

Objective: This study examined the associations between overall diet quality and attitudes and behaviors regarding sustainable food practices among college students. The roles of gender and race in attitudes and behaviors regarding sustainable food practices were examined.

Methods: A cross-sectional survey was conducted with a total of 97 college students. Surveys were completed to assess the relationships between self-reported dietary intake and attitudes toward local and genetically modified foods, along with farmers' market attendance. The roles of gender and race in attitudes and behaviors regarding sustainable food practices were also examined. Independent t-tests and chi square analyses were used for statistical analysis.

Results: The overall diet quality mean score (ODQMS) was higher for students who attended farmers' markets, for those who had positive attitudes toward local food, and for those who had negative attitudes toward genetically modified food. There was a significant difference between males and females in their farmers' market attendance, attitudes toward genetically modified food, and ODQMS.

Conclusions: Diet quality of college students was associated with attitudes toward local and genetically modified foods, farmers' market attendance, and gender. Future research should focus on further understanding of relationships between sustainable food practices and healthy food choices.

INTRODUCTION

Throughout the past twenty years, the rate of obesity among Americans has increased dramatically and remains high (CDC, 2011). The greatest increases in overweight and obesity occur in people 18-29 years old, with approximately 36% of U.S. college students currently overweight or obese (Boyle & LaRose, 2008).

As a result of the growing obesity epidemic, factors related to healthy food choices have been receiving increasing attention (Moore, Diez Roux, Nettleton, & Jacobs, 2007). There are many factors involved in college students' food choices and eating habits such as taste, convenience, health, and price (Deshpande, Basil, & Basil, 2009). In addition to these factors, environmental awareness and moral obligations also influence consumer purchasing habits. People's own food values, such as attitudes toward local food, may underlie their choices for certain types of food (Dreezens, Martijn, Tenbult, Kok, & Vries, 2005). Consumers interested in sustainable food systems and viability of local agriculture may seek foods that are 'seasonal' and 'local' (Wilkins, Bowdish, & Sobal, 2000).

A recent study demonstrated a positive association between positive attitudes toward local food and healthy food choices (Zhao, Wolff, Bianco-Simeral, & Goto, 2012). In an effort to reduce the prevalence of obesity among college students, the relationships between healthy food choices and attitudes and behaviors regarding sustainable food practices should be further assessed. There is currently limited information about the overall diet quality of individuals who choose to consume local food.

Prior research indicates that gender and race are significant factors associated with certain determinants of food choices among college students. Female students tend to avoid certain foods out of concern for health, weight, or other beliefs (Mooney & Walbourn, 2001), while males appear to rate cost and taste as important determinants of food choices (Boek, Bianco-Simeral S, Chan, & Goto, 2012). Race may also impact attitudes toward taste, quality and nutritional components of foods (Boek, Bianco-Simeral S, Chan, & Goto, 2012). To date, little is known about the roles of gender and race in other determinants of food choices such as attitudes and behaviors regarding sustainable food practices.

The purpose of this study was to examine how university students' attitudes and behaviors regarding sustainable food practices were associated with overall diet quality. This study also investigated the roles of gender and race in attitudes and behaviors regarding sustainable food practices.

METHODS

Study Design

The study utilized a cross-sectional design. A survey was conducted with students from a medium-sized university in northern California. Students were conveniently recruited from campus and the sample consisted of 97 college students.

Instruments and Measures

Survey questions were derived from the National Health and Nutrition Examination Survey (NHANES) and other published literature on diet quality and

attitudes and behaviors regarding local and genetically modified foods. The instrument was a two-page self-administered questionnaire consisting of demographic characteristics, dietary behaviors, and attitudes and behaviors regarding food sustainability practices.

The survey included general demographic questions regarding participants' gender, age, ethnicity, and year in college. There was one general question regarding farmers' market attendance. Three Likert-scale questions (1= strongly agree and 5=strongly disagree) measuring attitudes toward genetically modified food were focused on purchasing behaviors, links towards ending world hunger, and safety of genetically modified food. Five Likert-scale questions assessing attitudes toward local food focused on food environment, health benefits, safety, taste factors, and the effects on animal rights. Overall diet quality was evaluated by 8 items. Participants were asked to report how often they consumed fruits, vegetables, sweets, sodas/soft drinks, fast food, ready-to-eat food, snack foods, and vitamin supplements.

Four nutrition professionals evaluated the survey instrument for content validity. To ensure the face validity of the questions, the survey was piloted among 10 college students and comments were then used to revise the survey questions. The final survey was administered by research assistants over a 2-week period. The study was approved by the University Human Subjects in Research Committee at [University: blinded for review].

Data Analysis.

Data were analyzed using SPSS version 19.0. Descriptive statistics were used to provide a description of the sample.

Cronbach's alpha was used to assess the reliability of the scale items measuring attitudes toward local food and genetically modified food. Cronbach's alpha values were 0.79 for local food and 0.88 for genetically modified foods. These values are higher than 0.70, indicating acceptable internal consistency. After examining the response frequencies, these two scale variables were collapsed into two categories, "positive" or "negative/neutral," in order to simplify interpretation of the results. The variable regarding farmers' market attendance, which included five categories ranging from "every week" to "never," was also dichotomized into "attend" and "don't attend."

In order to adopt a diet quality scale, responses of eight questions related to diet quality were standardized. A scale ranging from 1 to 6 was used for 'positive' diet quality variables: fruits, vegetables, and vitamin supplements. Variables concerning less nutritious foods (sweets, sodas/soft drinks, fast food, ready-to-eat food, snack foods) were reverse coded using the same 1 to 6 scale. By averaging the standardized score of all eight diet related questions, a composite scale representing the overall diet quality mean score (ODQMS) ranging from 1 to 6 was calculated.

Chi-square tests were used to examine the effects of gender and race on attitudes and behaviors regarding sustainable food practices (attitudes toward local food, attitudes toward genetically modified foods, and farmers' market attendance). Independent t-tests were used to examine associations between ODQMS and factors including gender, race, and attitudes and behaviors regarding sustainable food practices. ODQMS was used as a

dependent variable for the independent t-tests. Statistical significance was accepted at the level of $p \leq .05$.

RESULTS

Sample Characteristics.

The study sample ($N = 97$) consisted of 37 (38%) males and 60 (62%) females. Race composition was 59% non-Hispanic white and 41% others. The mean age of the participants was 22.4 ($SD \pm 2.5$) years, with a range of 25 to 30 years old.

Attitudes toward Local Food

While 48% of the study participants had positive attitudes toward local food, 52% of respondents had negative or neutral attitudes. Table 1 shows attitudes and behaviors regarding sustainable food practices by gender. Gender was not a significant factor associated with attitudes toward local food ($p=.064$). There was no significant difference in attitudes toward local food between non-Hispanic white and other participants.

Attitudes toward Genetically Modified Food

Overall, 59.8% of the study participants had positive attitudes toward genetically modified food and 40.2% of respondents had negative or neutral attitudes. As shown in Table 1, there was a significant difference among males and females in their attitudes toward genetically modified foods ($p=.007$), with males having more positive attitudes compared to females who were more uncertain of their attitudes. There was no significant difference in attitudes toward genetically modified food between non-Hispanic white and other participants.

Farmers' Market Attendance

While 56.3% of respondents reported attending farmers' markets, 43.8% reported that they never attended farmers' markets. As displayed in Table 1, there was a significant difference between males and females in their farmers' market attendance ($p=.006$), with females reporting higher attendance than males (68.3% to 37.1% respectively). There was no significant difference among non-Hispanic white and other participants.

Diet Quality

The average mean score of ODQMS was 4.08 (SD = 0.71). Factors associated with ODQMS are displayed in Table 2. Females had a higher overall diet quality mean score than male students ($p = .015$). As shown in Table 2, ODQMS was higher among respondents who had a positive attitude toward local food ($p = .042$). Respondents with negative/neutral attitudes toward genetically modified food had a higher ODQMS compared to those with positive attitudes ($p= .035$). ODQMS was higher among respondents who attend farmers' markets ($p = .012$). There was no significant difference among non-Hispanic whites and others related to ODQMS.

DISCUSSION

Because of the high prevalence of overweight and obesity among college students, it is important to examine factors affecting their food choices. This study examined relationships between students' attitudes and behaviors regarding sustainable food practices and healthy food choices. This study also investigated the roles gender and race play in attitudes and behaviors regarding sustainable food practices. To our knowledge, this is one of the first studies that examined associations between attitudes and behaviors regarding sustainable food practices and healthy food choices.

The present study revealed that positive attitudes and behaviors regarding sustainable food practices were significantly associated with healthy food choices among the study participants. These findings were congruent with the other study that showed a positive association between positive attitudes toward local food and overall vegetable consumption (Zhao, Wolff, Bianco-Simeral, & Goto, 2012). The present study indicates that food sustainability practices and convenient access to local foods may be critical determinants of overall diet quality.

Previous research indicates that gender and race are significant factors associated with certain determinants of food choices among college students (Boek, Bianco-Simeral, Chan, & Goto, 2012). The current study indicates that gender is a significant factor associated with attitudes and behaviors regarding sustainable food practices among college students. In comparison to males, females had more positive attitudes toward local food, had more negative attitudes toward genetically modified foods, and reported higher attendance at farmers' markets. This suggests that nutrition and health professionals should consider gender when promoting sustainable food practices.

Limitations of the study include that the data was self-reported and the sample was a convenient sample, which didn't represent a wide range of students from multiple universities. In addition, the participants were classified into white and other races for parsimony in data analysis due to the small number of participants from racial groups other than white. Future research is needed to explore possible roles of race in sustainable food practices in an ethnically diverse population.

In conclusion, this study has given insight into attitudes and behaviors regarding sustainable food practices and their relationships with overall diet quality among college

students. Food choice evolves from values and attitudes which may be influenced by factors including gender. Future research should explore a more thorough understanding of the complex food attitudes and behaviors among college students. Finally, promoting sustainable food practices among college students may allow students to make informed choices about their dietary habits and to consider how these choices might impact their own health, as well as the current and future food systems.

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Table 1. Attitudes and Behaviors regarding Sustainable Food Practices by Gender

	Male n(%)	Female n(%)	p-value
GMO			
Positive	28 (77.8)	30 (50)	0.007**
Negative/neutral	8 (22.2)	30 (50)	
Local Food			
Positive	13 (35.1)	34(56.7)	0.064
Negative/neutral	24 (64.9)	26(43.3)	
Farmers' Market Attendance			
Yes	13 (37.1)	41 (68.3)	0.006**
No	22 (62.9)	19 (31.7)	

*p values: ≤ 0.05 ** p values ≤ 0.01

Table 2. Factors associated with ODQMS

Characteristics	ODQMS¹ Mean (SD)	p-value
Gender		
Male	3.87 (0.78)	0.015*
Female	4.22 (0.63)	
Race		
Non-Hispanic white	4.03 (0.81)	0.428
Others	4.14 (0.55)	
Attitudes toward local food		
Negative/neutral	3.94 (0.74)	0.042*
Positive	4.23 (0.65)	
Attitude toward GMO food		
Negative/neutral	4.27 (0.79)	0.035*
Positive	3.97 (0.62)	
Farmers' Market Attendance		
Don't Attend	3.87 (0.73)	0.012*
Attend	4.23 (0.66)	

¹ ODQMS: overall diet quality mean score ranging from 1 to 6

*p values: ≤ 0.05