PREDICTORS OF FOOD LABEL USE AMONG TCU COLLEGE STUDENTS

by

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TCU COLLEGE STUDENTS

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INTRODUCTION

The time a student spends in college may be associated with weight gain. Hoffman and colleagues (2006) examined the change in body weight among college freshman students and found that freshman experience an average weight gain of 3.2 kilograms during their first year. Racette et al (2008) examined changes in body weight among college students from freshman through senior year and reported that female students on average gain about 1.75 ± 4.5 kg and male students gain 4.2 ±6.4 kg during that time period.

The effect of excess weight or weight gain on subsequent health during young adulthood has not been studied to a great extent, but those studies that have been performed in this area reveal that excess weight or weight gain in the early twenties may be critical in determining future morbidity and mortality. In a historical (retrospective) cohort study, Jeffreys and colleagues (2003) examined the relationship between body mass index (BMI) (weight in kg divided by the height squared in m) and morbidity in 629 young men in Glasgow over a period of thirty-five years and found that men listed as overweight (defined as BMI $\geq$ 25 kg/m^2) at the median age of twenty-two had a strong positive association with cardiovascular disease later in life and a positive association with all-cause mortality, while men listed as overweight in mid adulthood (median age 38) had no association with all-cause mortality and a very weak association with cardiovascular disease later in life. In a study by Stevens et al (2012) in which 13,941 African-American and Caucasian subjects were followed for up to eighteen years or until the time of their death each 5 kg/m^2 increase in BMI in individuals at the age of twenty-five increased their risk for mortality by 28%.

With the trends of significant weight gain and increased health risk among college-aged individuals, it is important to look at factors of a college lifestyle that may contribute to weight gain. Greene et al (2011) examined the diet quality of students in eight universities and found that most students do not meet the dietary guidelines for Americans. The authors did not correlate food intake with body weight, however (Greene et al., 2011). In a longitudinal study in which college students were evaluated during their first and fourth year, Racette et al (2009) found that most students did not meet the dietary guidelines for Americans during either time periods. Furthermore, the percentage of students who were considered overweight (BMI$\geq$ 25 kg/m^2) increased from 15% of students to 23% of students in this prospective, longitudinal study despite exercise habits not changing; therefore, the authors infer that the weight gain in college students may be related to their nutritional habits.

Individuals who use nutrition labels on packaged foods to guide their food choices generally consume better diets than non-users. Label users report consuming diets that are lower in fat and cholesterol and higher in fruit and vegetables than non-users (Neuhouser et al., 1999; Kreuter et al., 1997). What is not well studied, however, is determining the factors that predict use of food labels, especially in college students.

Marietta, Welshimer & Anderson (1999) examined food label knowledge, attitudes, and behaviors among undergraduate students in a mid-western university and found that food label knowledge, positive attitude towards food labels, and female sex predicted food label use. More recently, Misra (2007) assessed the relationship between food label knowledge, attitudes, and use in college students from two mid-western universities and found that prior nutrition education, female sex, and positive attitudes

towards food labels but not food label knowledge predicted food label use. Both the above studies were conducted in state universities that have students with a more diverse socioeconomic background. Whether similar results may be expected in college students from a more middle-class background remain to be evaluated. Also neither of the above studies examined the role of exercise as a predictor of food label use.

PURPOSE

The purpose of the study was to identify predictors of food label use in TCU students.

HYPOTHESIS

We hypothesized that female sex, regular exercise, prior food label education, prior nutrition education, greater food label understanding, greater general nutrition knowledge, and a more positive food label attitude will predict use of food labels.

METHODS

Subjects and Recruitment

We recruited 263 male and female TCU students between the ages of 18 and 30 to participate in this study. Exclusion criteria included having special dietary needs or health conditions affected by diet or training for a competitive event.

The subjects were recruited through classroom announcements, via flyers (See Appendix) posted around campus, TCU Announce, social media, and word of mouth.

The study was conducted in the Metabolic Lab in the Department of Kinesiology at TCU.

The study was approved by the TCU Institutional Review Board (IRB). Each subject read and signed the IRB approved consent document (see Appendix) upon entering the lab, prior to participation.

Study Design

A convenient sample of 263 subjects from TCU was recruited for this survey to determine the predictors of food label use.

Measurements

Demographic, Lifestyle, and Personal Health History Questionnaire

The subjects were instructed to complete a demographic, lifestyle, and personal health history questionnaire (see Appendix).

Anthropometric Measurements

Height was measured without shoes to the nearest 0.2 cm using a Seca stadiometer (Model 222, Hamburg, Germany). Body weight was measured without heavy clothing or shoes, to the nearest 0.1 kg using Befour scales (Model FS-0961, Saukville, WI). Body mass index (BMI) was calculated for each subject by dividing the weight in kilogram by the height squared in meter (kg/m^2).

Nutrition Knowledge Questionnaire

The subjects were instructed to complete a general nutrition knowledge questionnaire (see Appendix). It was a revised version of a validated nutrition-knowledge questionnaire (Parmenter & Wardle, 1999). The completed questionnaire was scored for the percentage of correct responses with a maximum possible score of 100%. A higher score reflects greater nutrition knowledge.

Food Label Knowledge Questionnaire

The subjects were instructed to complete a food label knowledge questionnaire (see Appendix). This questionnaire was designed with input from nutrition and dietetics faculty members at TCU. Some of the questions were adopted from previous studies (Rothman et al, 2006; Marietta, Welshimer, & Anderson, 1999) that had developed a food label knowledge questionnaire and validated the contents. The questionnaire was scored for the percentage of correct responses with a maximum possible score of 100%. A higher score reflects better food label knowledge.

Food Label Attitude

Food label attitude was measured through a self-administered four-question survey with a Likert scale (1 = strongly disagree, 5 = strongly agree) (see Appendix). This questionnaire was developed and validated for content by Marietta et al (1999). A composite score was calculated from the responses to the 4 questions with 20 being the maximum possible total score. A higher score represented a more positive attitude towards the food labels.

Food Label Use

Food label use was measured through a self-administered survey using a Likert scale (1 = never, 5 = always) (see Appendix). This questionnaire was developed and validated for content by Marietta et al (1999). A composite score was calculated from the responses to the 5 questions with twenty-five being the maximum possible total score. A higher score represents greater use of food labels.

Procedure During the Study

Individuals interested in participating in the study were asked to read and sign the IRB approved informed consent document. Following this, they were instructed to complete the questionnaire on demographic, lifestyle, and personal health history and data from this questionnaire was used to determine eligibility. Eligible participants were then instructed to complete the, nutrition knowledge questionnaire, food label knowledge questionnaire, food label attitude questionnaire, and food label use questionnaire. The investigators also took the anthropometric measurements.

Statistical Analyses

Means and standard deviations were computed for continuous variables and frequencies for categorical variables. Pearson coefficient correlations were computed to identify factors that correlated with food label use. Factors that were significantly correlated with food label use (sex, prior nutrition education, regular exercise, general nutrition knowledge, food label knowledge, and food label attitude) were included in a stepwise multiple linear regression analysis model to identify the significant predictors of food label use.

RESULTS

Demographic and Behavioral Characteristics

The demographics and behavioral characteristics of the subjects are presented in **Table 1**. Sixty-eight percent of the subjects were females. Most of the subjects were White non-Hispanic (84.4%). Mean age was 21.1 ± 1.7 y. Mean BMI was 23.9 ± 3.7 (kg/m^2). About 50 % of the subjects reported having received prior food label education. Nutrition knowledge and food label knowledge average scores were 59.54 ± 16.43 % and

73.96 ± 13.17 %, respectively out of a maximum possible score of 100. The mean total score for food label attitudes was 18.02 ± 3.02 out a maximum possible score of 25. The average total score for food label use was 13.49 ± 3.58 with a maximum possible score of 20. Most of the subjects reported exercising on a regular basis (89.7%), drank alcohol (65.8%), and were not smokers (97.3%).

Pearson's Correlation Coefficients

Pearson correlation coefficients on factors that were correlated with food label use are presented in **Table 2**. Sex, previous label education, regular exercise, food label attitude, food label knowledge, and nutrition knowledge were significantly correlated with food label use. Female gender was related to more food label use than male gender. Subjects who had received prior food label education or exercised regularly used the food labels more than subjects who did not receive food label education or were sedentary, respectively. Higher food label attitude, nutrition knowledge, and food label knowledge were positively related to food label use.

Stepwise Multiple Linear Regression Analysis

The results from the stepwise multiple linear regression analysis are presented in **Table 3**. A significant ($F(5,255)=14.2$; $p<0.0001$) regression equation was found with r^2 equal to 0.22. Sex ($p = 0.012$), food label knowledge ($p = 0.015$), food label attitude ($p = 0.0001$), nutrition knowledge ($p = 0.015$), and regular exercise ($p = 0.026$) were significant predictors of food label use. Food label use was greater among females than among males. Subjects who exercised regularly were also more likely to use the food labels than subjects who were sedentary. Higher food label attitude, nutrition knowledge, and food label knowledge were also related to more food label use.

DISCUSSION

Stepwise regression analysis revealed that sex, regular exercise, food label attitude, food label knowledge, and nutrition knowledge, but not previous food label education, were all significant predictors of food label use. Most of our results are corroborated by results from other studies. Marietta et al. (1999) examined the relationship between food label knowledge, attitudes, and use in college students and found that food label use was higher in females than in males and in those with greater food label knowledge and more positive attitude towards food labels. Misra (2007) who examined the relationship between food label knowledge, attitudes, and food label use in college students reported that food label use was higher with increased nutrition education, positive attitudes towards food labels, and being female. This study also did not find previous food label education to be a predictor of food label use. Neither Marietta et al. (1999) nor Misra (2007) examined the role regular exercise as a predictor of food label use.

Female subjects in our study used the food labels more than males probably possibly because females may be more health conscious than males. Subjects who exercised regularly also used the food labels more than subjects who were sedentary possibly because those who exercise regularly may be more motivated to have a healthy lifestyle, and this may be associated with more food label use when making food purchasing decisions. Both nutrition knowledge and food label knowledge were predictors of food label use possibly because increased knowledge may enhance awareness and desire to make healthy food choices. A positive attitude towards the food

label also predicted more food label use possibly because those with a higher food label attitude had higher nutrition and food label knowledge.

This study had several weaknesses. It was a convenient sample and so the study population may not be completely representative of the TCU population. Another limitation of this study was the smaller number of male compared to female subjects. The proportion of subjects by gender, however, was largely representative of our campus population. Finally, while our sample represented the ethnic and racial make-up of our college campus, it was a largely homogenous sample made up of mostly non-Hispanic Whites and the results may not be generalized to a more diverse group of college students.

A strength of this study was that multiple variables were measured, allowing us to better determine possible predictors of food label use. Nevertheless only 22% of the variation in food label use was explained by our predictive model suggesting that other variables, not measured by our study, may play a role in food label use.

These findings are significant, because they reveal a need for enhancing nutrition knowledge in college students, especially considering the low nutrition knowledge scores that we observed in our subjects. Whether this leads to better food label use and better diet and health remains to be evaluated in randomized controlled studies in a more diverse group of college students.

In conclusion, female sex, regular exercise, more positive food label attitude, and greater food label knowledge and nutrition knowledge were related to more food label use in TCU college students.

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Table 1. Demographics and Behavioral Characteristics of the Subjects

Variables	n=263
Gender (% female)	68
Ethnicity (% non-Hispanic)	84
Race (% White)	91
Age (years)	21.1 ± 1.7
BMI (kg/m^2)	23.9 ± 3.7
Food Label Education (% with previous education)	51
Nutrition Knowledge Score (out of 100%)	59.5 ± 16.4
Food Label Knowledge Score (out of 100%)	73.9 ± 13.2
Food Label Attitude Score (out of 25)	18.0 ± 3.0
Food Label Use Score (out of 20)	13.5 ± 3.6
Exercise (% exercising regularly)	90
Alcohol (% drinking regularly)	66

All values are means ± standard deviation unless otherwise specified.

Table 2. Significant Correlates of Food Label Use

Variables	**Food Label Use**		
	n	r*	P#
Sex (1 = M, 2 = F)	263	0.183	0.003
Previous Label Education (1 = Y, 2 = N)	263	-0.187	0.002
Regular Exercise (1 = Y, 2 = N)	263	-0.162	0.009
Food Label Attitude	263	0.333	<0.0001
Fool Label Knowledge	263	0.290	<0.0001
Nutrition Knowledge	261	0.306	<0.0001

*r = Pearson correlation coefficient.
#P values were computed using Pearson's correlations.

Table 3. Predictors of Food Label Use (n = 260)

Variables	β (SE)	P Value*
Sex (1= M, 2= F)	1.128 ± 0.444	0.012
Regular Exercise (1= Y, 2 = N)	-1.507 ± 0.675	.026
Food Label Attitude	.285 ± 0.069	<0.0001
Food Label Knowledge	.041 ± 0.016	0.015
Nutrition Knowledge	.033 ± 0.013	0.015

*P values were computed using stepwise multiple linear regression.

A significant ($F(5,255)=14.2$; $p<0.0001$) regression equation was found with $r^2=0.22$

APPENDIX

Recruitment Flyer

TCU Kinesiology Nutrition Study

Volunteers are needed to participate in a nutrition research study at TCU looking at food label opinions and usage.

Study Details

- TCU students between the ages of 18 and 30 are eligible to participate.
- The participation will require about 60 minutes of your time.
- The study will take place in the Metabolic Lab in the Dept. of Kinesiology.
- The participant's height and weight will be measured and he/she will be asked to complete questionnaires on demographics, health, lifestyle, food labels, and nutrition.

Contact

To participate or for further information, please call or email Nicole Toomey by phone (310.569.0926) or e-mail (nicole.toomey@tcu.edu).

Thank you!!!!

IRB Approved Consent

Texas Christian University
Fort Worth, Texas

KINESIOLOGY CONSENT TO PARTICIPATE IN RESEARCH

Title of Research: Predictors of Food Label Use Among TCU College Students

Funding Agency/Sponsor: N/A

Study Investigators: Nicole Toomey, Dr. Meena Shah, Brian Franklin, Maria Muller, Eric Blasco, Chritiana Kittelson, Chase Stewart, Kyle Gonzalez, and Karl Bjorn.

What is the purpose of the research?
The purpose of this research is to examine food label usage among college students and the factors that predict it.

How many people will participate in this study?
Five hundred TCU students between the ages of 18 and 30 will participate in this study.

What is my involvement for participating in the study?
You will be asked to complete questionnaires on demographics, lifestyle, personal health history, nutrition, and food labels. We will also measure your height and weight.

How long am I expected to be in this study for and how much of my time is required?
To participate in this study, you will visit the metabolic lab one time for approximately one hour.

What are the risks of participating in this study and how will they be minimized?
You may feel self-conscious when your weight and height are taken. To protect your privacy, we will take these measurements in a private place behind a screen. You may also feel that your nutrition knowledge is inadequate after completing the questionnaires. We will refer you to nutritional educational resources which you can use if desired.

What are the benefits for participating in this study?

There is no personal benefit to you from participating in this study. The results may provide us with clues as to how to improve food label usage in college students.

Will I be compensated for participating in this study?
No, there will be no compensation for participation in the study.

What is an alternate procedure(s) that I can choose instead of participating in this study?
Professors who offer extra credit for participation in the study will also offer another option for extra credit for students who do not wish to participate in the study. The other activity will take no more time to complete than the study participation.

How will my confidentiality be protected?
All data and consents will be stored in a locked filing cabinet in the Metabolic Lab and only the researchers will have access to them. The electronic data will be stored on a TCU password protected computer in the Metabolic Lab and will not contain any identifying information. The data will be presented in aggregate at symposiums, conferences, and in papers but without any identifying information. All data will be kept for at least 3 years after which the hard data will be shred.

Is my participation voluntary?
Yes, all participation is voluntary.

Can I stop taking part in this research?
You can stop taking part in this study at any time without penalty.

What are the procedures for withdrawal?
To withdraw for the study, notify the researcher in person or by e-mail.

Will I be given a copy of the consent document to keep?
Yes, you will be given a copy of the consent document to keep for your own personal records.

Who should I contact if I have questions regarding the study?
If you have a question regarding the study, please contact Nicole Toomey by email (nicole.toomey@tcu.edu).

Who should I contact if I have concerns regarding my rights as a study participant?
Dr. Gloria Solomon, TCU Kinesiology Review Committee Chair, Telephone 817-257-6868.
Dr. Timothy Barth, IRB Co-Chair, Telephone 817-257-64215263.

Your signature below indicates that you have read or been read the information provided above, you have received answers to all of your questions and have been told who to call if you have any questions, you have freely decided to participate in this research, and you understand that you are not giving up any of your legal rights.

Participant Name (please print):
_____

Participant Signature: _____
Date: _____

Investigator Name (please print): _____
Date: _____

Investigator Signature: _____
Date: _____

Demographics, Lifestyle, and Personal Health History Questionnaire

Demographics and Health History Questionnaire

1. Today's date (m/d/y):_____

2. Name (Last, Middle, first):_____

3. Phone Number:_____

4. E-mail Address:_____

5. Birthdate (m/d/y):_____

6. Sex:
    1. Male
    2. Female

7. Racial Categories:
    1. *Black or African American* (any black African racial origins including Haitians)
    2. *Asian* (Far East, Southeast Asia or Indian Subcontinent including Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, Philippine Islands, Thailand, and Vietnam)
    3. *Native Hawaiian or other Pacific Islander* (any origins from Hawaii, Guam, Somoa or other Pacific Islands, specifically not the Philippine Islands
    4. *American Indian or Alaskan Native* (any origins from the *original peoples* of *North*,*Central*, and *South* America)
    5. *White* (any origins from original peoples of Europe, Near/Middle East, or North Africa including Hispanics and Latino of these races)
    6. *Multiracial*

8. Ethnic Categories:
    1. *Hispanic or Latino* (A person of Cuban, Mexican, Puerto Rican, South/Central American or other Spanish-speaking culture regardless of race)
    2. *Not Hispanic or Latino*

9. What is your current student status?
    1. Undergraduate
    2. Graduate

10. If you are an undergraduate student, what is your current classification?
    1. Freshman
    2. Sophomore
    3. Junior
    4. Senior

11. Have you taken a University level course in Nutrition or Dietetics?
    1. Yes
    2. No
    3. Currently Enrolled

12. If yes, how many credit hours have you taken in the field of nutrition or dietetics?

    _____

13. Have you had prior exposure to food label reading education?
    1. Yes
    2. No

14. Are you currently on any diet?
    1. Yes
    2. No

15. If you are on a diet, please specify:

_____

16. Do you have any eating disorder?
    1. Yes
    2. No

17. If you have any eating disorders, please specify?

_____

18. Are you currently pregnant?
    1. Yes
    2. No

19. Are you currently lactating?
    1. Yes
    2. No

20. Do you currently smoke?
    1. Yes
    2. No

21. If you smoke, how many cigarettes per day do you smoke? _____ per day.

22. Do you drink any alcoholic beverages?
    1. Yes
    2. No

23. If you drink alcohol, how many drinks (1 drink = 12 ounce beer, 4 ounce wine, or one ounce hard liquor) on average do you drink per week? _____ per week.

24. Do you participate in a regular exercise?
    1. Yes
    2. No

25. If you participate in regular exercise please specify below:
    1. Moderate intensity aerobic exercise that makes you breathe somewhat harder than normal (e.g., walking briskly): _____ minutes per week
    2. Vigorous intensity aerobic exercise that makes you breathe a lot harder than normal (e.g., jogging or running): _____ minutes per week
    3. Stretching (e.g., yoga): _____ minutes per week
    4. Resistance training (e.g. weight lifting): _____ minutes per week

26. Do you have any of the following health conditions? Please circle or check the ones that you have:

    Type 1 diabetes
    Type 2 diabetes
    Cancer
    High blood cholesterol
    High blood triglycerides
    High blood pressure
    Overactive thyroid (hyperthyroidism)
    Underactive thyroid (hypothyroidism)
    Kidney Problems (protein in urine)
    Adrenal Disease such as Addison's Disease or Cushing's Syndrome
    Psychiatric Problems
    Reflux Disease
    Sleep Apnea
    Gall Stones
    Polycystic ovarian syndrome

27. Do you have any other health problem? If yes, please specify:

_____

THANK YOU FOR PARTICIPATING IN THIS STUDY

Nutrition Knowledge Questionnaire

Nutrition Knowledge Questionnaire

1) Which fat do you think health experts say is the most important for individuals to decrease in their diet?
    a. Monounsaturated Fat
    b. Polyunsaturated Fat
    c. Saturated Fat
    d. Not sure

2) What version of dairy foods do experts say people should eat?
    a. Whole milk
    b. Low-fat or non-fat milk
    c. Neither; dairy foods should be eliminated from the diet
    d. Not sure

3) Saturated fats are mainly found in
    a. Vegetable Oils
    b. Animal Products
    c. Both (a) and (b)
    d. Not Sure

4) There is more protein in a glass of whole milk than a glass of skim (non-fat) milk.
    a. Agree
    b. Disagree
    c. Not sure

5) Margarine contains less fat than butter per serving.
    a. Agree
    b. Disagree
    c. Not sure

6) Which of the following breads contains the most vitamins and minerals?
    a. White
    b. Brown
    c. Whole grain
    d. Not sure

7) A type of oil which contains mostly monounsaturated fat is
    a. Coconut oil
    b. Sunflower oil
    c. Olive oil
    d. Palm oil
    e. Not sure

8) There is more calcium in a glass of whole milk than in a glass of skim (non-fat) milk.
    a. Agree
    b. Disagree
    c. Not sure

9) Solid fats contain more:
    a. Monounsaturated fat
    b. Polyunsaturated fat
    c. Saturated fat
    d. Not sure

10) Polyunsaturated fats are mainly found in:
    a. Vegetable oils
    b. Dairy products
    c. Cold water fish
    d. Both (a) and (c)
    e. Not sure

11) Which would be the best choice for a low fat, high fiber snack?
    a. Low-fat strawberry yogurt
    b. Raisins
    c. Muesli bar
    d. Whole grain crackers and cheddar cheese
    e. Not sure

12) Which would be the best choice for a low fat, high fiber light meal?
    a. Grilled chicken
    b. Cheddar cheese on whole wheat toast
    c. Black beans and rice
    d. Quiche
    e. Not sure

13) Which would be the best choice for someone who wants to reduce the amount of fat in their diet?
    a. Grilled sirloin steak
    b. Grilled sausage
    c. Grilled chicken thigh
    d. Grilled pork chop
    e. Not sure

14) Which cheese would be the best choice as a lower fat option?
    a. Plain cream cheese
    b. Feta
    c. Cheddar
    d. Cottage cheese
    e. Not sure

15) In what types of foods can trans fatty acids be found?
    a. Snack foods such as cookies and pretzels
    b. Fried fast foods
    c. Stick margarine
    d. All of the above
    e. Not sure

16) Good sources of omega-3 fats include all of the following except:
    a. Fatty fish
    b. Walnuts
    c. Flax seed
    d. Milk
    e. Not sure

17) The most energy dense food (most calories/gram) is:
    a. Carbohydrate
    b. Fat
    c. Protein
    d. Not sure

18) Which lifestyle change can prevent or delay the onset of high blood pressure and can lower elevated blood pressure?
    a. Reducing salt intake
    b. Increasing potassium intake
    c. Losing excess body weight
    d. Increasing physical activity
    e. All of the above can prevent or lower high blood pressure
    f. Not sure

19) Are you aware of any major health problems or diseases that are related to a low intake of fruits and vegetables?
    a. Yes
    b. No
    c. Not sure

20) If yes, what health problems or diseases do you think are related to a low intake of fruits and vegetables?

_____

21) Are you aware of any major health problems or disease that are related to a low intake of fiber?
   a. Yes
   b. No
   c. Not sure

22) If yes, what health problems do you think are related to a low intake of fiber?

_____

23) Are you aware of any major health problems or diseases that are related to high sugar intake?
   a. Yes
   b. No
   c. Not sure

24) If yes, what health problems or diseases do you think are related to high sugar intake?

_____

25) Are you aware of any major health problems or diseases that are related to a high salt or sodium intake?
   a. Yes
   b. No
   c. Not sure

26) If yes, what diseases or health problems do you think are related to sodium intake?

_____

27) Are you aware of any major health problems or diseases that are related to the types and amounts of fat that people eat?
   a. Yes
   b. No
   c. Not sure

28) If yes, what health problems or diseases do you think are related to the types and amounts of fat that people eat?

_____

Food Label Knowledge Questionnaire

Food Label Assessment

Nutrition Facts

Serving Size 1 bagel (80g)
Servings Per Container 6

Amount Per Serving	
Calories 250	Calories from Fat 25
	% Daily Value*
Total Fat 2.5g	**4%**
Saturated Fat 0g	**0%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 410mg	**17%**
Total Carbohydrate 48g	**16%**
Dietary Fiber 2g	**6%**
Sugars 3g	
Protein 8g	

Vitamin A 0%	• Vitamin C 0%
Calcium 2%	• Iron 20%
Thiamin 30%	• Riboflavin 15%
Niacin 20%	• Folate 45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

INGREDIENTS: Enriched Bleached Flour (Wheat Flour, Malted Barley Flour, Niacin, Iron, Thiamin, Riboflavin, Folic Acid), Water, Sugar, Soybean Oil, Salt, Yeast.

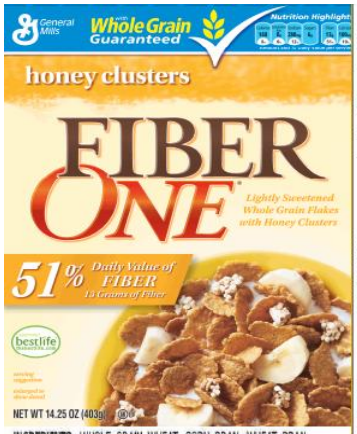
ALLERGENS: Contains Wheat.

1) Using the nutrition facts panel on the left, state which calorie intake the % Daily Value is based on.

_____

2) How many grams of total carbohydrates are in ½ a bagel?

_____



Nutrition Facts

Serving Size 1 cup (52g)
Servings Per Container about 8

Amount Per Serving	Fiber One Honey Clusters	with ½ cup skim milk
Calories	160	200
Calories from Fat	15	15
	% Daily Value**	
Total Fat 1.5g*	**2%**	**2%**
Saturated Fat 0g	**0%**	**0%**
Trans Fat 0g		
Polyunsaturated Fat 0.5g		
Monounsaturated Fat 0g		
Cholesterol 0mg	**0%**	**1%**
Sodium 280mg	**12%**	**15%**
Potassium 320mg	**9%**	**15%**
Total Carbohydrate 42g	**14%**	**16%**
Dietary Fiber 13g	**51%**	**51%**
Soluble Fiber 3g		
Sugars 6g		
Other Carbohydrate 23g		
Protein 5g		
Vitamin A	0%	4%
Vitamin C	0%	0%
Calcium	10%	25%
Iron	25%	25%
Vitamin D	0%	10%
Thiamin	25%	30%
Riboflavin	25%	35%
Niacin	25%	25%
Vitamin B_6	25%	25%
Folic Acid	25%	25%
Vitamin B_{12}	25%	35%
Phosphorus	10%	20%
Magnesium	8%	10%
Zinc	25%	30%

* Amount in cereal. A serving of cereal plus skim milk provides 1.3g total fat, less than 5mg cholesterol, 350mg sodium, 520mg potassium, 48g total carbohydrate (11g sugars) and 9g protein.

** Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Potassium		3,500mg	3,500mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

INGREDIENTS: WHOLE GRAIN WHEAT, CORN BRAN, WHEAT BRAN, INULIN, SUGAR, WHOLE GRAIN OATS, CRISP OATS (RICE FLOUR, WHOLE GRAIN OATS, SUGAR, MALT EXTRACT, SALT, BHT [PRESERVATIVE]), BROWN SUGAR, CORN SYRUP, TOASTED OATS (WHOLE GRAIN OATS, SUGAR, HIGH FRUCTOSE CORN SYRUP, SOYBEAN OIL, HONEY, BROWN SUGAR MOLASSES), SALT, WHEAT BITS (WHOLE GRAIN WHEAT, CORN STARCH, CORN FLOUR, SUGAR, SALT, TRISODIUM PHOSPHATE, BAKING SODA, COLOR ADDED), BARLEY MALT EXTRACT, HONEY, MODIFIED CORN STARCH, MALT SYRUP, TRIPOTASSIUM PHOSPHATE, COLOR ADDED, CINNAMON, NATURAL AND ARTIFICIAL FLAVOR, SUCRALOSE, WALNUT MEAL, ALMOND MEAL, NONFAT MILK. VITAMIN E (MIXED TOCOPHEROLS) AND BHT ADDED TO PRESERVE FRESHNESS.
VITAMINS AND MINERALS: CALCIUM CARBONATE, ZINC AND IRON (MINERAL NUTRIENTS), VITAMIN C (SODIUM ASCORBATE), A B VITAMIN (NIACINAMIDE), VITAMIN B_6 (PYRIDOXINE HYDROCHLORIDE), VITAMIN B_2 (RIBOFLAVIN), VITAMIN B_1 (THIAMIN MONONITRATE), A B VITAMIN (FOLIC ACID), VITAMIN B_{12}.
CONTAINS WHEAT, WALNUT, ALMOND AND MILK INGREDIENTS.

DISTRIBUTED BY **General Mills Cereals, LLC**
GENERAL OFFICES, MINNEAPOLIS, MN 55440 USA

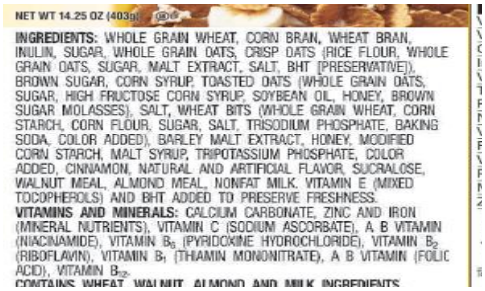
Exchange: 3 Starch
Exchange calculations based on the *Exchange Lists for Meal Planning*. ©2003 the American Dietetic Association, the American Diabetes Association.

3) Based on the nutrition facts panel on the left, how many servings of cereal would you have to consume to meet 100% of your daily requirement of iron?

_____

4) Based on the ingredient list below, which ingredient has the highest content in this product?

_____



Bread 1

Bread 2

5) Which of these two bread products (bread 1 or bread 2) shown above will provide you with more dietary fiber per serving?

_____

6) A food is considered to be a good source of fiber when the percent of daily value for fiber is _____%

7) Drinking ½ bottle of this sports drink would provide how many grams of sugar?

_____

Use the following label for Questions 8 and 9.

8) How many calories would you consume if you were to ingest the whole can of soup?

_____

9) Does one serving of this soup have a low, moderate, or high percent daily value for sodium?

Spread 1

Nutrition Facts

Serving Size: 1 tbsp (14g)
Servings Per Container: About 32

Amount Per Serving	
Calories 100	
Calories from Fat 100	
	% Daily Value*
Total Fat 11 g	**17%**
Saturated Fat 2 g	**11%**
Trans Fat 2.5 g	
Cholesterol 0 mg	**0%**
Sodium 105 mg	**4%**
Total Carbohydrate 0 g	**0%**
Dietary Fiber 0 g	**0%**
Sugars 0 g	
Protein 0 g	
Vitamin A 10 %	Calcium 0 %
Vitamin C 0 %	Iron 0 %

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Liquid Soybean Oil, Partially Hydrogenated Soybean Oil, Water, Buttermilk, Contains Less Than 2% Of Salt, Soy Lecithin, Sodium Benzoate (Preservative), Vegetable Mono And Diglycerides, Artificial Flavor, Vitamin A Palmitate, Colored with Beta Carotene (Provitamin A).
CONTAINS: MILK AND SOY

Spread 2

Nutrition Facts

Serving Size: 1 tbsp. (14 g)
Servings Per Container: Will depend on package size

Amount Per Serving	
Calories 100	
Calories from Fat 100	
	% Daily Value*
Total Fat 11 g	**17%**
Saturated Fat 4 g	**20%**
Trans Fat 0 g	
Cholesterol 15 mg	**5%**
Sodium 85 mg	**4%**
Total Carbohydrate 0 g	**0%**
Dietary Fiber 0 g	**0%**
Sugars 0 g	
Protein 0 g	
Vitamin A 4 %	Calcium 0 %
Vitamin C 0 %	Iron 0 %

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Sweet Cream, Canola Oil, Salt.
CONTAINS: MILK

10) Which of the two butter spread products (spread 1 or spread 2) has a lower amount of saturated fat per serving?

_____

Yogurt 1

Nutrition Facts
Serving Size 1 container (113g)
Servings Per Package 6

Amount Per Serving	
Calories 120	Calories from Fat 30
	% Daily Value*
Total Fat 3.5g	5%
Saturated Fat 2.5g	3%
Cholesterol 10mg	3%
Sodium 60mg	5%
Potassium 180mg	6%
Total Carbohydrate 17g	
Sugars 16g	10%
Protein 5g	

Calcium 15% • Riboflavin 15%
Not a significant source of Trans Fat, Fiber, Vitamin A, Vitamin C and Iron.

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

		Calories:	2,000	2,500
Total Fat	Less than		65g	80g
Sat Fat	Less than		20g	25g
Cholesterol	Less than		300mg	300mg
Sodium	Less than		2,400mg	2,400mg
Potassium			3,500mg	3,500mg
Total Carbohydrate			300g	375g
Dietary Fiber			25g	30g

INGREDIENTS: CULTURED GRADE A MILK, SUGAR, WATER, MILK PROTEIN CONCENTRATE, CONTAINS LESS THAN 1% OF CORN STARCH, NATURAL VANILLA FLAVOR, LIME JUICE CONCENTRATE.

CONTAINS ACTIVE YOGURT CULTURES.

Yogurt 2

Amount/Serving	%DV*	Amount/Serving	%DV*
Total Fat 0g	0%	**Potassium** 160mg	5%
Saturated Fat 0g	0%	**Total Carbohydrate** 6g	2%
Trans Fat 0g		Dietary Fiber 0g	0%
Cholesterol 10mg	3%	Sugars 6g	
Sodium 50mg	2%	**Protein** 15g	30%

Vitamin A 0% • Vitamin C 0% • Calcium 15% • Iron 0%

) are
diet.
LTURED GRADE A NON FAT MILK.
YOGURT CULTURES.

11) What ingredient is responsible for the difference in sugar content between yogurt 1 and yogurt 2?

_____

12) Look at the trans fat information on the food label above. At what amount (grams) are products required to list the amount of trans fat? _____

13) Looking at the label below, what is the cholesterol intake limit on a 2000 calorie diet?

_____

Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

14) What are two of the mandatory components on a food label?

_____
_____

15) What government agency regulates the components of a food label?

_____

Food Label Attitudes Questionnaire

Food Label Opinion Assessment

Use the following scale to answer the following five questions. Circle the number representing how you feel about each statement.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Not Sure**	**Agree**	**Strongly Agree**

1) I find the food label useful.

1 2 3 4 5

2) I believe that the food label is accurate.

1 2 3 4 5

3) I believe that nutritional claims, such as “no trans fat” or “no fat,” on the food label are truthful.

1 2 3 4 5

4) I believe that health claims, such as “diets high in soluble fiber may lower cholesterol,” on the food label are truthful.

1 2 3 4 5

5) The food label is easy to understand.

1 2 3 4 5

Food Label Usage Questionnaire

Name: _____ ID:_____ Date: _____

Food Label Usage

Use the scale below to answer following four questions. Circle the number best representing your behavior regarding food labels.

1	2	3	4	5
Never	**Rarely**	**Sometimes**	**Often**	**Always**

1) How frequently do you use the food label when purchasing a product?

   1 2 3 4 5

2) When you purchase a food product for the first time, how frequently do you look at the Nutrition Facts label on the package?

   1 2 3 4 5

3) Would you purchase a food item with a health claim statement on the front label rather than the same or similar item with no health claim statement on the label?

   1 2 3 4 5

4) When you eat a food, how frequently do you use the information on the Nutrition Facts label to help you fit that food into your daily diet?

   1 2 3 4 5

Check all of the following items that you look at when using a food label.

- Total Fat	Yes	No	- Sugar	Yes	No
- Calories	Yes	No	- Total Carbohydrates	Yes	No
- Calories From Fat	Yes	No	- Vitamin C	Yes	No
- Serving Size	Yes	No	- Calcium	Yes	No
- Saturated Fat	Yes	No	- Protein	Yes	No
- Health Claims	Yes	No	- Iron	Yes	No
- Nutritional Claims	Yes	No	- Dietary Fiber	Yes	No
- Sodium	Yes	No	- Vitamin A	Yes	No

ABSTRACT

Use of nutrition labels is associated with better diet quality. The factors that determine use of food labels have not been well identified, however, especially in college students. This study determined predictors of food label use among TCU students by recruiting 263 TCU students ages 18 through 30. Subjects completed questionnaires on food label knowledge, nutrition knowledge, attitude towards food labels, and food label use. Stepwise multiple liner regression analysis revealed that sex, regular exercise, food label attitude, food label knowledge, and nutrition knowledge were significant ($p < 0.02$) predictors of food label use ($F(5, 255) = 14.2$; $p < 0.0001$; $r^2 = 0.22$). We found that being female or exercising regularly was related to more food label use than being male or sedentary, respectively. Furthermore, butter food label attitude, food label knowledge, and nutrition knowledge were related to increased food label use. In conclusion, female gender, exercising regularly, and better food label attitude, food label knowledge, and nutrition knowledge were related to more food label use. Future studies are needed to evaluate the effect of nutrition and food label education in college students on food label use.