College Students' Feasibility and Acceptability of a Culinary Medicine and Wellness Class and Food Security and Eating Behaviors at a Minority Serving Institution: A Pilot Study

Zainab Alonge , Joshua Simpkins , Claire A Spears , Alexander Kirpich , Jessica Todd , Nida I Shaikh *

Posted Date: 19 May 2025

doi: 10.20944/preprints202505.1368.v1

Keywords: culinary medicine; feasibility; acceptability; food security; mental health; academic performance; college students

 doi:10.20944/preprints202505.1368.v1

Article

College Students' Feasibility and Acceptability of a Culinary Medicine and Wellness Class and Food Security and Eating Behaviors at a Minority Serving Institution: A Pilot Study

Zainab Alonge [1], Josh Simpkins [2], Claire A. Spears [3], Alexander Kirpich [4], Jessica Todd [5] and Nida I. Shaikh [5,*]

[1] Department of Nutrition, Byrdine Lewis College of Nursing and Health Professions, Georgia State University, Atlanta, GA 30303, USA
[2] Office of Institutional Research, Georgia State University, Atlanta, GA 30303, USA
[3] Department of Health Policy and Behavioral Sciences, School of Public Health, Georgia State University, Atlanta, GA 30303, USA
[4] Department of Population Health Sciences, School of Public Health, Georgia State University, Atlanta, GA 30303, USA
[5] Department of Nutrition, Byrdine Lewis College of Nursing and Health Professions, Georgia State University, Atlanta, GA 30303, USA
* Correspondence: nshaikh2@gsu.edu

Abstract: Objective: To assess the feasibility and acceptability of a Culinary Medicine and Wellness (CMW) class among undergraduate college students attending a U.S. Minority Serving Institution (MSI) and their food security and mental health status and eating behaviors. **Methods:** This pre and post intervention study was conducted at an MSI in the Southeaster U.S. College students enrolled in a 15-week, 3-credit CMW class received instruction on cooking and preparing healthy meals on a budget. The primary outcomes included the acceptability and feasibility of the CMW class, food security status, mental health status and fruit and vegetable intake. Program evaluation utilized thematic analysis and descriptive statistics and trend analyses of outcomes were performed. **Results:** Eleven students completed both surveys. The average age was 24 years, with 73% identifying as Black/African American. All participants were female and experienced low or very low food insecurity and most reported moderate stress levels. All students reported they would recommend the CMW class to others, with 73% rating it as excellent. Additionally, 82% felt they had learned valuable cooking and budgeting skills. **Conclusions**: The acceptability and feasibility of a CMW class among college students at a MSI suggests a promising approach to improve cooking skills, nutrition knowledge, fruit and vegetable intake, and reduce stress.

Keywords: culinary medicine; feasibility; acceptability; food security; mental health; academic performance; college students

1. Introduction

Culinary medicine courses in colleges are gaining popularity for empowering students to prepare nutritious meals on a budget[1] yet few studies have explored their feasibility and acceptability specifically among college students.[1–3] College students represented about 5% of the U.S. population in Fall 2023, totaling about 18.1 million individuals.[4] They often report a need for better food preparation skills, cooking self-efficacy, and time management.[5–7] Minority Serving Institutions (MSI) may play a crucial role in offering nutrition education opportunities to students, some that may also be experiencing food insecurity.[8] Nationwide, food insecurity is a growing concern with 48.6%

 doi:10.20944/preprints202505.1368.v1

undergraduate college students experiencing food insecurity in 2024.[9] Offering culinary medicine courses in MSI may offer an opportunity to improve food security among this population who is often disproportionately affected by limited access and affordability to healthy foods.[10,11]

Most studies that have examined the feasibility and acceptability of a culinary medicine program focused on specific groups such as medical students or individuals with specific health conditions.[1–3,12] One study found that a culinary medicine elective for medical students at Northwestern University improved their confidence in nutrition counselling, cooking skills and dietary behaviors with high feasibility and acceptability demonstrated through strong attendance and retention rates.[3] Another study among 23 gastroenterology fellows in University of California, Irvine found a tailored culinary medicine course useful for addressing nutrition-related Gastrointestinal disorders, though maintaining engagement throughout the program was a challenge.[2] A scoping review of 23 studies conducted in U.S. and one in Canada on culinary medicine in medical training highlighted improved nutritional knowledge, skills and confidence among participants, despite variations in delivery methods and inconsistent long-term follow-up.[1] Additionally, a pilot culinary medicine program in Australia involving eight adults with mild-moderate intellectual disabilities demonstrated high acceptability, engagement and preliminary improvements in diet quality and cooking confidence.[12]

Culinary medicine provides an educational platform that blends practical cooking skills with scientific insights into how nutrition and dietary patterns impact health[13,14] It has been shown to improve food security, alleviate stress, enhance culinary confidence,[15] improve food literacy, and increase the frequency of meal preparation among undergraduate students.[16] Culinary medicine classes on college campuses may also reduce perceived stress by equipping students with practical skills that promote healthier eating habits, which, in turn, may improve mental well-being and resilience.[15] Culinary medicine classes have been shown to not only enhance cooking skills but also lead to positive dietary changes, including increased fruit and vegetable intake, which are crucial for improving students' overall health and well-being.[17] Culinary medicine classes can potentially improve students' diet quality; some studies have found some inverse associations between dietary quality and levels of stress and depression[18–20] although others have found no significant association.[21–23] College students, a population known to experience time and logistical challenges with food preparation and often prioritize convenience and affordability over healthy options, may see the benefits of taking a culinary medicine class to extend improvements in mental health, food security status, and academic performance.

This study aimed to assess the feasibility and acceptability of a Culinary Medicine and Wellness Class among undergraduate college students attending a MSI in the U.S and their food security and mental health status and eating behaviors.

2. Materials and Methods

2.1. Study Sample and Recruitment

This was an exploratory pilot study with a pre-post design. All undergraduate college students enrolled in a 15-week 3-credit Culinary Medicine and Wellness (CMW) class at a large urban public university in the U.S. in Spring 2024 were invited to participate. The large urban public university, also considered a MSI, had 27,610 undergraduate students in Fall 2023.[24] The CMW class was initially developed in 2019 and taught every semester since. It uses a flipped classroom approach. Students are assigned lectures and activities to complete before coming weekly to teaching kitchen where they learn knife skills, cook and engage in discussions. The teaching kitchen has a capacity of accommodating a maximum of 19 students; each semester two-three sections are offered. In spring 2024, all 46 undergraduate students who were enrolled in the CMW class were invited to participate in the study. This study was conducted following approval from the University's Institutional Review Board under IRB number H22316. The university's Office of Institutional Research (OIR) sent recruitment emails with a link to a Qualtrics baseline survey to all students enrolled in the CMW class in spring 2024.

 doi:10.20944/preprints202505.1368.v1

2.2. Data Collection and Survey Instruments

Participants completed the pre-and post-surveys at the beginning and at the end of the semester. The first section of the survey asked for consent for both the baseline and endline surveys. The pre-CMW class assessment survey (baseline survey) was sent to students in the second week of the Spring 2024 semester and the post-CMW class assessment survey (endline survey) was sent to students within one week of the class completion in late April. Students' survey responses were linked with data on their academic performance (term and annual GPA), enrollment, and socio-demographic characteristics provided by the university's OIR. The surveys were developed using a compilation of validated tools from the literature and researcher-generated questions. The domains included program evaluation, food security status, mental health, eating and cooking behaviors, and fruit and vegetable intake. Mental health variables included stress, anxiety, depression, coping, and resilience.

Food security was measured using the United States Department of Agriculture (USDA) 10-item Food Security Module.[25] The 10-item Perceived Stress Scale (PSS) was used to measure the perceived stress of the participants.[26] The severity of anxiety was measured with the Generalized Anxiety Disorder tool (GAD-7).[27] Resilience was assessed with the Connor-Davidson Resilience Scale (CD-RISC) a 25-item tool, where higher summed scores reflect higher resilience.[28] Coping strategies were assessed using the Brief COPE Inventory; 28-items were categorized into three main categories including problem-focused, emotion-focused, and avoidant coping.[29] Depression risk was assessed using the Center for Epidemiologic Studies Depression (CES-D) Scale, a 20-item measure.[30]

A program evaluation was conducted at the endline of the study using researcher-generated questions to gather feedback from the participants on the feasibility and acceptability of the CMW class.

2.3. Data Analysis

De-identified survey data and institutional data were processed and analyzed using SAS (version 9.4). Descriptive analyses were conducted to summarize baseline participant characteristics as well as quantitative scores on baseline and endline mental health measures (e.g., CES-D, GAD-7, PSS), food security status, fruit and vegetable intake, academic performance (GPA) and program evaluations. Given the limited sample size and exploratory nature of the study, only descriptive statistics were computed while inferential statistical tests were not conducted. Qualitative data from open-ended program evaluation questions were analyzed in Excel. These responses were organized, coded, and examined for recurring themes and patterns.

3. Results

Of the 46 students invited to participate, 25 completed either the baseline or endline survey, and 11 of those also completed both surveys. The summary means were reported together with the standard deviations in parentheses. Table 1 shows the baseline demographic characteristics of the 11 participants who completed both the baseline and endline surveys. Overall, the average age was 24.1 (7.3), all participants were female, 72.7% identified as Black or African American, 27.3% were first-generation participants, 72.7% lived off-campus, 27.3% reported being single, 54.5% were Pell Grant eligible and none were enrolled in Supplemental Nutrition Assistance Program (SNAP). At baseline, mean GPA was 3.16 (0.7), with 45.5% participants' GPA in the 3.00-3.99 range. At endline, mean GPA was 3.30 (0.6), with 63.6% of participants in the 3.00-3.99 GPA range. Most participants received an A or A+ in their culinary medicine class (81.8%).

Table 1. Socio-demographic Characteristics and Academic Performance of College Students Attending a Culinary Medicine Class at a Public University in Southern U.S. (n=11).

Characteristics	N (%)
Age (years)	
Mean (SD)	24.1 (7.3)

 doi:10.20944/preprints202505.1368.v1

Gender	
Female	11 (100.0)
Race	
Black or African American	8 (72.7)
Asian	3 (27.3)
Ethnicity	
Not Hispanic or Latino	11 (100.0)
First generation	
Yes	3 (27.3)
No	8 (72.7)
Father's education Level	
High School	5 (45.5)
College Degree	4 (36.4)
Not Reported	2 (18.2)
Mother's education Level	
High School	4 (36.4)
College Degree	5 (45.5)
Not Reported	2 (18.2)
Marital status	
Single	3 (27.3)
Not reported	8 (72.7)
Pell Grant eligible	
Yes	6 (54.5)
No	5 (45.5)
Housing	
On Campus	3 (27.3)
Off Campus	8 (72.7)
Baseline GPA (all courses)	
2-2.99	4 (36.4)
3-3.99	5 (45.5)
>4	1 (9.1)
Missing	1 (9.1)
Mean (SD)	3.16 (0.7)
Endline GPA (all courses)	
2-2.99	3 (27.3)
3-3.99	7 (63.6)
>4	1 (9.1)
Mean (SD)	3.30 (0.6)
Culinary Medicine Class grade	
A+	8 (72.7)
A	1 (9.1)
B+	1 (9.1)
B	1 (9.1)
Total credit hours taken	
<20	1 (9.1)
20-50	0
50-100	4 (36.4)
100 – 120	6 (54.5)
Mean (SD)	89.90 (29.7)

Table 2 shows participants' endline ratings of the CMW class. All participants reported liking the class "a lot" and would "definitely recommend" the class to others. The majority (72.7%) rated the class quality as "excellent," with all others rating it "very good." Most of the participants (81.9%)

 doi:10.20944/preprints202505.1368.v1

either agreed or completely agreed that they learned how to cook and also learned how to cook on a budget. About 45.5% rated their knife skills as “excellent” while 54.5% rated them as “very good.” Confidence in practicing the learned skills varied; 54.5% reported that they were “extremely confident,” 18.2% were “very confident,” and 27.3% reported being “moderately confident.”

Table 2. Acceptability and Feasibility of a Culinary Medicine Class among College Students at a Public University in the Southern U.S. (n=11).

Characteristics	Endline N (%)
Liked class a lot	11 (100.0)
Class quality	
Excellent	8 (72.7)
Very Good	3 (27.3)
Learned how to cook	
Completely Agree	5 (45.5)
Agree	4 (36.4)
Disagree	2 (18.2)
Learned to cook on a budget	
Completely Agree	5 (45.5)
Agree	4 (36.4)
Neutral	1 (9.1)
Disagree	1 (9.1)
Knife skills rating	
Excellent	5 (45.5)
Very Good	6 (54.5)
Will recommend class	
Would Definitely	11 (100.0)
Will practice skills learned	
Extremely Confident	6 (54.5)
Very Confident	2 (18.2)
Moderately Confident	3 (27.3)

Based on the open-ended program evaluation questions, participants had a positive experience in the CMW class; responses reflecting overall contentment included broad statements of liking "Everything" and positive comments about the instructors, teaching assistants, and classmates in addition to the knowledge and skills learned. While the sample size was small, the majority of participants did not indicate any dislikes about the course. In particular, when asked about their recommendations to improve the class, most responded “none” or “N/A.”

Four main themes emerged from the qualitative responses. First, in theme one, many participants appreciated the opportunity to engage directly in cooking. They valued the hands-on experience of trying out new recipes and techniques. They highlighted their enjoyment of "hands-on cooking;" for example, one person said what participants liked best about the class was “the opportunity we were given to cook and grow in the classroom.” Second, participants appreciated the variety and nature of the recipes taught. Participants enjoyed learning new and diverse recipes, particularly those that were not typically “American”. The feedback emphasized the value of exploring "different and unique types of foods" and appreciating the "variety of recipes." One person explained, “I really liked being able to discover different and unique types of foods and being able to expand my palette.” The class had a notable impact on participants' perceived cooking skills and their ability to make healthy food choices. Third, student feedback highlighted their appreciation of learning healthy cooking habits that could be incorporated into everyday life. For example, one person said, “I liked learning how to healthify basic recipes.” Another explained, “I've learned to really examine what I eat and to make small changes daily to incorporate more nutritious choices, i.e., food swaps”. Many participants reported increased confidence in cooking, a greater

 doi:10.20944/preprints202505.1368.v1

understanding of nutrition, and a willingness to try new foods. Comments included, “Yes, I make more meals at home now,” and “This class benefited me because I learned new nutrition facts and tried new foods.” One participant noted that the class fostered a positive atmosphere that contributed to a sense of peace and happiness. Another student noted improvement in her ability to speak in public, she reported, "I am a very quiet person, but this class was a great space where I felt comfortable speaking." Fourth, participants provided suggestions to improve the class, which included expanding the variety of meals.

The few criticisms mentioned were related to the quality and practicality of some of the food items prepared, such as dissatisfaction with some of the foods prepared and concerns over food swaps. A student stated, “Some of the health swaps were not completely realistic like Greek yogurt as a ranch swap.” Another student recommended, "a wider variety of meals," while another asked for "more breakfast recommendations." Another suggestion was to "increase the cost per serving on the final project in relation to the rising cost of groceries, $3 per serving was limiting." The final project required participants to find a healthy recipe and prepare a dish, with the cost limited to no more than $3 per serving. Besides adjusting the budget for the final project dish, students suggested "more time for cooking".

Table 3 shows the quantitative results on pre-post food security and mental health (n = 11). At baseline, 81.8% of the participants reported low food security (score 3–5), and 18.2% reported very low food security (score 6–10), with a mean score of 5.72 (1.7). At endline, 72.7% of the participants reported low food security and 27.3% reported very low food security, with a mean score of 5.45 (0.9). About 27% of participants reported low stress at baseline (score 0–13), and 9.1% at endline. Participants reported 55% moderate stress (score 14–26) at baseline and 72.7% at endline. The mean perceived stress score was 19.27 at baseline and 17.54 at endline, indicating moderate stress at both time points. There was no change in resilience; 72.7% reported high resilience (score >25.5) both at baseline and endline. At baseline, the participants had a mean anxiety score of 7.73 (5.4), and 7.00 (5.4) at endline, indicating mild anxiety (score 5-9) at both time points. The proportion of participants experiencing minimal anxiety (score 0-4) trended up from 27.3% to 36.4%, while the proportion of participants experiencing moderate anxiety (score 10-14) showed a downward trend from 18.2% to 9.1%. For depression risk, 27.3% of participants were at risk for depression (score > 16) at baseline, with a mean of 17.67 (14.9). At baseline, a lower proportion of participants (18.2%) were at risk for depression, with a mean score of 17.00 (14.3). Participants relied more on problem-focused and emotion-focused coping strategies, with minimal change across both time points.

Table 3. Food Security Status and Mental Health Indicators of College Students Attending a Culinary Medicine Class at a Public University in Southern U.S (n=11).

Outcomes	Baseline N (%)	Endline N (%)
Food security		
Low food security (score 3 -5)	9 (81.8)	8 (72.7)
Very low food security (score 6 -10**)**	2 (18.2)	3 (27.3)
Mean (SD)	5.72 (1.7)	5.45 (0.9)
Perceived stress scale		
Low stress (score 0–13)	1 (9.1)	3 (27.3)
Moderate stress (score 14–26)	8 (72.7)	6 (54.5)
High stress (score 27–40)	2 (18.2)	2 (18.2)
Mean (SD)	19.27 (7.7)	17.54 (7.5)
Generalized anxiety disorder scale		
Minimal Anxiety (score 0-4)	3 (27.3)	4 (36.4)
Mild Anxiety (score 5-9)	5 (45.5)	5 (45.5)
Moderate Anxiety score (10-14)	2 (18.2)	1 (9.1)
Severe Anxiety (score >15)	1 (9.1)	1 (9.1)

 doi:10.20944/preprints202505.1368.v1

Mean (SD)	7.73 (5.4)	7.00 (5.4)
Connor-Davidson resilience scale		
High resilience (score >25.5)	8 (72.7)	8 (72.7)
Low resilience (score < 25.5)	3 (27.3)	3 (27.3)
Mean (SD)	32.72 (9.7)	33.30 (9.9)
Center for epidemiologic studies depression scale		
Low Depression risk (score <16)	8 (72.7)	9 (81.8)
At Risk for Depression (score >16)	3 (27.3)	2 (18.2)
Mean (SD)	17.67 (14.9)	17.00 (14.3)
Coping orientation to problems experienced inventory [Mean (SD)]		
Problem Focused Coping (score 1-4)	2.58 (0.8)	2.54 (0.7)
Emotion Focused Coping (score 1-4)	2.23 (0.7)	2.31 (0.7)
Avoidant Coping (score 1-4)	1.75 (0.6)	1.74 (0.7)

Table 4 shows the results regarding fruit and vegetable consumption (n=11). At baseline, 54.5% of participants consumed 1-2 servings of any type of fruit per day, while 27.3% reported consuming 3-4 servings. By endline, participants consuming 1 - 2 servings of any type of fruit per day increased from 27.3% to 63.6%, while there was a decrease in number of participants consuming 3-4 servings of all types of fruits per day (from 27.3% at baseline to 18.2% at endline). There was an increase in the proportion of participants consuming fresh fruits 3-4 times per week from 27.3% to 45.5%. The consumption of canned fruit increased from 0.75 (0.8) to 0.95 (0.8) times a week but frozen fruit intake did not change. In terms of vegetable intake, the proportion of participants that consumed 3-4 servings of any type of vegetable per day increased from 36.4% at baseline to 72.7% at endline. In addition, the proportion of participants that consumed fresh vegetables daily decreased from 27.3% to 9.1%. On the other hand, the proportion of participants who consumed fresh vegetables 1-2 times per week increased from 18.2% to 45.5%. The frequency of canned vegetable consumption showed a slight decrease at endline compare to baseline, while there was no change in consumption of frozen vegetables during the study period.

Table 4. - Fruit and Vegetable Consumption among College Students Attending a Culinary Medicine Class at a Public University in Southern U.S. (n=11).

Outcomes	Baseline N (%)	Endline N (%)
Total fruit servings (serving/day)		
3-4 servings	3 (27.3)	2 (18.2)
1-2 servings	6 (54.5)	7 (63.6)
None	0	2 (18.2)
Missing	2 (18.2)	0
Fresh fruit consumption (times/week)		
Daily	2 (18.2)	1 (9.1)
3-4 times a week	3 (27.3)	5 (45.5)
1-2 times a week	5 (45.5)	4 (36.4)
Never	0	1 (9.1)
Missing	1 (9.1)	0
Mean (SD)	3.2 (2.2)	2.77 (1.9)
Canned fruit consumption (times/week)		

 doi:10.20944/preprints202505.1368.v1

1-2 times a week	5 (45.5)	7 (64)
Never	5 (45.5)	4 (36)
Missing	1 (9.1)	0
Mean (SD)	0.75 (0.8)	0.95(0.8)
Frozen fruit consumption (times/week)		
1-2 times a week	4 (36.4)	5 (45.5)
Never	5 (45.5)	6 (54.5)
Missing	2 (18.2)	0
Mean (SD)	0.67 (0.8)	0.68 (0.8)
Types of fruits consumed		
Apples	9 (81.8)	8 (72.7)
Bananas	6 (54.5)	5 (45.5)
Berries	8 (72.7)	10 (90.9)
Citrus fruits (oranges, lemons, etc.)	6 (54.5)	8 (72.7)
Other (grape, mango, pineapple)	1 (9.1)	2 (18)
Total vegetable servings (servings/day)		
3-4 servings	4 (36.4)	8 (72.7)
1-2 servings	5 (45.5)	3 (27.3)
Missing	2 (18.2)	0
Fresh vegetable consumption (times/week)		
Daily	3 (27.3)	1 (9.1)
3-4 times a week	4 (36.4)	4 (36.4)
1-2 times a week	3 (27.3)	5 (45.5)
Never	0	1 (9.1)
Missing	1 (9.1)	0
Mean (SD)	3.95 (2.2)	2.59 (1.9)
Canned vegetable consumption (times/week)		
3-4 times a week	3 (27.3)	2 (18.2)
1-2 times a week	3 (27.3)	5 (45.5)
Never	3 (27.3)	4 (36.4)
Missing	2 (18.2)	0
Mean (SD)	1.67 (1.5)	1.30 (1.3)
Frozen vegetable consumption (times/week)		
Daily	1 (9.1)	1 (9.1)
3-4 times a week	4 (36.4)	2 (18.2)
1-2 times a week	2 (18.2)	6 (54.5)
Never	3 (27.3)	2 (18.2)
Missing	1 (9.1)	0
Mean (SD)	4.15 (4.7)	4.72 (5.1)
Types of vegetables consumed		
Leafy greens (spinach, kale, lettuce)	9 (81.8)	9 (81.8)
Cruciferous vegetables (broccoli, cauliflower)	9 (81.8)	9 (81.8)
Root vegetables (carrots, potatoes)	9 (81.8)	9 (81.8)
Bell peppers	4 (36.4)	9 (81.8)
Other (brussels, asparagus)	1 (9.1)	0

Table 5 shows the pre-post eating, cooking and food purchasing behaviors of participants (n=11). Most meals were eaten at home, increasing from 72.7% at baseline to 90.9% at endline. Participants

 doi:10.20944/preprints202505.1368.v1

reportedly ate an average of 2.2 (0.8) meals per day at baseline and 2.1 (0.6) meals per day at endline. By endline, the percentage of participants consuming two meals had increased to 63.6%, with those consuming three meals falling to 27.3%. Participants took an average of 1.9 (0.9) snacks per day at baseline and 1.82 (0.8) snacks per day at endline. The most commonly skipped meal by the participants during both baseline and endline was breakfast. Average daily meal-skipping frequency decreased from 45.5% at baseline to 36.4% at endline. There was a shift in the type of cooking method commonly used; the proportion of participants that used stove-top cooking experienced an upward trend from 81.9% at baseline to 100.0% at endline. There was an increase in the proportion of participants using baking as a means of food preparation, from 36.4% at baseline to 72.7% at endline. As far as food purchasing behavior was concerned, all participants purchased food items from grocery stores. Food pantries were barely used; the proportion of participants who had never visited a food pantry increased from 63.4% at baseline to 81.8% at endline.

Table 5. Eating, Cooking and Food Purchase Behaviors of College Students Attending a Culinary Medicine Class at a Public University in Southern U.S (n=11).

Characteristics	Baseline N (%)	Endline N (%)
Number of meals per day		
1	2 (18.2)	1 (9.1)
2	4 (36.4)	7 (63.6)
3	4 (36.4)	3 (27.3)
Missing	1 (9.1)	0
Mean (SD)	2.2 (0.8)	2.18 (0.6)
Number of snacks per day		
1	4 (46.4)	5 (45.5)
2	4 (36.4)	3 (27.3)
3	1 (9.1)	3 (27.3)
≥4	1 (9.1)	0
Missing	1 (9.1)	0
Mean (SD)	1.9 (0.9)	1.82 (0.8)
Meals skipped frequency		
Daily	5 (45.5)	4 (36.4)
Weekly	2 (27.3)	2 (18.2)
Bi-weekly	1 (9.6)	3 (27.3)
Rarely	2 (18.2)	2 (18.2)
Missing	1 (9.1)	0 (0.0)
Meal skipped most often		
Breakfast	5 (45.5)	6 (54.5)
Lunch	4 (36.4)	5 (45.5)
Dinner	1 (9.1)	0
Missing	1 (9.1)	0
Where meals are eaten (pick all that apply)		
Home	8 (72.7)	10 (90.9)
Off-campus restaurants	1 (9.1)	2 (18.2)
Dining hall	1 (9.1)	1 (9.1)
On-campus retail locations	1 (9.1)	1 (9,1)
Cooking method (pick all that apply)		
Stove-top cooking		
Micro-wave cooking	9 (81.9)	11(100.0)

 doi:10.20944/preprints202505.1368.v1

Micro-wave (heat and eat)	6 (54.5)	4 (36.4)
Bake	5 (45.5)	6 (54.5)
No cooking required (e.g. toss salads, sandwiches)	4 (36.4)	8 (72.7)
Air fryer	4 (36.4)	6 (54.5)
	1 (9.1)	1 (9.1)
Receive SNAP		
Yes	0	0
No	10 (90.9)	11 (100)
Missing	1 (9.1)	0
Location where food is purchased		
Grocery Store	10 (90.9)	11 (100.0)
Missing	1 (9.1)	0
Frequency of receiving food from a food giveaway		
Rarely	1 (9.1)	1 (9.1)
Never	9 (81.8)	10 (90.9)
Missing	1 (9.1)	0
Food pantry visit frequency		
Bi-weekly	1 (9.1)	1 (9.1)
Monthly	0	1 (9.1)
Rarely	2 (18.2)	0
Never	7 (63.6)	9 (81.8)
Missing	2 (18.2)	0
Received formal training in knife skills or culinary arts		
Yes	3 (27.3)	8 (72.7)
No	6 (54.5)	2 (18.2)
Missing	1 (9.1)	1 (9.1)
Use of knife confidence rating		
High confidence	2 (18.2)	4 (36.4)
Very confident	5 (45.5)	5 (45.5)
Moderate confidence	3 (27.3)	2 (18.2)
Missing	1 (9.1)	0

*SNAP – Supplemental Nutrition Assistance Program.

4. Discussion

Overall, undergraduate students attending a culinary medicine class at a large, public, Minority Serving Institution in the U.S. provided positive feedback that included the class taught them several skills such as learning not only how to cook and knife skills but also to cook on a budget. Students reported they would practice what they had learned in the class. A high level of satisfaction was expressed by students both for the class and for the skills learned. Students expressed they were better equipped to prepare healthy recipes, consistent with the findings of a study involving 84 health professional students taking an 8-week culinary medicine class at the University of Utah where they reported significant improvements in their ability to prepare healthy meals.[31] Many students in our study also highlighted that they had learned to cook on a budget, which is crucial since financial and time constraints are known barriers to healthy eating among students and also lead to less frequent cooking among students experiencing food insecurity.[7] The strong confidence expressed in applying their new cooking skills, further puts into perspective how the class has the ability to empower students to make sustainable changes.

In addition to examining the feasibility and acceptability of the culinary medicine class among college students, we evaluated college students' food security, mental health, academic performance,

 doi:10.20944/preprints202505.1368.v1

fruit and vegetable intake, and eating behaviors. All 11 participants were experiencing either low or very low food security. Among a convenience sample of 400 students at the same university where the study was conducted, 59% were experiencing food insecurity.[32] However, even though all participants in our pilot study were experiencing food insecurity, only 55% were eligible to receive a Federal Pell Grant and none reported being enrolled in SNAP or using food pantries and food giveaways. The SNAP benefits are designed to help low-income households pay for food, but students must meet additional criteria, to qualify, such as working at least 20 hours a week at a paid job.[33] While beyond the scope of this study, institutions could focus on understanding college students' awareness and barriers to utilization of SNAP as well as other food resources and assist those who meet the specific eligibility requirements in signing up for these programs.

Food insecurity has been found to be negatively associated with GPA among college students.[34–37] Our study showed an upward trend in overall GPA at the end of the CMW class (although we did not examine statistical significance given the small sample size). From the feedback students provided, this class may have indirectly helped maintain their academic performance by contributing to reduced stress levels and providing tangible learning skills related to cooking and budgeting. It is important to note the diversity of the class; students took this class at different points in the undergraduate journey and represented different majors including nutrition, computer science, nursing, psychology, film and media, which might have affected their experiences and academic outcomes. Although no previous research has investigated the impact of a culinary medicine class on GPA, this exploratory study fills an important gap by providing new information about the academic performance of a diverse undergraduate population, who were experiencing low or very low food security.

A majority of participants showed high resilience and low risk for depressive symptoms throughout the semester. In comparison, a study of 65 undergraduate students enrolled in a four-session cooking curriculum at two land grant institutions found an improvement in the number of days [13.7 (9.8) to 11.7 (9.5) days] the students were worried, tensed or anxious using CDC's Health Days Module. [38] Although our study used a different duration and different validated questionnaires to assess anxiety, we found a downward trend in mean GAD score from 7.7 (5.4) to 7.0 (5.4). Students' level of stress may relate to the struggle of juggling academic demands with financial food security and other challenges as documented in other studies as well.[39,40] A study of 1138 freshman students at a public metropolitan university found that students experiencing financial difficulties faced an increased level of stress using a four-question perceived stress questionnaire.[41] The mean stress score in our study experienced a downtrend from 19.3 (7.7) to 17.5 (7.5). This finding aligns with reduced perceived stress in a study among 171 undergraduates in a large public university in California who completed a culinary medicine class from 19.7 (5.9) pre-intervention to 18.1 (6.0) post-intervention.[15] One possible mechanism through which the culinary medicine class may have reduced the perceived stress may be through empowerment by providing practical cooking and nutrition knowledge, enabling students to make better dietary choices and foster a greater sense of control of their health. More research with larger samples is needed to examine changes over time and mediators and moderators of those changes.

Another key finding of this study is the small increase in the total vegetable servings eaten per day and the upward trend in frozen vegetable consumption per week among students after attending the CMW class. While there was no change in the intake of total fruit servings per day, fresh fruit and canned fruit consumption per week improved as students were now consuming them more times per week. This finding is consistent with the finding of a previous study of 171 undergraduates in a large public university enrolled in a nutrition course with a teaching kitchen lab that found self-efficacy scores for consuming fruits and vegetables improved from 31.1 (7.5) to 36.5 (6.9) for fruits and 31.3 (8.1) to 38.5 (7.0) for vegetables post-intervention.[17] Previous literature has also shown that food literacy and culinary skills interventions were positively associated with increased intake of nutrient-dense foods such as fruits, vegetables and whole grains among college students.[16,17] These results suggest the culinary medicine class equipped students with practical cooking skills and food

 doi:10.20944/preprints202505.1368.v1

literacy, enabling them to prepare and consume more nutrient-dense foods like vegetables and fruits, even within the time and access constraints typical of a college environment.

The study was not without limitations. First, this was a pilot pre-post exploratory study without a control group; as such we are not able to evaluate the effects of the intervention on study outcomes. However, program acceptability was high, and quantitative results suggest the intervention promotes the development of critical culinary skills. Next, the response rate was low. Out of 46 students enrolled in the CMW class in spring 2024, 25 students (54.3%) participated in either of the two surveys, but only 11 students completed both surveys. To improve response rates, future efforts could include collecting data over multiple semesters to have a larger sample size and offering incentives for participating in the study. This pilot study allowed for only one semester or 15 weeks of data collection, but one semester may have been a short period to capture changes in some of the outcomes including food security, mental health, and fruit and vegetable intake. As this was an exploratory pilot study, we did not have funding to offer incentives. Students were given extra credit for study participation. A second limitation was that the small sample size of 11 students allowed us to examine only the trends in the study outcomes. Even so, this pilot study is the first to provide insights to the feasibility and acceptability of a culinary medicine program at a MSI, and the assessments of multiple interrelated outcomes related to food security, mental health, and dietary habits suggest potential benefits of the course. Another limitation is the potential for response bias, particularly in the domains of mental health, fruit and vegetable intake, and eating behaviors, as participants may have underreported or overreported their experiences due to social desirability or other factors. Also, our pilot study was limited to undergraduate students. Graduate students were excluded from this study as the graduate portion of the program is open only to graduate nutrition students and has a different focus. Future work will evaluate the program's effectiveness and applicability for graduate students.

Despite the limitations this study had several strengths. We assessed the feasibility and acceptability of an established CMW class for undergraduate college students at a large public university also recognized as a MSI. This is particularly important because MSIs serve large proportions of students from racial and ethnic minoritized groups who are at increased risk of food insecurity, poor dietary quality, and health disparities.[10,11] We made of use an existing class that is available campus-wide each semester to all enrolled undergraduate students without students required to take any pre-requisites. The positive feedback from the students about the CMW class' ability to teach critical culinary skills and nutrition education and high course quality ratings could be used as drivers to scale this class up. To offer the benefits of completing a culinary medicine class to more students each semester, institutions including MSI, could consider investing in a larger teaching kitchen space and offering more sections of the class. Another strength was our use of validated measures of food security, anxiety, depressive symptoms, and coping strategies for the college student population.

5. Conclusions

Findings from this pilot study support the feasibility and acceptability of a culinary medicine class among undergraduate college students at a public MSI. Students provided strong ratings of the quality of the course and appreciated improving their cooking skills and food budgeting practices. Higher education institutions might consider the development of new or expansion of existing culinary medicine classes on college campuses to interactively teach students nutrition education and other valuable skills such as not only to cook but to cook on a budget in a teaching laboratory. This program could be scaled up at other MSI's and colleges to reach a wider and more diverse student population to improve food security and equip students with practical tools to enhance their food choices and dietary habits. Tangible skills learned in culinary medicine class could help students cope with and better manage their stress, while at the same time enhancing their capability to manage meal preparation and identify healthier food options. These skills would be especially valuable for low-income students experiencing food insecurity. Future studies should focus on the long-term

 doi:10.20944/preprints202505.1368.v1

impact of the culinary medicine class on the outcomes measured in the current study, consider including a control group, and expanding the eligibility criteria to include graduate students. **Author Contributions:** Conceptualization, Z.A., N.I.S., C.A.S. J.S.; Methodology, Z.A. N.I.S. and CAS; Software, Z.A., A.K. Formal Analysis, Z.A. J.S. A.K; Investigation, Z.A., N.I.S. J.S.; Resources, Z.A., N.I.S.; J.T. J.S.; Data Curation, Z.A. J.S., N.I.S.; Writing –Preparation, Z.A., N.I.S.; Writing – Review & Editing, Z.A., N.I.S. J.T. A.K., C.A.S. J.S.; Visualization, Z.A., N.I.S., Supervision, N.I.S.; Project Administration, Z.A., N.I.S.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of Georgia State University (IRB Number H24343, approved on 01/18/2024).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this article are will be made available by the authors on request.

Acknowledgements: The authors would like to thank the participants for their time.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Tan J, Atamanchuk L, Rao T, Sato K, Crowley J, Ball L. Exploring culinary medicine as a promising method of nutritional education in medical school: a scoping review. *BMC Med Educ*. 2022;22:441. https://doi.org/10.1186/s12909-022-03449-w
2. Lindsay KL, Kennedy J, Kim D, Kalra A, Parekh NK. Development of a Culinary Medicine Curriculum to Support Nutrition Knowledge for Gastroenterology Fellows and Faculty. *Nutrients*. 2024;16(3):404. https://doi.org/10.3390/nu16030404
3. Ring M, Cheung E, Mahadevan R, Folkens S, Edens N. Cooking Up Health: A Novel Culinary Medicine and Service Learning Elective for Health Professional Students. *J Altern Complement Med N Y N*. 2019;25(1):61-72. https://doi.org/10.1089/acm.2018.0313
4. Current Term Enrollment Estimates | National Student Clearinghouse Research Center. Accessed October 13, 2024. https://nscresearchcenter.org/current-term-enrollment-estimates/
5. Olfert MD, Hagedorn-Hatfield RL, Houghtaling B, et al. Struggling with the basics: food and housing insecurity among college students across twenty-two colleges and universities. *J Am Coll Health J ACH*. 2023;71(8):2518-2529. https://doi.org/10.1080/07448481.2021.1978456
6. Knol LL, Robb CA, McKinley EM, Wood M. Very Low Food Security Status is Related to Lower Cooking Self-Efficacy and Less Frequent Food Preparation Behaviors Among College Students. *J Nutr Educ Behav*. 2019;51(3):357-363. https://doi.org/10.1016/j.jneb.2018.10.009
7. Anderson A, Lazarus J, Anderson Steeves E. Navigating Hidden Hunger: An Exploratory Analysis of the Lived Experience of Food Insecurity among College Students. *Int J Environ Res Public Health*. 2022;19(19):12952. https://doi.org/10.3390/ijerph191912952
8. Nguyen MH. Minority-Serving Institutions and College Promise Programs: Supporting and Advancing the Success of Students of Color.
9. NCHA-IIIb_SPRING_2024_UNDERGRADUATE_REFERENCE_GROUP_EXECUTIVE_SUMMARY.pdf. Accessed October 14, 2024. https://www.acha.org/wp-content/uploads/NCHA-IIIb_SPRING_2024_UNDERGRADUATE_REFERENCE_GROUP_EXECUTIVE_SUMMARY.pdf
10. Freije SL, Lederer AM, Rose D, Chaparro MP. A Comparison of Food Insecurity Prevalence among Students Attending Minority Serving Versus Predominantly White Institutions in Pre, Earlier, and Later Phases of the COVID-19 Pandemic. *J Nutr*. 2024;154(10):3125-3132. https://doi.org/10.1016/j.tjnut.2024.06.009

 doi:10.20944/preprints202505.1368.v1

11. Begum J, Tettey NS. Are Minority Serving Institutions Contributing to Unhealthy Eating and Health Disparities Among College Students: A Pilot Study. *Int Educ Stud*. 2020;13(3):p1. https://doi.org/10.5539/ies.v13n3p1
12. Asher RC, Shrewsbury VA, Innes B, et al. Feasibility and acceptability of a culinary nutrition programme for adults with mild-to-moderate intellectual disability: FLIP Food and Lifestyle Information Programme. *J Appl Res Intellect Disabil JARID*. 2024;37(5):e13281. https://doi.org/10.1111/jar.13281
13. Irl B H, Evert A, Fleming A, et al. Culinary Medicine: Advancing a Framework for Healthier Eating to Improve Chronic Disease Management and Prevention. *Clin Ther*. 2019;41(10):2184-2198. https://doi.org/10.1016/j.clinthera.2019.08.009
14. La Puma J. What Is Culinary Medicine and What Does It Do? *Popul Health Manag*. 2016;19(1):1-3. https://doi.org/10.1089/pop.2015.0003
15. Matias SL, Rodriguez-Jordan J, McCoin M. Integrated Nutrition and Culinary Education in Response to Food Insecurity in a Public University. *Nutrients*. 2021;13(7):2304. https://doi.org/10.3390/nu13072304
16. Carr IJ, Cater MW, Tuuri G. A cooking intervention increased food literacy of students who frequently used the campus food pantry: A Pilot Program. *J Am Coll Health*. 2024;0(0):1-4. https://doi.org/10.1080/07448481.2024.2346339
17. Matias SL, Rodriguez-Jordan J, McCoin M. Evaluation of a College-Level Nutrition Course With a Teaching Kitchen Lab. *J Nutr Educ Behav*. 2021;53(9):787-792. https://doi.org/10.1016/j.jneb.2021.02.004
18. Quehl R, Haines J, Lewis SP, Buchholz AC. Food and Mood: Diet Quality is Inversely Associated with Depressive Symptoms in Female University Students. *Can J Diet Pract Res*. 2017;78(3):124-128. https://doi.org/10.3148/cjdpr-2017-007
19. Chacón-Cuberos R, Zurita-Ortega F, Olmedo-Moreno EM, Castro-Sánchez M. Relationship between Academic Stress, Physical Activity and Diet in University Students of Education. *Behav Sci*. 2019;9(6):59. https://doi.org/10.3390/bs9060059
20. Corezzi M, Bert F, Lo Moro G, Buda A, Gualano MR, Siliquini R. Mediterranean diet and mental health in university students: an Italian cross-sectional study. *Eur J Public Health*. 2020;30(Supplement_5):ckaa166.201. https://doi.org/10.1093/eurpub/ckaa166.201
21. Cena H, Porri D, De Giuseppe R, et al. How Healthy Are Health-Related Behaviors in University Students: The HOLISTic Study. *Nutrients*. 2021;13(2):675. https://doi.org/10.3390/nu13020675
22. Keck MM, Vivier H, Cassisi JE, et al. Examining the Role of Anxiety and Depression in Dietary Choices among College Students. *Nutrients*. 2020;12(7):2061. https://doi.org/10.3390/nu12072061
23. Fabian C, Pagan I, Rios JL, et al. Dietary patterns and their association with socio-demographic characteristics and perceived academic stress of college students in Puerto Rico. *P R Health Sci J*. 2013;32(1):36-44.
24. Georgia State University - Profile, Rankings and Data | US News Best Colleges. Accessed November 18, 2024. https://www.usnews.com/best-colleges/georgia-state-university-1574
25. Coleman-Jensen A, Nord M. U.S. Adult Food Security Survey Module.
26. Cohen S, Kamarck T, Mermelstein R. A Global Measure of Perceived Stress. *J Health Soc Behav*. 1983;24(4):385-396. https://doi.org/10.2307/2136404
27. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10):1092-1097. https://doi.org/10.1001/archinte.166.10.1092
28. Connor KM, Davidson JRT. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depress Anxiety*. 2003;18(2):76-82. https://doi.org/10.1002/da.10113
29. Coping Orientation to Problems Experienced Inventory (Brief-COPE). NovoPsych. March 1, 2021. Accessed August 15, 2024. https://novopsych.com.au/assessments/formulation/brief-cope/
30. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population - Lenore Sawyer Radloff, 1977. Accessed March 30, 2024. https://journals.sagepub.com/doi/10.1177/014662167700100306
31. Brennan BR, Beals KA, Burns RD, et al. Impact of Culinary Medicine Course on Confidence and Competence in Diet and Lifestyle Counseling, Interprofessional Communication, and Health Behaviors and Advocacy. *Nutrients*. 2023;15(19):4157. https://doi.org/10.3390/nu15194157

 doi:10.20944/preprints202505.1368.v1

32. Georgia Universities and Colleges Continue to See High Numbers of Food-Insecure Students - Georgia State University News - College of Nursing and Health Professions, Press Releases -. Georgia State News Hub. October 25, 2024. Accessed January 15, 2025. https://news.gsu.edu/2024/10/25/georgia-universities-and-colleges-continue-to-see-high-numbers-of-food-insecure-students/
33. Office USGA. Supplemental Nutrition Assistance Program: Estimated Eligibility and Receipt among Food Insecure College Students | U.S. GAO. August 15, 2024. Accessed October 4, 2024. https://www.gao.gov/products/gao-24-107074
34. Raskind IG, Haardörfer R, Berg CJ. Food insecurity, psychosocial health and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476-485. https://doi.org/10.1017/S1368980018003439
35. Loofbourrow BM, Scherr RE. Food Insecurity in Higher Education: A Contemporary Review of Impacts and Explorations of Solutions. *Int J Environ Res Public Health*. 2023;20(10):5884. https://doi.org/10.3390/ijerph20105884
36. Camelo K, Elliott M. Food Insecurity and Academic Achievement Among College Students at a Public University in the United States. *J Coll Stud Dev*. 2019;60(3):307-318.
37. Van Woerden I, Hruschka D. Food insecurity negatively impacts academic performance. *J Public Aff*. 2018;19:e1864. https://doi.org/10.1002/pa.1864
38. Barr-Porter M, Sullivan A, Watras E, Winn C, McNamara J. Community-Based Designed Pilot Cooking and Texting Intervention on Health-Related Quality of Life among College Students. *Int J Environ Res Public Health*. 2024;21(3):293. https://doi.org/10.3390/ijerph21030293
39. Meza A, Altman E, Martinez S, Leung CW. "It's a feeling that one is not worth food": a qualitative study exploring the psychosocial experience and academic consequences of food insecurity among college students. *J Acad Nutr Diet*. 2019;119(10):1713-1721.e1. https://doi.org/10.1016/j.jand.2018.09.006
40. French CD, Gomez-Lara A, Hee A, et al. Impact of a Food Skills Course with a Teaching Kitchen on Dietary and Cooking Self-Efficacy and Behaviors among College Students. *Nutrients*. 2024;16(5):585. https://doi.org/10.3390/nu16050585
41. Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *Int J Behav Nutr Phys Act*. 2018;15:9. https://doi.org/10.1186/s12966-018-0647-7