure.



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