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## Positive attitudes toward organic, local, and sustainable foods are associated with higher dietary quality among young adults

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### Abstract

Scant evidence is available on the relationship between preferences for organic, local, sustainable, and non-processed foods (i.e., alternative food production practices) and dietary quality. This cross-sectional study examined the characteristics and dietary behaviors (e.g., consumption of fruit, vegetables, fast food, etc.) of young adults who reported placing low, moderate, or high importance on alternative food production practices. A diverse sample of 1,201 students at a two-year community college and a four-year public university in the Twin Cities, MN, completed the Student Health and Wellness Study survey in spring 2010. Chi-square tests examined differences in attitudes across demographic characteristics. Linear regression adjusted dietary intake across attitudes. About half (49%) of young adults placed moderate to high importance on alternative production practices, and few demographic differences across attitudes were found. Young adults who placed high importance on alternative production practices consumed 1.3 greater servings of fruits and vegetables ( $p < 0.001$ ), more dietary fiber ( $p < 0.001$ ), fewer added sugars ( $p < 0.001$ ) and less fat ( $p = 0.025$ ) than those who placed low importance on these practices. Young adults who placed high importance on alternative food production practices also consumed breakfast about one more day per week and fast food half as often as those who placed low importance on these practices ( $p < 0.001$ ). Study findings suggest that nutrition messaging around social and environmental implications of food production practices may be well received by this age group. Experimental studies are needed to investigate whether attitudes toward alternative production practices can be manipulated to improve dietary quality.

### Keywords

organic food; local food; sustainable agriculture; young adults

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Public concern over issues related to food production has increased in recent decades, as evidenced by rapid growth in food from alternative agricultural and distribution practices. Organic food and beverage sales in the U.S. increased from \$3.6 billion in 1997 to \$26.7 billion in 2010,<sup>1,2</sup> and the U.S. Department of Agriculture recorded more than 1,000 new

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farmer's markets between 2010 and 2011, bringing the total number to over 7,000.<sup>3</sup> In 2009, 54% of organic purchases were made from mainstream grocery stores, club/warehouse stores, and mass merchandisers.<sup>4</sup> Availability of local and sustainable foods is also beginning to spread to mainstream retail stores, increasing year-round availability of these products.<sup>5,6</sup>

Recent studies have characterized consumer attitudes toward organic, local, and environmentally sustainable food production in the U.S.<sup>7-21</sup> Across studies, higher educational attainment is the only demographic characteristic that has been consistently associated with organic purchases.<sup>1,17</sup> Several recent studies have found greater support for organic, local, non-genetically modified, and non-processed food among racial minorities and lower income populations,<sup>7,14,22</sup> but no consistent differences among age, race, income, or family composition have been found.<sup>1,17</sup> Consumers of organic, local, and sustainable food appear to have similar attitudes and motivations related to their purchasing decisions, including beliefs that organic or local food is healthier, more wholesome and tastes better; concerns for environmental protection, food safety, and animal welfare; and support for local economies and civic agriculture.<sup>19,20,23,24</sup>

Little evidence is available on how preferences for food from organic, local, or sustainable sources (hereafter referred to as alternative production practices) relate to dietary quality. One population-based study of adolescents found that positive attitudes toward alternative production practices were associated with higher fruit and vegetable intake and lower fat consumption.<sup>22</sup> A study with college students found increased intake of vegetables and lower intakes of high-fat dairy, high-fat meat and sweets after students took a course on societal issues related to food and food production.<sup>25</sup>

The purpose of this study was to characterize young adults' attitudes toward alternative food production practices and their association with measures of dietary quality. Based on the theoretical framework of an Integrated Behavioral Model<sup>26</sup> and previous work on adolescents and young adults,<sup>22,25</sup> it was hypothesized that individuals with positive attitudes toward alternative food production practices consume more fresh, whole foods and fewer foods processed with added sugars or fats.

## METHODS

### Study design and participants

The Student Health and Wellness Study was a cross-sectional study of nutrition- and weight-related issues among a large, diverse, convenience sample of students enrolled at a two-year community college and a large, public four-year university in the Twin Cities metropolitan area of Minnesota. Between March and May 2010, data collectors approached college students (age 17–51 years) on campus and provided them with “pass codes” to enter a secure online survey assessing diet, physical activity, weight control behaviors and personal, social, and environmental factors that may influence these behaviors. A team of experts developed the survey, which included items adapted from previous studies and formative work with young adults. All items were piloted with young adults prior to data collection. For a large proportion of items, test-retest reliability was assessed with 48 similarly-aged young adults recruited for a related study.<sup>27,28</sup> The survey took approximately 30 minutes to complete, after which participants had their height, weight, and body composition measured on campus and received a \$50 gift card for their participation. Participants were also entered in a lottery to win an iPod touch® device (Apple, Inc., Cupertino, CA). The final sample included 1,201 participants (598 two-year community college students and 603 four-year public university students). Details on the online survey design and study population have been described elsewhere.<sup>29</sup> The University of Minnesota Institutional Review Board

approved the study protocol. All participants provided informed consent prior to participation.

### Attitudes toward alternative production practices

Attitudes toward alternative production practices were assessed using five items adapted from Project EAT<sup>22</sup> asking how important it was that their food is 1) organically grown, 2) made with organic ingredients, 3) not processed, 4) locally grown, and 5) grown using sustainable agricultural practices (response options: not at all, a little, somewhat, or very). No definitions were provided; therefore, responses refer to participants' definitions of these terms. One-week test-retest evaluations indicated moderate reliability ( $Kappa=0.5-0.67$ ,  $p<0.0001$ ). These five items were chosen to represent a broad range of alternative production practices, including growing practices (organic, local, sustainable) and preparation/processing practices (made with organic ingredients, not processed) that may include non-plant based foods or products that some participants might not think of as "grown," such as flour.

The five items demonstrated high internal consistency when combined into a summative scale (Cronbach's  $\alpha=0.91$ ), which is standard practice on this and other Project EAT scales.<sup>22</sup> The scale was divided into three groups: low (scores zero to five), moderate (scores six to 10) and high importance (scores 11 to 15).

### Dietary quality

Participants self-reported dietary behaviors for the previous 30 days using two validated screeners developed by the National Cancer Institute:<sup>30</sup> 1) the Five Factor Screener, which assesses consumption of fruits and vegetables, fiber, calcium, dairy, and added sugars; and 2) a modified version of the Percentage Energy from Fat Screener,<sup>31</sup> which assesses usual intake of foods that are the most important predictors of intake of energy from fat (e.g., eggs, sausage, salad dressings, etc.). From these dietary screeners, summary variables (i.e., fruits and vegetables (servings, excluding French fries), fruits (cups), vegetables (cups, excluding French fries), dietary fiber (grams), added sugars (teaspoons), calories from fat (percent), dairy (servings) and calcium (mg)) were calculated. These summary measures have been validated to provide estimates comparable to 24-hour dietary recalls.<sup>30,32</sup>

Participants also self-reported three dietary behaviors commonly used as markers of healthy eating: breakfast consumption frequency in a typical week (range: zero to seven);<sup>33</sup> fast food consumption frequency ("During the past seven days, how often did you eat a meal at a fast food restaurant [like McDonald's, Burger King, Hardees, etc.]?" [response options: never, one or two times, three or four times, five or six times, seven times or more]);<sup>34-36</sup> and sugar-sweetened beverage consumption, measured by summing participants' responses to questions asking how often in the past 30 days they drank regular soda, fruit drinks, sports drinks, coffee drinks with added sugars, and other sweetened beverages (e.g., "sweetened teas, energy drinks, rice drinks, sugar can beverages, horchata, or other drinks with added sugar")<sup>37</sup> (response range: zero to 10 drinks/day after removing outliers).

### Socio-demographic characteristics

Socio-demographic characteristics included two-year or four-year college student, place of residence (e.g., on campus, parent home, rent/share rent, or homeowner), gender, age, and race/ethnicity. Measures of socioeconomic status included parents' highest educational attainment, difficulty living on household income (not at all or somewhat difficult ["low"] versus very/extremely difficult or impossible ["high"]) and whether students received public assistance.

## Vegetarian status

Because prior studies have found vegetarianism to be associated with better dietary quality, as well as positive attitudes toward alternative production practices,<sup>22,38</sup> self-reported vegetarian status was also examined (6% of the sample).

## Analysis

Chi-square tests examined differences in attitudes across socio-demographic characteristics. Mean dietary intake of fruits and vegetables, dietary fiber, added sugars, percent calories from fat, dairy, calcium, breakfast, fast food, and sugar-sweetened beverages were adjusted using linear regression controlling for vegetarian status and the socio-demographic characteristics described above (e.g., age, race, gender, etc.). Due to right-skewed distributions, dietary intake variables (except percent calories from fat) were log-transformed, and fast food and sugar-sweetened beverage consumption were square root-transformed. F-tests assessed differences in dietary intake across levels of attitudes ( $\alpha=0.05$ ); t-tests with a Bonferroni correction examined pairwise differences between levels in post-hoc analyses. All analyses were conducted using Stata version 10.1 (StataCorp, College Station, TX, 2009).

## RESULTS AND DISCUSSION

### Sample characteristics

Participants' mean age was  $21.9 \pm 5$  years, and 53% of the sample was female. Ninety-five percent of the sample was under 33 years of age. Racial/ethnic composition was 41% White; 19% Black; 27% Asian; and 13% other (including Hispanic) (data not shown).

### Attitudes toward alternative production practices

The percentage of participants who reported it was very important that their food was organically grown, made with organic ingredients, not processed, locally grown, or grown using sustainable agricultural practices ranged from 10 to 17% (Table 1). After combining the measures into a summative scale, nearly half (49%) of young adults placed moderate or high importance on alternative production practices (Table 2). Higher importance on alternative production practices was reported by women, those age 25 and over, vegetarians, and those living outside their parent/family home ( $p < 0.05$ ) (Table 2).

More positive attitudes among young adult women and vegetarians confirm prior results found for adolescents<sup>22</sup> and adults.<sup>14</sup> Previous research suggests that these differences may be due to greater involvement in food preparation, stronger beliefs about the role and meaning of food, and greater knowledge of alternative production practices among these groups.<sup>7,14</sup> No differences were found by race/ethnicity or socio-economic status in this sample, consistent with some other studies.<sup>14, 23</sup>

### Associations with dietary quality

After adjusting for socio-demographic characteristics and vegetarian status, participants who placed higher importance on alternative food production practices had healthier dietary patterns for most of the measures examined (Table 3). Results did not change after removing vegetarian status as a covariate (data not shown).

Young adults who placed high importance on alternative food production practices consumed on average 4.4 servings of fruits and vegetables per day. This amount was 0.7 and 1.3 servings greater than the amount consumed by those who placed moderate and low importance on alternative production practices, respectively ( $p < 0.001$ ). Participants who placed higher importance on alternative food production practices also consumed

significantly more dietary fiber ( $p < 0.001$ ), fewer added sugars ( $p < 0.001$ ) and less fat ( $p = 0.025$ ).

Significant differences in dietary behaviors were also observed; participants who reported high importance of alternative production practices ate breakfast about one more day per week ( $p < 0.001$ ) and fast food half as often (0.6 times per week versus 1.1 times per week,  $p < 0.001$ ) and consumed one-third fewer sugar-sweetened beverages ( $p = 0.001$ ) than those who placed low importance on these practices.

In the present study, no differences were found in dietary quality for dairy and calcium intake. Since three out of the five surveyed production practices referred to food that is grown in various ways, it is possible that these measures did not adequately reflect participants' preferences for production practices related to animal products such as dairy. However, the findings for other measures of dietary behaviors (i.e., breakfast, fast food, and sugar-sweetened beverage consumption) indicate that healthier eating behaviors were seen for behaviors not directly elicited by the questions. Since the survey measured overall intake of fruits, vegetables, dairy, etc., rather than intake of organic, local, or sustainable foods specifically, this study suggests that preferences for alternative production practices are associated with a wide range of generally healthy eating behaviors, regardless of whether the foods consumed are from alternative or conventional sources.

Despite these findings, average consumption of fruits, vegetables, dairy, calcium, and fiber fell short of recommended dietary intake levels in all categories of attitudes (low, moderate and high importance). National data indicate that only about 1% of 19–30 year olds eat recommended amounts of fruits and vegetables,<sup>39</sup> and young adults consume fast food and sugar-sweetened beverages at higher rates than other age groups.<sup>40,41</sup> Dietitians and health educators should be aware that young adults reporting a preference for alternative production practices might still be at risk for inadequate intake of key nutrients despite having healthier diets than their peers.

This study is among the first of its kind to examine how college students' attitudes toward alternative food production practices are associated with dietary quality. Strengths of the study include a large and diverse sample of college students, validated dietary assessment methods and robust measures of attitudes toward alternative production practices. Limitations include the following: First, the results may not be generalizable given the sample from one Midwestern metropolitan area and a convenience sampling approach, which may have resulted in a sample that was more interested in health than the general population. Second, the sample was limited to college students. It is possible that young adults who do not attend college, or those who have already graduated, exhibit different attitudes toward alternative production practices. Third, the study used cross-sectional data, prohibiting conclusions about causality. It cannot be determined from this study whether more positive attitudes toward alternative production practices result in higher dietary quality or whether young adults who maintain healthy dietary habits are more likely to prefer foods from alternative production practices. And fourth, the dietary screeners used, while validated, provide a less accurate and more limited view of dietary quality than more comprehensive dietary assessment methods such as 24-hour recalls.<sup>30</sup>

## CONCLUSIONS

Positive attitudes toward alternative production practices were common among college students in this study and were associated with higher dietary quality. As dietitians and other nutrition educators search for innovative ways to promote healthy eating, the results of this study suggest that messaging around the social and environmental implications of food

production may be well received by this age group. Incorporating these topics into health promotion efforts or college health courses may encourage healthy eating without talking about nutrition directly. While this type of “stealth” intervention has shown some promise,<sup>25,42</sup> additional research using experimental study designs is needed to investigate whether attitudes toward alternative production practices can be manipulated to improve dietary quality.

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**Table 1**

Young adults' attitudes toward alternative food production practices (Student Health and Wellness Study, n=1,201)<sup>a</sup>

How important is it to you that your food is...	Not at all		A little		Somewhat		Very	
	n	%	n	%	n	%	n	%
Organically grown	436	36.5	343	28.8	279	23.4	135	11.3
Made with organic ingredients	427	35.8	330	27.7	314	26.3	121	10.2
Not processed	325	27.4	329	27.7	329	27.7	204	17.2
Locally grown	421	35.4	342	28.8	309	26.0	116	9.8
Grown using sustainable agricultural practices	374	31.5	361	30.4	288	24.3	164	13.8

<sup>a</sup>Sample sizes vary due to missing data.

**Table 2**

Young adults' attitudes toward alternative food production practices by socio-demographic characteristics and vegetarian status (Student Health and Wellness Study, n=1,201)<sup>a</sup>

	n	Low Importance <sup>b</sup>	Moderate Importance	High Importance	P-value <sup>c</sup>
		%	%	%	
All Students	1,201	51	34	15	
<b>Gender</b>					
Male	565	54	33	13	
Female	630	47	35	18	0.02
<b>Age</b>					
Under 21	706	54	34	12	
21 to 24	313	50	34	16	
25 and older	178	39	34	28	<0.001
<b>Race</b>					
White	498	50	35	15	
Black	223	46	33	20	
Asian	326	54	36	11	
Other	154	53	30	17	0.077
<b>Student type</b>					
2-year student	598	50	33	17	
4-year student	603	51	35	13	0.185
<b>Residence</b>					
Lives on-campus	130	46	39	15	
Lives in parent/family home	579	54	33	14	
Rents/shares rent	413	49	32	19	
Owens home	67	39	48	13	0.035
<b>Highest parental educational attainment</b>					
College degree or higher	657	48	35	16	
Less than college degree	544	53	33	14	0.185
<b>Difficulty living on household income</b>					
Low	965	51	35	14	

	n	Low Importance <sup>b</sup>	Moderate Importance	High Importance	P-value <sup>c</sup>
		%	%	%	
High	223	52	29	19	0.103
<b>Public assistance receipt</b>					
No	1,089	50	34	16	
Yes	107	56	34	10	0.196
<b>Vegetarian</b>					
No	1,115	52	34	14	
Yes	69	32	28	41	<0.001

<sup>a</sup>Sample sizes vary due missing data.

<sup>b</sup>Sum of responses to the importance of food being organically grown, made with organic ingredients, not processed, locally grown, and grown using sustainable agricultural practices between 0–5 was classified as low importance, between 6–10 as moderate importance, and between 11–15 as high importance.

<sup>c</sup>P-values from  $\chi^2$  tests.

Table 3

Adjusted dietary intake and behaviors of young adults by attitudes toward alternative food production practices (Student Health and Wellness Study, n=1,201)<sup>a,b</sup>

	n	Low Importance <sup>c</sup>	Moderate Importance	High Importance	P-value <sup>d</sup>
<b>Dietary Intake</b>					
Fruits and vegetables (servings) <sup>e,f</sup>	1,117	3.1 <sup>x</sup>	3.7 <sup>y</sup>	4.4 <sup>z</sup>	<0.001
Fruit (cups) <sup>f</sup>	1,145	0.8 <sup>x</sup>	1.0 <sup>y</sup>	1.3 <sup>z</sup>	<0.001
Vegetables (cups) <sup>e,f</sup>	1,124	1.0 <sup>x</sup>	1.1 <sup>y</sup>	1.2 <sup>z</sup>	<0.001
Dietary fiber (g) <sup>f</sup>	1,071	13.1 <sup>x</sup>	14.5 <sup>y</sup>	16.3 <sup>z</sup>	<0.001
Added sugars (tsp) <sup>f</sup>	1,127	15.6 <sup>x</sup>	14.7 <sup>x</sup>	13.0 <sup>y</sup>	<0.001
Percent calories from fat	1,153	30.1	29.5	29.1	0.025
Dairy (servings) <sup>f</sup>	1,147	1.3	1.3	1.3	0.755
Calcium (mg) <sup>f</sup>	1,013	691	715	692	0.477
<b>Dietary Behaviors</b>					
Eats breakfast (days/week)	1,161	3.8 <sup>x</sup>	4.3 <sup>y</sup>	4.7 <sup>y</sup>	<0.001
Fast food (times/week) <sup>g</sup>	1,154	1.1 <sup>x</sup>	1.0 <sup>x</sup>	0.5 <sup>y</sup>	<0.001
Sugar-sweetened beverages (drinks/day) <sup>g</sup>	1,158	0.9 <sup>x</sup>	0.9 <sup>x</sup>	0.6 <sup>y</sup>	0.001

<sup>a</sup>Sample sizes vary due missing data.

<sup>b</sup>Means adjusted for gender, age, race/ethnicity, student type (2-year or 4-year), type of residence, parent educational attainment, difficulty living on household income, receipt of public assistance, and vegetarian status.

<sup>c</sup>Sum of responses to the importance of food being organically grown, made with organic ingredients, not processed, locally grown, and grown using sustainable agricultural practices between 0–5 was classified as low importance, between 6–10 as moderate importance, and between 11–15 as high importance.

<sup>d</sup>P-values from F tests.

<sup>e</sup>Excludes French fries.

<sup>f</sup>Analysis conducted on natural log scale.

<sup>g</sup>Analysis conducted on square root scale.

<sup>x,y,z</sup>Values with unlike superscript letters (x, y, z) statistically different at P<0.05 with a Bonferroni correction for three pairwise tests (P<0.0167).