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Research Report: Measuring Undergraduate Students' Knowledge of Selected Nutrients

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Abstract

Based on the study's findings, students' overall knowledge of the selected nutrients was extremely low. However, students who lived in smaller households, non–African Americans, and those who ranked their health status as being poor/fair or good/very good were more likely to correctly answer the question on protein. Knowledge of carbohydrates was higher among older and female students. Non–African Americans and students who ranked their health status below excellent were more knowledgeable about vitamin C. Older students knew more about vitamin D than younger students, while non–African American and female students were more knowledgeable about saturated fat, trans fat, and cholesterol.

Keywords: binomial logit models, carbohydrates, nutritional knowledge, protein, saturated fat, Nutrition Facts, cholesterol, undergraduate students

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Introduction

The *Dietary Guidelines for Americans*, now in its 8th edition (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2016), was first introduced in 1980 to help Americans to make healthier food choices. Each subsequent 5-year issue has continued that core goal. The *Guidelines* encourage Americans to eat a wide variety of fruits, vegetables, protein foods, grains, and fat-free or low-fat dairy and to limit daily intake of sugars, saturated fats, trans fats, sodium, and alcohol. In essence, the recommendations aim to foster healthier eating habits to mitigate rising overweight and obesity rates, incidences of chronic diseases, and healthcare costs, among others.

The Nutrition Labeling and Education Act was passed in 1990 and implemented in 1994 to give consumers another source of uniform, reliable nutritional information through Nutrition Facts labels on food products. Despite the easy access and prevalence of nutritional information, the most recent report from the Trust for America's Health (2019) indicated that the U.S. obesity rate was high, that it had increased among certain segments of the population, and that it varied racially, ethnically, and regionally. The report also indicated that Louisiana's obesity rate stood at 35%+ and that the largest increases were among young adults. In 2018, for example, 27.9% of those aged 18–24 years in Louisiana and 37% of those aged 25–44 years old were obese, ranking the state 2nd and 10th nationally in those categories.

Over a decade ago, Nelson et al. (2008), in describing the U.S. obesity problem and subsequent public health concerns, argued that more research was needed on the segment of the population that was transitioning from adolescence to young adulthood or emerging adulthood. They observed that obesity rates had been rising rapidly among young adults because of unhealthy eating habits and lack of physical activity. Because most undergraduates fell in the emerging adulthood category, the authors suggested that colleges, universities, and other postsecondary institutions were fertile grounds for implementing strategies to combat obesity. They also theorized that the impact could be widespread because of the large numbers of students from racially and economically diverse backgrounds who enrolled in these institutions annually and the weight gain often associated with college matriculation.

In their study, Racette et al. (2008) found that—although some variability existed between male and female college students—overall, both groups gained weight throughout their undergraduate matriculation and that the weight gain was associated with poor dietary habits and low levels of physical activity. Based on their findings, Jung and Bice (2019) suggested that college students' weight gain resulted from having busier schedules than in high school and greater responsibilities for their own meal planning. Consequently, many college students consumed more high-calorie foods, skipped more meals, and drank more sugary and alcoholic beverages than they did prior to enrolling in college. Unfortunately, these eating patterns place them at higher risks for developing diet-related diseases later in life. In fact, coronary heart disease is now a leading cause of death among 18–24-year-olds in the United States (Karabulut, et al. 2018).

Yahia et al. (2016) alluded to the association between saturated fat, trans fat, and cholesterol and coronary heart disease and conducted a study exploring whether nutritional knowledge reduced fat consumption among a selected group of university students. Their findings indicated that there was an inverse relationship between students' nutritional knowledge and consumption of unhealthy fats and cholesterol. Downes (2015) found that over 80% of college students sampled did not meet the recommended guidelines for physical activity and or for the daily consumption of fruits and vegetables. In her view, other high-risk behaviors such as alcohol and drug use got more attention on college campuses than physical activity and dietary choices and that this short-sighted strategy could have long-term health consequences. In their assessments of college students' health status, Abraham, Noriega, and Shin (2018) acknowledged that students needed to know about nutrition because inadequate nutrition could affect their health and academic success.

As argued previously, college students are likely to gain weight in the transitional years between 18 and 24 because of their low levels of physical activity and daily consumption of fruits and vegetables (Karabulut, et al. 2018). Therefore, nutritional intervention strategies are needed for this segment of the population. However, for these programs to be effective, researchers must have baseline data on students' levels of nutritional knowledge about basic nutrients such as protein, carbohydrates, fats, and cholesterol, among others. This study examines undergraduate students' knowledge of selected nutrients and factors associated with their levels of knowledge and recommends ways to help students to expand their nutritional knowledge so that they can make better food and lifestyle choices.

Objectives

The study's main objective is to determine students' knowledge of basic nutrients and their roles in fostering good health. The specific objectives are (i) to document students' general knowledge of protein (PROTEIN), carbohydrates (CARBOHYDRATES), vitamin C (VITAMIN C), vitamin D (VITAMIN D), saturated fat, trans fat, and dietary cholesterol (FATS); and (ii) to determine whether selected sociodemographic characteristics—age (AGE), household size (HSIZE), income levels (INCOME), race (RACE), gender (GENDER), body mass indices (BMI), and health status rankings (HEALTH1, HEALTH2, and HEALTH3)—influence performance on a nutritional knowledge quiz.

Methods and Procedures

The study's data were compiled from a random sample of 402 undergraduate students and were designed to capture nutritional knowledge and sociodemographic characteristics. The sampled students were asked to select the correct answers from the following statements:

(i) Protein is required by the body for (a) energy production only, (b) insulation of the body, or (c) growth, maintenance and repair of all cells.

(ii) Carbohydrate (a) maintains healthy skin and vision, (b) maintains normal function of the nervous system, (c) acts as the body's main source of energy, or (d) all of the above.

(iii) Vitamin C (a) maintains healthy gums and teeth, (b) maintains strong blood vessel walls, (c) produces energy for the body, or (d) both a and b.

(iv) Vitamin D (a) aids in the absorption and utilization of calcium in the formation and maintenance of strong bones and teeth, (b) provides insulation for the body, (c) maintains healthy skin and vision, or (d) none of the above.

(v) Consumption of saturated fat, trans fat, and dietary cholesterol (a) raises bad cholesterol levels, (b) increase the risk for heart disease, (c) none of the above, or (d) a and b.

These dependent variables were paired with sociodemographic variables, BMI, and health perceptions (Table 1). BMI was determined using the formula (weight in pounds ÷ height in inches^2) × 703. Binomial logit modeling techniques were used to estimate the relationships between each dependent and the selected independent variables.

Table 1. Variables and Definitions

Variables	**Definitions**
Independent variables	
AGE	Participants' age in years
HSIZE	Number of persons living at participants' permanent address
INCOME	Family's total household income: < $15,000; $15,000–$24,999; $25,000–$34,999; $35,000–$49,999; $50,000–$74,999; ≥ $75,000
RACE	African American = 0; otherwise = 1
GENDER	Male =1; female = 0
BMI	Body mass indices
HEALTH 1	Poor or fair health
HEALTH 2	Good or very good health
HEALTH 3	Excellent health (reference variable)
Dependent variables	
PROTEIN	Correct = 1; incorrect = 0
CARBOHYDRATE	Correct = 1; incorrect = 0
VITAMIN C	Correct = 1; incorrect = 0
VITAMIN D	Correct = 1; incorrect = 0
FATS	Correct = 1; incorrect = 0

Empirical Results and Discussion

Table 2 shows the results for students' responses to the protein question. Students from smaller households, non–African Americans, and those who ranked their health status below excellent were more likely to answer the protein question correctly. For example, the logarithms of the odds ratios are 2.831 times higher for non–African Americas than for African American students and 2.576 and 2.656 times higher, respectively, for students who regard their health status as poor to very good compared to those who view their health status as excellent. The model is significant at the 5% level of probability and predicts 60% of the data correctly. Performance is invariant to age, household income level, gender, and BMI.

Table 2. Binomial Logit Model's Results for Protein

Variables	Estimated Coefficients	Std. Err.	Wald	*p*-Value	Exp(β)
Constant	−0.573	0.750	0.585	0.444	0.564
AGE	0.027	0.019	1.930	0.165	1.027
HSIZE	−0.155**	0.063	6.043	0.014	0.856
INCOME	−0.031	0.064	0.236	0.627	0.969
RACE	1.041**	0.473	4.845	0.028	2.831
GENDER	0.218	0.225	0.932	0.334	1.243
BMI	−0.003	0.015	0.028	0.867	0.997
HEALTH 1	0.946*	0.485	3.813	0.051	2.576
HEALTH 2	0.977**	0.471	4.294	0.038	2.656
Likelihood ratio test					
χ^2 (8)	17.497**			0.025	
Correctly predicted	60%				

Note: Single and double asterisks (*, **) indicate statistical significance at the 10% and 5% levels, respectively.

Based on the results reported in Table 3, the logarithms of the odds ratios that older and female students answered the carbohydrate question correctly are higher than for younger students and for male students. Household size, household income level, race, BMI, and health perceptions do not affect students' performance on the carbohydrate question. The model is statistically significant at the 1% level of probability and predicts 72% of the observations correctly.

Based on knowledge of vitamin C's role in the body, the logarithms of the odds ratios imply that non–African American students and those who ranked their health status as poor/fair or good/very good are more likely to correctly answer the question than African Americans and those who perceived themselves as being in excellent health (Table 4). Older students are more likely to correctly answer the question on vitamin D compared to younger students (Table 5).

Table 3. Binomial Logit Model's Results for Carbohydrates

Variables	Estimated Coefficients	Std. Err.	Wald	*p*-Value	Exp(β)
Constant	−1.977**	0.796	6.165	0.013	0.138
AGE	0.070***	0.020	11.891	0.001	1.073
HSIZE	−0.077	0.072	1.132	0.287	0.926
INCOME	−0.068	0.070	0.936	0.333	0.935
RACE	0.434	0.439	0.974	0.324	1.543
GENDER	−0.438*	0.253	3.000	0.080	0.645
BMI	0.020	0.016	1.483	0.223	1.020
HEALTH 1	−0.219	0.509	0.185	0.667	0.803
HEALTH 2	−0.566	0.500	1.261	0.258	0.560
Likelihood ratio test					
χ^2 (8)	28.848***			0.000	
Correctly predicted	72%				

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4. Binomial Logit Model's Results for Vitamin C

Variables	Estimated Coefficients	Std. Err.	Wald	*p*-Value	Exp(β)
Constant	−0.583	0.781	0.557	0.455	0.558
AGE	−0.013	0.018	0.527	0.468	0.987
HSIZE	0.032	0.062	0.267	0.605	1.033
INCOME	−0.015	0.064	0.056	0.813	0.985
RACE	0.877*	0.451	3.784	0.052	2.404
GENDER	−0.334	0.222	2.268	0.132	0.716
BMI	−0.020	0.015	1.695	0.193	0.980
HEALTH 1	1.757***	0.553	10.085	0.001	5.794
HEALTH 2	1.563***	0.541	8.333	0.004	4.772
Likelihood ratio test					
χ^2 (8)	20.281***			0.000	
Correctly predicted	59%				

Note: Single, and triple asterisks (*, ***) indicate statistical significance at the 10% and 1% levels, respectively.

Table 5. Binomial Logit Model's Results for Vitamin D

Variables	Estimated Coefficients	Std. Err.	Wald	*p*-Value	Exp(β)
Constant	−1.344*	0.798	2.838	0.092	0.261
AGE	0.065***	0.024	7.118	0.008	1.067
HSIZE	−0.028	0.063	0.201	0.654	0.973
INCOME	0.089	0.065	1.882	0.170	1.093
RACE	−0.198	0.406	0.239	0.625	0.820
GENDER	−0.234	0.223	1.106	0.293	0.791
BMI	−0.009	0.016	0.333	0.564	1.009
HEALTH 1	−0.085	0.471	0.032	0.857	0.919
HEALTH 2	0.109	0.457	0.056	0.812	1.115
Likelihood ratio test					
χ^2 (8)	17.497**			0.047	
Correctly predicted	60%				

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

The model for students' knowledge on saturated fat, trans fat, and dietary cholesterol is statistically significant at the 1% level of probability and implies that it performs better than the intercept-only model (Table 6). The model also predicts 75% of the results correctly. Further, the logarithms of the odds ratios for answering this question correctly is higher for older students (1.065) compared to younger students and for non–African Americans (2.612) compared to African Americans but are lower for male students (0.584) compared to female students (1.71). Performance on this question is not influenced by household size, income level, BMI, or health perceptions.

Table 6. Binomial Logit Model's Results for Saturated and Trans Fats and Cholesterol

Variables	Estimated Coefficients	Std. Err.	Wald	*p*-Value	Exp(β)
Constant	−0.852	0.925	0.848	0.357	0.427
AGE	0.063**	0.030	4.374	0.037	1.065
HSIZE	0.076	0.074	1.048	0.306	1.079
INCOME	−0.049	0.073	0.453	0.501	0.952
RACE	0.960*	0.568	2.860	0.091	2.612
GENDER	−0.539**	0.245	4.860	0.028	0.584
BMI	0.015	0.018	0.700	0.403	1.015
HEALTH 1	0.046	0.497	0.008	0.927	1.047
HEALTH 2	0.368	0.485	0.575	0.448	1.444
Likelihood ratio test					
χ^2 (8)	20.153***			0.010	
Correctly predicted	75%				

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Summary and Conclusions

The study's objectives were to document students' general knowledge of protein, carbohydrates, vitamin C, vitamin D, saturated fat, trans fat, and dietary cholesterol and then determine whether age, household size, income level, race, gender, BMI, or health status ranking influenced nutritional knowledge. Although overall nutritional knowledge was low, students from smaller households, non–African Americans, and those who ranked their health status below excellent performed better on the protein question.

A higher percentage of older and female students answered the question on carbohydrates correctly, and a larger percentage of non–African Americans and those who ranked their health status below excellent correctly answered the question on vitamin C. Older students also were more likely to correctly answer the vitamin D question, while older, non–African Americans, and female students were more likely to correctly answer the question on saturated fat, trans fat, and cholesterol.

U.S. consumers now have easier access to nutrition information than previously. However, over the past 30 years, overweight and obesity rates have skyrocketed, especially among young adults. The risks of becoming overweight or obese are high among undergraduate students because of educational and financial stress and other stressors associated with living away from home for the first time. Research suggests that these stressors can cause sleep deprivation, poor eating habits, or ill health. To effectively address undergraduate students' health and well-being, researchers need baseline information on students' basic knowledge about nutrition. This study was conceived on that premise. It analyzed undergraduate students' general knowledge about selected nutrients—proteins; carbohydrates; vitamins C and D; saturated fat, trans fatty acids, and dietary cholesterol; and factors affecting that knowledge. The low overall scores on the nutritional quiz suggest that students need help to understand nutrition information to enable them to develop healthier eating habits now and in the future. Those of us in higher education must increase our nutritional knowledge so that we can help and encourage our students to read and learn about nutrition and health. Greater emphasis also needs to be placed on students' diets and health through course offerings such as through mandatory courses in the biological sciences, nutrition, and health and wellness.

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