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An Analysis of the Effects of Demographic Characteristics on Nutrition Awareness of Fiber, Potassium, Vitamin D, and Nutrition Label Use Among College-Aged Young Adults

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ABSTRACT
Nutrition awareness is essential for promoting healthy dietary behaviors and reducing the risk of nutrition-related chronic diseases among young adults. This study examined the effects of demographic characteristics on nutrition awareness of dietary fiber, potassium, vitamin D, and nutrition label use among college-aged young adults enrolled in introductory biology courses at a Historically Black College and University (HBCU) in the southern United States. A quantitative cross-sectional research design was employed using a structured Nutrition Awareness Survey administered to 228 undergraduate students. Descriptive statistics were used to summarize participant characteristics, while Chi-square tests of independence examined the relationships between demographic variables and nutrition awareness outcomes at the 5% significance level. The findings indicated that most participants were younger than 20 years (85%), enrolled in biology for the first time (84%), and majoring outside Science, Technology, Engineering, and Mathematics (STEM) disciplines (78%). Again, the study revealed that awareness of dietary fiber, potassium, vitamin D, and nutrition label use was generally low across the sample. Also, the Chi-square analyses revealed that gender was significantly associated with nutrition label use, $\chi^2(12, N = 228) = 28.54$, $p = .005$, and race/ethnicity was also significantly associated with nutrition label use**,** $\chi^2(18, N = 228) = 33.92$, $p = .027$. However, no statistically significant associations were found between nutrition awareness and age, household size, annual work income, academic major, or first-time biology enrollment ($p > .05$). Similarly, awareness of dietary fiber, potassium, and vitamin D did not differ significantly across most demographic characteristics. These findings suggest that demographic factors have a limited influence on nutrition awareness among college-aged young adults, although gender and race/ethnicity significantly influence nutrition label use behaviors. The results underscore the need for targeted nutrition education interventions that improve nutrient awareness and food label literacy among diverse college populations.
Keywords: *nutrition awareness, dietary fiber, potassium, vitamin D, nutrition label use, demographic characteristics, college students, HBCU, Chi-square analysis, health promotion*
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INTRODUCTION

Nutrition awareness is a fundamental component of health promotion because it enables individuals to make informed dietary decisions that reduce the risk of obesity, cardiovascular disease, diabetes, osteoporosis, and other nutrition-related chronic illnesses (Agatston, 2011; Kickbusch, 2001). During late adolescence and early adulthood, dietary behaviors established in college often persist into adulthood, making the college years a critical period for promoting healthy eating habits (Crombie et al., 2009; Fedewa et al., 2014; Vella-Zarb & Elgar, 2009). Despite widespread public health campaigns encouraging healthy eating, numerous studies have reported that many college students possess limited nutrition knowledge and engage in unhealthy dietary behaviors characterized by low consumption of fruits, vegetables, whole grains, dietary fiber, and essential micronutrients (Greene et al., 2012; Kattelmann et al., 2014; Richards et al., 2006).

Poor nutrition awareness has been linked to misconceptions regarding the functions and health benefits of essential nutrients such as dietary fiber, potassium, and vitamin D. Individuals who lack adequate nutrition knowledge are less likely to consume balanced diets, more likely to misunderstand nutrition information, and less likely to utilize nutrition labels when making food choices (Dickson-Spillmann & Siegrist, 2011; Sharf et al., 2012). Nutrition labels remain one of the most accessible sources of nutrition information available to consumers; however, research suggests that many young adults experience difficulty interpreting nutrition facts panels and applying nutrition information to dietary decisions (Hawthorne et al., 2006; Ollberding et al., 2011; Sharf et al., 2012).

The prevalence of obesity among young adults further underscores the importance of improving nutrition awareness. National studies have consistently documented weight gain during the transition from high school to college, often attributed to unhealthy eating behaviors, limited nutrition literacy, increased consumption of processed foods, and reduced physical activity (Crombie et al., 2009; Deliens et al., 2013; Fedewa et al., 2014). These behaviors contribute to increased risks of hypertension, cardiovascular disease, type 2 diabetes, osteoporosis, and other chronic conditions that place substantial burdens on individuals and healthcare systems (Agatston, 2011; Finkelstein et al., 2009). Although previous studies have examined nutrition knowledge among college students, relatively few have investigated whether demographic characteristics influence awareness of specific nutrients such as dietary fiber, potassium, vitamin D, and nutrition label use among students attending Historically Black Colleges and Universities (HBCUs). Understanding these relationships is particularly important because demographic characteristics—including gender, race/ethnicity, age, socioeconomic status, and educational background—may shape dietary behaviors, access to nutrition information, and health literacy (Charlton et al., 2004; Resnicow & Braithwaite, 2001; Zoellner et al., 2009).

Accordingly, this study examined the effects of demographic characteristics on nutrition awareness of dietary fiber, potassium, vitamin D, and nutrition label use among college-aged young adults enrolled in introductory biology courses at a Historically Black College and University in the southern United States. Specifically, the study evaluated whether demographic characteristics were associated with nutrition awareness using Chi-square analyses. The findings contribute to the growing literature on nutrition literacy by identifying demographic factors associated with nutrition awareness and food label use and provide evidence to inform targeted nutrition education interventions designed to improve healthy dietary behaviors among college students.

LITERATURE REVIEW

Nutrition Awareness and Health Promotion

Nutrition awareness refers to an individual's understanding of the relationship between food consumption, nutrient intake, and health outcomes. Adequate nutrition knowledge enables individuals to make healthier dietary choices, whereas misconceptions frequently contribute to unhealthy eating behaviors and increased risks of chronic disease (Kickbusch, 2001; Dickson-Spillmann & Siegrist, 2011). Several studies have demonstrated that individuals with greater nutrition knowledge are more likely to consume fruits, vegetables, whole grains, and other nutrient-dense foods while limiting consumption of highly processed foods (Greene et al., 2012; Richards et al., 2006). Young adulthood represents an important developmental period during which lifelong dietary behaviors are established. Unfortunately, college students often experience significant lifestyle changes that negatively affect dietary quality, including increased independence, limited financial resources, academic stress, irregular meal patterns, and greater consumption of convenience foods (Crombie et al., 2009; Deliens et al., 2013; Fedewa et al., 2014). Consequently, improving nutrition awareness during this life stage represents an important public health strategy for reducing future disease risk.

Awareness of Dietary Fiber, Potassium, and Vitamin D

Dietary fiber, potassium, and vitamin D are among the nutrients identified as under-consumed by many Americans despite their well-established health benefits. Adequate dietary fiber intake contributes to gastrointestinal health, improved glycemic control, cholesterol reduction, and lower risks of cardiovascular disease (Ma & Chapman, 2009). Potassium plays an essential role in regulating blood pressure and maintaining cardiovascular and muscular function, whereas vitamin D supports calcium metabolism, bone mineralization, and immune function (Goldberg, 2003). Despite these benefits, research consistently demonstrates that many young adults possess limited knowledge regarding the health functions and dietary sources of these nutrients (Dickson-Spillmann & Siegrist, 2011; Charlton et al., 2004). Misunderstandings regarding nutrient requirements often result in dietary patterns characterized by inadequate consumption of fruits, vegetables, legumes, dairy products, and whole grains. These nutritional deficiencies increase susceptibility to obesity, hypertension, osteoporosis, and other chronic health conditions later in life (Agatston, 2011; Steelman & Westman, 2016).

Nutrition Label Use Among Young Adults

Nutrition labels provide consumers with standardized information regarding calories, serving sizes, nutrients, and ingredients, enabling healthier food choices. Nevertheless, numerous investigations have reported

that many consumers either misunderstand or rarely use nutrition labels when selecting foods (Hawthorne et al., 2006; Ollberding et al., 2011; Sharf et al., 2012). Among college-aged young adults, nutrition label use has been associated with healthier dietary behaviors, including greater consumption of fruits and vegetables and reduced intake of saturated fat and added sugars (Ollberding et al., 2011). However, several studies have found that many students possess insufficient food label literacy and are unable to correctly interpret serving sizes, nutrient percentages, and health claims (Sharf et al., 2012). These findings suggest that nutrition education programs should emphasize practical food label interpretation in addition to traditional nutrition instruction.

Demographic Characteristics and Nutrition Awareness

Previous research has reported inconsistent findings regarding the influence of demographic characteristics on nutrition awareness. Some studies suggest that women generally possess greater nutrition knowledge and are more likely to read food labels than men (Dickson-Spillmann & Siegrist, 2011; Ollberding et al., 2011). Similarly, socioeconomic status, educational attainment, and cultural background have been associated with differences in dietary behaviors and nutrition literacy (Charlton et al., 2004; Resnicow & Braithwaite, 2001). Other investigations, however, have reported relatively weak relationships between demographic characteristics and overall nutrition knowledge, suggesting that behavioral, educational, and environmental factors may exert greater influence than demographic characteristics alone (Zoellner et al., 2009). Furthermore, relatively few studies have specifically examined these relationships among students attending Historically Black Colleges and Universities, where student demographics differ substantially from those of predominantly White institutions.

Research Gap

Although previous investigations have examined nutrition knowledge, food label use, and dietary behaviors among college students, limited research has simultaneously evaluated awareness of dietary fiber, potassium, vitamin D, and nutrition label use across multiple demographic characteristics within an HBCU population. Existing studies have largely focused on general nutrition knowledge, obesity, or dietary behaviors rather than specific nutrient awareness among young adults. This study addresses this gap by examining whether gender, race/ethnicity, age, household size, annual work income, academic major, and first-time biology enrollment are associated with awareness of dietary fiber, potassium, vitamin D, and nutrition label use among college-aged young adults. The findings provide evidence that may assist educators and public health professionals in designing demographic-sensitive nutrition education interventions aimed at improving nutrition literacy and promoting healthier dietary behaviors among college students.

METHODOLOGY

Research Design

This study employed a quantitative cross-sectional research design to examine the relationship between selected demographic characteristics and nutrition awareness among college-aged young adults enrolled in introductory biology courses at a Historically Black College and University (HBCU) in the southern United States. A cross-sectional design was appropriate because the study sought to assess participants' nutrition awareness and demographic characteristics at a single point in time without manipulating any variables. The design allowed for the examination of associations between demographic factors and nutrition awareness related to dietary fiber, potassium, vitamin D, and nutrition label use. The study was guided by the premise that demographic characteristics may influence an individual's level of nutrition awareness and healthy dietary behaviors. Specifically, age, household size, student work income, gender, academic major, and first-time enrollment in biology were examined as potential predictors of nutrition awareness.

Study Setting and Participants

The study was conducted at a Historically Black College and University (HBCU) located in the southern United States. Participants consisted of undergraduate students enrolled in five sections of an introductory non-major general biology course during the Fall semester. These courses were selected because they satisfy general education requirements and enroll students from diverse academic disciplines, providing a representative sample of college-aged young adults.

The participating courses were taught by four full-time biology faculty members, including three Associate Professors and one Assistant Professor. Each course enrolled approximately 60 to 80 students. Students represented a variety of academic majors, including education, business, accounting, psychology, criminal justice, and other non-STEM disciplines. Participation in the study was voluntary. Students who were at least 18 years of age and enrolled in one of the participating introductory biology courses were eligible to participate. Students who declined participation or did not complete the survey were excluded from the final analysis.

Instrumentation

Data were collected using a structured Nutrition Awareness Survey administered electronically through the Qualtrics online survey platform. The survey instrument was adapted from a previously Institutional Review Board (IRB)-approved nutrition survey developed at the participating institution and was modified to address the objectives of the present study. The survey consisted of two sections. The first section assessed participants' nutrition awareness regarding four key nutrition concepts: Dietary fiber, Potassium, Vitamin D, and Nutrition label use. Survey items measured students' awareness of nutrient functions, dietary sources, health benefits, and frequency of using nutrition labels when making food purchasing decisions. The second section collected demographic information, including: Age, Household size, Student work income, Gender, Academic major, and First-time enrollment in an introductory biology course. The questionnaire was pilot tested prior to implementation to improve clarity and readability. Minor revisions were made based on participant feedback before the instrument was administered in the study.

Data Collection Procedures

Institutional Review Board approval was obtained before initiating the study. Permission to administer the survey was also obtained from the participating biology faculty members. During scheduled class meetings, students received information describing the purpose of the study and were invited to participate voluntarily. Participants completed an electronic informed consent form before accessing the online questionnaire. The Nutrition Awareness Survey was administered during class using Qualtrics and required approximately 15–20 minutes to complete. To ensure confidentiality, no personally identifiable information was collected. Survey responses were anonymous and stored securely in password-protected electronic files accessible only to the principal investigator.

Variables

Independent Variables: The independent variables consisted of six demographic characteristics: Age, Household size, Student work income, Gender, Academic major, and First-time enrollment in biology. These variables were selected because previous nutrition and health education research has suggested that demographic and socioeconomic characteristics may influence nutrition knowledge, dietary behaviors, and health literacy.

Dependent Variables: The dependent variables were participants' nutrition awareness regarding: Dietary fiber, Potassium, Vitamin D, and Nutrition label use. Nutrition awareness was measured using responses to survey items assessing knowledge of nutrient sources, health benefits, recommended intake, and nutrition label reading practices.

Data Analysis

Data were analyzed using IBM SPSS Statistics (Version 29). Prior to analysis, survey responses were screened for completeness, missing values, and coding accuracy. Descriptive statistics were computed to summarize participant characteristics and nutrition awareness variables. Frequencies, percentages, means, and standard deviations were used to describe the demographic profile of participants and overall levels of nutrition awareness. To address the research question, Chi-square tests of independence were conducted to determine whether statistically significant associations existed between demographic characteristics and nutrition awareness variables. Each demographic characteristic was analyzed separately against awareness of dietary fiber, potassium, vitamin D, and nutrition label use. When appropriate, Cramer's V was calculated to determine the strength of statistically significant associations. Statistical significance was established at an alpha level of .05.

Ethical Considerations

Approval for the study was obtained from the Institutional Review Board (IRB) of the participating institution before data collection commenced. Participation was entirely voluntary, and informed consent was obtained electronically from all participants prior to completing the survey. Participants were informed that they could withdraw from the study at any time without penalty. No identifying information was collected, and all survey responses remained confidential. Data were reported only in aggregate form to protect participant anonymity.

In summary, this study employed a quantitative cross-sectional design to examine whether demographic characteristics influence nutrition awareness among college-aged young adults enrolled in introductory biology courses at an HBCU. Using a structured online Nutrition Awareness Survey, the study evaluated awareness of dietary fiber, potassium, vitamin D, and nutrition label use while collecting demographic information related to age, household size, student work income, gender, academic major, and first-time biology enrollment. Descriptive statistics and Chi-square analyses were used to determine the extent to which demographic characteristics were associated with nutrition awareness. The methodological approach provides an evidence-based framework for identifying population groups that may benefit from targeted nutrition education interventions within higher education settings.

RESULTS AND DATA ANALYSIS

Table 1
Summary of Enrollment and Completion of the Nutrition Knowledge Survey

	Sections	Total Enrollment	Completed Pre-Test Survey	Completed Post-Test Survey	Completed Both Surveys
Treatment Groups	1	64	41	32	20
	2	63	43	40	28
	3	66	50	32	18
Control Groups	4	72	46	45	17
	5	66	48	40	28

Table 1 presents the enrollment and survey completion rates for students participating in the nutrition knowledge intervention across the treatment and control sections. A total of five course sections participated in the study, including three treatment sections and two control sections. Initial enrollment ranged from 63 to 72 students per section, indicating relatively comparable class sizes across all participating groups. Among the treatment sections, pre-test completion ranged from 41 to 50 students, while post-test completion ranged from 32 to 40 students. Similarly, the control sections reported pre-test completion rates between 46 and 48 students and post-test completion rates between 40 and 45 students.

The number of students completing both the pre-test and post-test surveys varied from 17 to 28 across the five sections, reflecting the expected participant attrition commonly observed in longitudinal educational studies. Although there was a modest decline in survey participation from pre-test to post-test, the completion patterns were relatively consistent across treatment and control groups, suggesting that participant attrition was evenly distributed and unlikely to introduce systematic bias between experimental conditions. Overall, the comparable enrollment and response rates provide a balanced foundation for subsequent analyses examining differences in nutrition knowledge and awareness between the intervention and comparison groups.

Table 2a.
Descriptive Statistics Demographics Frequency Distribution

Demographic Characteristics	Control/ Comparison group				Experimental Group					
	Pre		Post		Pre			Post		
Groups	4	5	4	5	1	2	3	1	2	3
Gender	n^1=43	n^1=46	n^1=45	n^1=37	n^1=41	n^1=50	n^1=48	n^1=32	n^1=40	n^1=32
Heterosexual Male	13	19	14	15	22	19	16	16	13	15
LGBT	1	1	2	1	4	2	1	3	2	2
Heterosexual Female	26	25	22	20	13	25	23	11	20	14
Prefer not to answer gender	3	1	7	1	2	4	8	2	5	1
Race/Ethnicity	n^1=43	n^1=46	n^1=45	n^1=37	n^1=41	n^1=50	n^1=48	n^1=32	n^1=40	n^1=32
African American/Black	39	42	37	33	39	43	46	29	36	28
Caucasian/White	1	2	3	3	1	1	0	1	2	0
Asian/Japanese/Chinese/Pacific Rim	0	1	2	0	0	2	0	0	0	1
Hispanic Mexican	0	0	0	0	1	0	0	0	0	0
Native American/American Indian	0	0	0	0	0	0	0	0	0	1
Prefer not to answer race	1	1	3	1	0	0	2	0	2	0
Other	2	0	0	0	0	4	0	2	0	2
Age	n^1=43	n^1=46	n^1=45	n^1=37	n^1=41	n^1=50	n^1=48	n^1=32	n^1=40	n^1=32
≤20	37	40	35	32	35	42	48	28	30	29
>20	6	6	10	5	6	8	0	3	10	2
Household Size	n^1=43	n^1=46	n^1=45	n^1=37	n^1=41	n^1=50	n^1=48	n^1=32	n^1=40	n^1=32
1-2	5	2	9	1	5	10	7	5	10	7
3-4	15	18	15	16	20	26	16	14	15	11
5-6	18	23	14	18	11	13	18	9	12	9
7-8	4	3	3	2	3	1	4	3	2	2
>8	1	0	4	0	2	0	3	1	0	3

n^1=number of respondents participating in the study.

Table 2a presents the demographic characteristics of participants in both the control (comparison) and experimental (treatment) groups during the pre-test and post-test surveys. Overall, the demographic distributions across the participating sections were relatively similar, indicating that the treatment and control groups were generally comparable prior to the implementation of the nutrition education intervention. Such baseline similarity strengthens the internal validity of the study by reducing the likelihood that demographic differences influenced the observed outcomes. With respect to gender, heterosexual females represented the largest proportion of respondents across most treatment and control sections, followed by heterosexual males. Only a small number of participants identified as LGBT or preferred not to disclose their gender. The relatively balanced gender composition between the treatment and control groups suggests that gender differences were unlikely to bias comparisons of nutrition knowledge or awareness following the intervention.

Regarding race and ethnicity, African American/Black students constituted the overwhelming majority of participants across all sections in both the pre-test and post-test surveys. For example, among the treatment sections, African American/Black participants accounted for between 39 and 46 students during the pre-test and between 28 and 36 students during the post-test. Similar patterns were observed in the control sections, where African American/Black students represented nearly all respondents. Participants identifying as Caucasian/White, Asian, Hispanic, Native American, or Other racial groups represented only a small proportion

of the study population. Consequently, the study sample reflects the demographic composition of the institution and provides a relatively homogeneous racial distribution across treatment conditions. The age distribution further demonstrates the similarity of the participating groups. Most respondents in both the treatment and control groups were younger than 20 years of age, with relatively few students older than 20 years. Overall, approximately 185 students (85%) participating in the pre-test survey were younger than 20 years, indicating that the study primarily involved traditional college-aged freshmen and sophomores enrolled in introductory biology courses.

Household size was also relatively consistent across the study groups. The largest proportion of respondents reported living in households consisting of three to four individuals, followed by households with five to six members. Fewer participants reported household sizes of one to two members, seven to eight members, or more than eight individuals. Specifically, approximately 81 respondents (37%) reported living in households of three to four persons, suggesting relatively similar family structures across the participating groups.

Additional descriptive characteristics indicate that 182 respondents (84%) were taking biology for the first time, while 168 participants (78%) were majoring outside the Science, Technology, Engineering, and Mathematics (STEM) disciplines. These findings suggest that the study population primarily consisted of non-science majors with limited prior exposure to college-level biology, making them an appropriate target population for evaluating the effectiveness of nutrition education interventions. Overall, Table 2a demonstrates that the treatment and control groups were comparable across major demographic characteristics, including gender, race/ethnicity, age, household size, biology enrollment status, and academic major. The absence of substantial demographic differences between the groups provides confidence that subsequent differences in nutrition awareness and knowledge are more likely attributable to the educational intervention rather than pre-existing participant characteristics.

Table 2b.
Descriptive Statistics Demographics Frequency Distribution (continued)

Demographic Characteristics	**Control/ Comparison group**				**Experimental Group**					
	Pre		Post		Pre			Post		
Work Income	n^1=4	n^1=3	n^1=4	n^1=3	n^1=4	n^1=5	n^1=4	n^1=3	n^1=4	n^1=3
<$15K	9	4	14	9	3	8	12	2	8	7
$15-%24,999K	3	6	3	4	4	3	5	3	1	5
$25-34,999K	3	3	2	1	4	4	4	1	1	2
$35-49K	3	4	2	3	2	4	2	0	3	3
$50-$74K	4	5	5	3	3	5	4	5	2	3
≥$75K	6	11	6	6	9	7	2	4	2	2
Prefer not to answer work income	15	13	13	11	16	19	19	17	23	10

n^1=number of respondents participating in the study.

Table 2b presents the distribution of participants' annual work income for both the treatment and control groups during the pre-test and post-test surveys. The results indicate considerable similarity in income distributions across all participating sections, further supporting the demographic comparability of the experimental and comparison groups. Across both treatment and control groups, a substantial proportion of respondents preferred not to disclose their annual work income, making this the largest response category in nearly every section. During the pre-test survey, approximately 86 respondents (40%) chose not to report their income, and this pattern remained relatively consistent during the post-test. This high level of nonresponse is

common among college student populations, many of whom may have limited personal income, part-time employment, or uncertainty regarding household earnings.

Among participants who reported their income, the largest proportion earned less than $15,000 annually, reflecting the financial circumstances typically associated with full-time college students. Smaller proportions of respondents reported annual incomes between $15,000 and $24,999**,** $25,000 and $34,999**,** $35,000 and $49,999, and $50,000 and $74,999. Relatively few participants reported annual incomes exceeding $75,000, and the frequency distributions remained generally consistent between the treatment and control groups. In summary, the similarity in annual work income distributions across the treatment and comparison groups indicates that socioeconomic differences were minimal between study participants. Consequently, household income is unlikely to represent a major confounding factor when interpreting subsequent differences in nutrition awareness and knowledge following the educational intervention.

Figure 1
Ethnicity Distribution for the Participating Groups

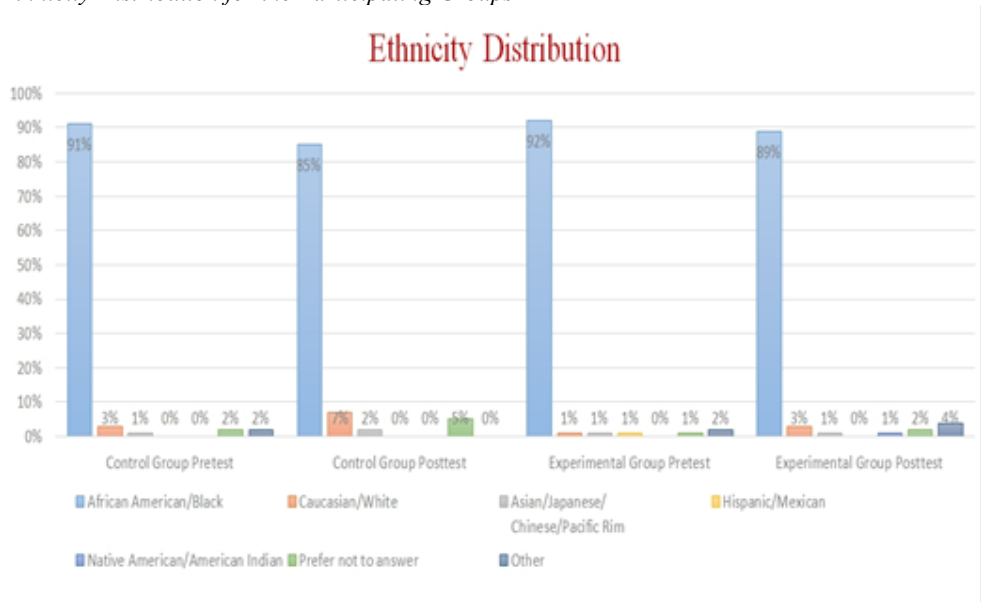

Figure 1 illustrates the racial and ethnic composition of students participating in both the treatment and control groups during the pre-test and post-test surveys. The figure demonstrates that African American/Black students constituted the overwhelming majority of participants across all study groups, representing approximately 95% of the treatment group during the pre-test and 91% during the post-test. Similarly, African American/Black students accounted for approximately 89% and 85% of the control group during the pre-test and post-test, respectively.

Participants identifying as White/Caucasian represented only a small proportion of the study population, while all remaining racial and ethnic categories accounted for very few respondents. The figure therefore illustrates a highly homogeneous study population with respect to race and ethnicity. The relatively consistent ethnic composition observed across treatment and control groups suggests that racial differences were unlikely to confound comparisons of nutrition awareness between the intervention and comparison groups. Consequently, any observed differences in nutrition knowledge are more likely attributable to the educational intervention rather than differences in participant ethnicity.

Table 3
Awareness of Health Problems Linked to Low Fiber Consumption

Groups	Class		Pretest				Post-Test		
		n[1] =	Yes	No	I don't know	n[1]=	Yes	No	I don't know
Treatment	1 (Sec 1)	41	12 (29%)	20 (49%)	9 (22%)	32	10 (31%)	16 (50%)	6 (19%)
	2 (Sec 3)	50	18 (36%)	22 (44%)	10 (20%)	40	14 (35%)	12 (30%)	14 (35%)
	3 (Sec 9)	48	12 (25%)	24 (50%)	12 (25%)	32	12 (38%)	10 (31%)	10 (31%)
	Total	139	42 (30%)	66 (47%)	31 (22%)	104	36 (35%)	38 (37%)	30 (29%)
Control	4 (Sec 2)	43	12 (28%)	17 (40%)	14 (33%)	45	14 (31%)	19 (42%)	12 (27%)
	5 (Sec 6)	46	20 (43%)	16 (35%)	10 (22%)	40	19 (48)	14 (35%)	7 (18%)
	Total	89	32 (36%)	33 (37%)	24 (27%)	85	33 (39%)	33 (39%)	19 (22%)

n[1]=number of respondents participating in the study.

Table 3 presents students' awareness of health problems associated with inadequate dietary fiber consumption before and after the nutrition education intervention. Prior to the intervention, awareness levels were generally low among both treatment and control groups. Within the treatment sections, only 30% of participants correctly identified health problems related to low fiber intake, whereas 47% reported that they were unaware of such health consequences and 22% indicated that they did not know. Similarly, among the control sections, only 36% answered correctly, while 37% reported no awareness and 27% selected "I don't know."

Following the intervention, awareness improved modestly among students in the treatment group. The percentage of correct responses increased from 30% to 35%, while the proportion reporting no awareness declined from 47% to 37%. Although the percentage of respondents selecting "I don't know" increased slightly, the overall trend suggests modest gains in nutrition knowledge among students exposed to the educational intervention. The control group exhibited only minimal changes between the pre-test and post-test, with correct responses increasing from 36% to 39% and the percentage reporting no awareness remaining essentially unchanged. These findings suggest that the educational intervention may have contributed to a slight improvement in students' understanding of the health consequences associated with inadequate dietary fiber intake, although substantial knowledge gaps remained among participants.

Figure 2.
Awareness of Health Problems Linked to Potassium Consumption

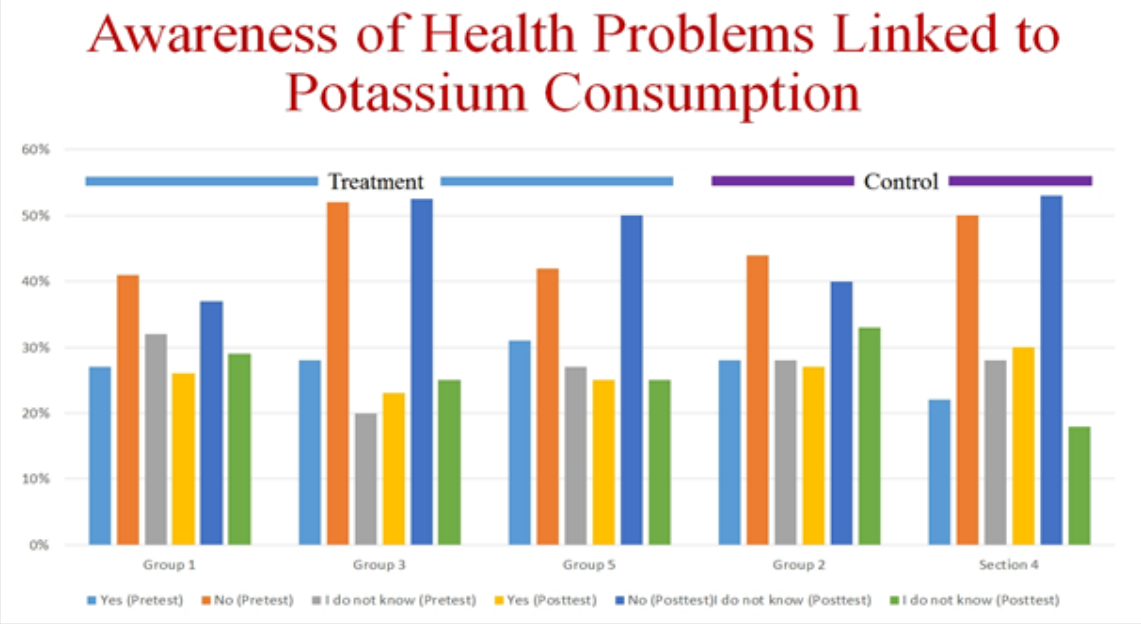

Figure 2 illustrates students' awareness of health problems associated with inadequate potassium consumption before and after the educational intervention. The figure demonstrates that limited awareness was common among both treatment and control groups during the pre-test, with nearly half of respondents reporting that they were unaware of the health consequences associated with potassium deficiency. Although modest improvements were observed following the intervention, substantial proportions of students continued to report limited knowledge regarding potassium-related health risks. The similarity between treatment and control groups indicates that improvements were relatively small, suggesting that additional instructional emphasis on potassium nutrition may be necessary to produce more substantial knowledge gains. Above all, Figure 2 highlights persistent deficiencies in students' understanding of potassium nutrition despite participation in the educational program.

Table 4
Awareness of Health Problems Linked to Vitamin D Consumption

		Pretest				Post-Test			
Groups	Class	n[1]	Yes	No	I don't know	n[1]	Yes	No	I don't know
Treatment	1 (Sec 1)	41	17 (41%)	19 (46%)	5 (12%)	32	12 (38%)	13 (41%)	7 (22%)
	2 (Sec 3)	50	19 (38%)	20 (40%)	11 (22%)	40	16 (40%)	14 (35%)	10 (25%)
	3 (Sec 9)	48	15 (31%)	21 (44%)	12 (25%)	32	7 (22%)	15 (47%)	10 (31%)
	Total	139	51 (37%)	60 (43%)	28 (20%)	102	35 (34%)	42 (41%)	27 (26%)
Control	4 (Sec 2)	43	17 (40%)	14 (33%)	12 (28%)	45	19 (42%)	19 (42%)	13 (33%)
	5 (Sec 6)	46	14 (30%)	21 (46%)	11 (24%)	40	12 (30%)	22 (55%)	6 (15%)
	Total	89	31 (35%)	35 (39%)	23 (26%)	85	31 (36%)	41 (48%)	19 (22%)

n[1]=number of respondents participating in the study.

Table 4 presents students' awareness of health problems associated with inadequate Vitamin D intake before and after the nutrition education intervention. Prior to instruction, awareness levels were relatively low in both treatment and control groups. Among treatment participants, only 37% correctly identified Vitamin D-related health problems, while 43% reported no awareness and 20% indicated uncertainty. Similar findings were observed within the control group. Following the intervention, only modest improvements in awareness were observed among treatment participants. Correct responses decreased slightly from 37% to 34%, while reports of no awareness remained relatively stable at approximately 41%. Likewise, the control group demonstrated minimal change between the pre-test and post-test. These findings suggest that the educational intervention produced limited improvement in students' understanding of Vitamin D-related health conditions. The persistence of relatively high levels of incorrect or uncertain responses indicates that Vitamin D concepts may require additional instructional reinforcement to enhance student learning outcomes.

Figure 3
Frequency of Reading Food Labels

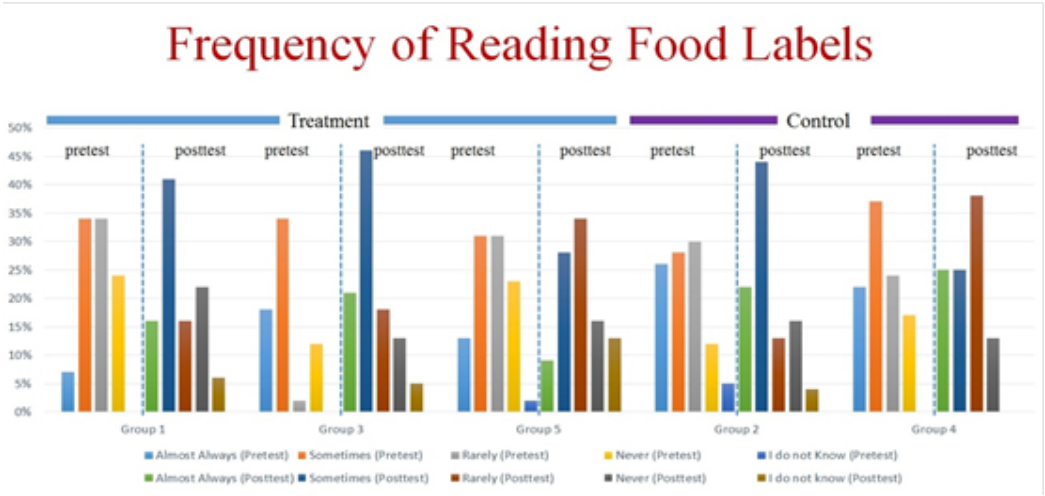

Figure 3 presents students' self-reported frequency of reading nutrition labels before and after participation in the nutrition education intervention. Prior to instruction, the most frequently selected response among treatment participants was "rarely" (34%), followed by "sometimes" (33%). Only 13% reported reading nutrition labels "almost always," while approximately one-fifth indicated that they never read nutrition labels. Following the intervention, improvements in label-reading behaviors were observed among treatment participants. The proportion of students reporting that they "sometimes" read food labels increased from 33% to 38%, while the percentage reporting "rarely" declined from 34% to 22%. Additionally, students reporting "almost always" reading labels increased modestly from 13% to 15%. In contrast, relatively little change occurred within the control group between the pre-test and post-test, with percentages remaining generally stable across response categories. These findings suggest that the nutrition education intervention encouraged more frequent engagement with nutrition labels among treatment participants, representing a positive behavioral outcome beyond improvements in nutrition knowledge alone.

Table 5
The Chi-Square (χ^2-test) Analysis of Demographic Characteristics and Nutrition Awareness

Variables	Awareness of Potassium		Awareness of Fiber		Awareness of Vitamin D		Food Label Use Models	
n^1=228	Chi Square	Asymptotic Significance (2-sided)	Chi Square	Asymptotic Significance (2-sided)	Chi Square	Asymptotic Significance (2-sided)	Chi Square	Asymptotic Significance (2-sided)
Gender	8.010	.237	5.594	.470	12.245	.057	28.538	.005*
Race/ Ethnicity	12.915	.228	15.406	.118	13.805	.182	33.924	.027*
Major	19.091	.386	22.871	.196	18.680	.412	23.746	.942
Age	14.365	.705	9.625	.943	28.852	.050	26.409	.879
Family's Total Annual Work Income	11.160	.515	17.106	.146	12.291	.423	27.213	.295
Household Size	20.446	.430	7.937	.992	29.773	.074	28.287	.917
First Time Taking Biology	1.071	.585	1.110	.574	.116	.944	.805	.938

Note. (*) imply statistical significance at the 5% level of probability. n^1=number of respondents participating in the study.

Table 5 presents the results of the Chi-square analyses examining associations between demographic characteristics and nutrition awareness related to potassium, dietary fiber, vitamin D, and nutrition label use. The analysis revealed that gender and race/ethnicity were the only demographic characteristics significantly associated with nutrition label use. Specifically, gender demonstrated a statistically significant relationship with nutrition label use (χ^2 = 28.54, p = .005), indicating that the frequency of reading nutrition labels differed significantly between male and female students. Likewise, race/ethnicity was significantly associated with nutrition label use (χ^2 = 33.92, p = .027), suggesting differences in nutrition label utilization across racial and ethnic groups.

In contrast, no statistically significant relationships were observed between nutrition awareness and academic major, household size, annual work income, first-time biology enrollment, or age for most nutrition awareness measures (p > .05). Similarly, awareness of potassium, dietary fiber, and vitamin D did not differ significantly across most demographic categories. Overall, these findings suggest that demographic characteristics have limited influence on nutrition awareness among college-aged young adults. However, gender and race/ethnicity appear to play important roles in nutrition label use, indicating that nutrition education initiatives designed to improve food label literacy may benefit from culturally responsive and gender-sensitive approaches.

DISCUSSION OF FINDINGS

This study examined the effects of demographic characteristics on nutrition awareness of dietary fiber, potassium, vitamin D, and nutrition label use among college-aged young adults enrolled in introductory biology courses at a Historically Black College and University (HBCU) in the southern United States. Using descriptive statistics and Chi-square analyses, the study explored whether demographic characteristics—including gender, race/ethnicity, age, household size, annual work income, academic major, and first-time biology enrollment—were associated with nutrition awareness and food label use. Overall, the findings suggest that nutrition awareness of dietary fiber, potassium, and vitamin D was generally low across the study population and that demographic characteristics had limited influence on students' nutrition awareness. However, gender and race/ethnicity were significantly associated with nutrition label use.

The descriptive findings indicate that nutrition awareness regarding dietary fiber, potassium, and vitamin D was generally inadequate among college-aged young adults. Across both the treatment and control groups, substantial proportions of students reported incorrect responses or uncertainty regarding the health benefits associated with these nutrients. Similarly, many students indicated that they only occasionally or rarely read nutrition labels. These findings are consistent with previous research demonstrating that college students frequently possess insufficient nutrition knowledge and often fail to meet recommended dietary guidelines (Dickson-Spillmann & Siegrist, 2011; Greene et al., 2012; Sharf et al., 2012). The results also support findings reported by Charlton, Brewitt, and Bourne (2004), who identified widespread deficiencies in nutrition knowledge and misconceptions regarding essential nutrients among young adults. Collectively, these findings reinforce concerns that inadequate nutrition literacy during young adulthood may contribute to unhealthy dietary behaviors and increase long-term risks for obesity, cardiovascular disease, hypertension, osteoporosis, and other chronic illnesses (Agatston, 2011; Steelman & Westman, 2016).

The findings further demonstrate that demographic characteristics generally did not significantly influence nutrition awareness of dietary fiber, potassium, or vitamin D. The Chi-square analyses revealed no statistically significant relationships between awareness of these nutrients and gender, race/ethnicity, age, household size, annual work income, academic major, or first-time biology enrollment ($p > .05$). These findings suggest that nutrition knowledge deficiencies were relatively consistent across demographic groups within this college population. This result differs from studies suggesting that socioeconomic status, educational background, and demographic characteristics substantially influence nutrition knowledge and dietary behaviors (Charlton et al., 2004; Zoellner et al., 2009). However, the findings are more consistent with Dickson-Spillmann and Siegrist (2011), who argued that nutrition misconceptions are widespread across population groups and may reflect broader deficiencies in nutrition education rather than demographic differences alone. The relative homogeneity of the study population, particularly within an HBCU setting where many participants shared similar age, educational experiences, and racial backgrounds, may also explain the absence of statistically significant demographic differences.

Gender emerged as a statistically significant factor associated with nutrition label use. The Chi-square analysis indicated that food label reading behavior differed significantly between male and female students ($\chi^2 = 28.54$, $p = .005$). This finding suggests that gender may influence how students access and utilize nutrition information during food purchasing and consumption decisions. Previous studies have similarly reported that women generally demonstrate greater interest in nutrition information and are more likely than men to read food labels and make health-conscious food choices (Ollberding et al., 2011; Sharf et al., 2012). Women often report greater concern regarding body weight, diet quality, and disease prevention, which may encourage more frequent use of nutrition labels when selecting foods. Consequently, the present findings reinforce previous literature indicating that gender-specific approaches may improve the effectiveness of nutrition education and food label literacy programs among college students.

Race and ethnicity were also significantly associated with nutrition label use ($\chi^2 = 33.92$, $p = .027$), indicating that food label utilization differed across racial and ethnic groups. Although the study sample consisted predominantly of African American students, statistically significant differences nevertheless emerged in nutrition label reading behaviors. This finding aligns with previous research suggesting that cultural beliefs, health literacy, and access to nutrition information contribute to differences in food purchasing behaviors among diverse populations (Charlton et al., 2004; Resnicow & Braithwaite, 2001). Cultural food preferences, family dietary traditions, and varying levels of exposure to nutrition education may partially explain these observed differences. However, because minority racial groups were represented by relatively few participants in this study, caution should be exercised when generalizing these findings beyond similar HBCU populations.

The study also found no statistically significant relationships between nutrition awareness outcomes and age, household size, annual work income, academic major, or first-time biology enrollment. These findings suggest that students' understanding of dietary fiber, potassium, vitamin D, and nutrition label information does not substantially vary according to socioeconomic characteristics or academic background. This result partially contradicts previous studies linking socioeconomic status and educational attainment with nutrition literacy and healthier dietary practices (Sarmugam et al., 2013; Zoellner et al., 2009). One possible explanation is that the study population exhibited limited variability across these demographic characteristics, thereby reducing the likelihood of detecting statistically significant differences. Additionally, because many participants were first-time biology students and non-STEM majors, nutrition awareness may have been uniformly limited regardless of academic discipline.

The descriptive analyses further revealed relatively consistent demographic characteristics across both treatment and control groups. Most participants were younger than 20 years of age, enrolled in biology for the first time, majoring outside STEM disciplines, and residing in households of three to six individuals. The demographic similarity between groups strengthens the internal validity of the study by reducing the likelihood that differences in participant characteristics influenced the observed nutrition awareness outcomes. Collectively, the findings suggest that nutrition awareness deficiencies are widespread among college-aged young adults and are not strongly explained by demographic characteristics. Instead, broader educational, behavioral, and institutional factors may play a more important role in shaping nutrition knowledge and food label utilization.

Above all, this study demonstrates that while nutrition awareness of dietary fiber, potassium, and vitamin D remains generally low among college-aged young adults, demographic characteristics explain relatively little variation in nutrition knowledge. The significant associations observed between gender, race/ethnicity, and nutrition label use suggest that food label literacy may be influenced by cultural and behavioral factors, whereas awareness of individual nutrients appears to be consistently limited across demographic groups. These findings support the need for comprehensive nutrition education interventions that improve nutrition literacy among all college students while incorporating culturally responsive and gender-sensitive approaches to promote effective food label use.

CONCLUSION AND POLICY IMPLICATIONS

This study examined the influence of demographic characteristics on nutrition awareness of dietary fiber, potassium, vitamin D, and nutrition label use among college-aged young adults attending a Historically Black College and University in the southern United States. The findings indicate that nutrition awareness of these essential nutrients is generally low among college students and that demographic characteristics exert limited influence on nutrition knowledge. Although gender and race/ethnicity were significantly associated with nutrition label use, most demographic variables—including age, household size, annual work income, academic major, and first-time biology enrollment—were not significantly related to awareness of dietary fiber, potassium, or vitamin D. The study therefore concludes that inadequate nutrition awareness represents a widespread educational concern among college-aged young adults rather than a problem confined to specific demographic groups. The generally low levels of knowledge regarding essential nutrients suggest that many students may lack the information necessary to make informed dietary decisions that support long-term health. Because nutrition awareness was consistently limited across demographic categories, broad-based nutrition education initiatives may be more effective than interventions targeting only selected demographic groups. These findings have several important policy implications.

First, colleges and universities should integrate evidence-based nutrition education into general education curricula, particularly for non-STEM majors who may have limited exposure to health and nutrition concepts. Incorporating nutrition literacy into introductory science courses, first-year experience programs, and student wellness initiatives may improve students' understanding of essential nutrients and promote healthier dietary behaviors throughout adulthood. Second, the significant association between gender and nutrition label use suggests that nutrition education programs should incorporate gender-responsive communication strategies that encourage greater engagement with food labels among all students. Educational campaigns emphasizing practical food label interpretation, portion sizes, daily nutrient values, and healthy food selection may improve students' ability to make informed purchasing decisions.

Third, the observed relationship between race/ethnicity and nutrition label use highlights the importance of culturally responsive nutrition education. Universities, public health agencies, and community organizations should develop educational materials that recognize cultural dietary preferences while promoting healthy eating practices. Tailoring nutrition messages to culturally diverse populations may increase student engagement and improve nutrition literacy within minority-serving institutions. Fourth, because nutrition awareness deficiencies were observed regardless of age, income, household size, or academic major, university administrators and policymakers should prioritize institution-wide nutrition literacy initiatives rather than narrowly targeted demographic programs. Campus dining services, student health centers, and wellness programs should collaborate to provide nutrition workshops, food demonstrations, healthy menu labeling, and educational campaigns that reinforce evidence-based dietary recommendations.

Finally, the findings support broader public health efforts to strengthen nutrition literacy among young adults as a strategy for preventing obesity and diet-related chronic diseases. Federal and state health agencies should continue promoting nutrition education through partnerships with colleges, universities, and community organizations while encouraging greater awareness and utilization of Nutrition Facts labels. These initiatives may contribute to healthier dietary behaviors, improved health outcomes, and reduced long-term healthcare

expenditures associated with nutrition-related chronic illnesses. In conclusion, improving nutrition awareness among college-aged young adults requires comprehensive educational strategies that extend beyond demographic differences. While gender and race/ethnicity influence nutrition label use, deficiencies in awareness of dietary fiber, potassium, and vitamin D are widespread across the student population. Strengthening nutrition literacy through curriculum integration, culturally responsive education, food label instruction, and campus-wide health promotion programs offers an important opportunity to improve dietary behaviors and reduce the future burden of nutrition-related chronic diseases among young adults.

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