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[Return to Current Issue](#)

The Difference Between Physical Activity and Nutrition Attitudes and Behaviors Among Maine High School Students

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Abstract: A study was conducted to estimate physical activity and fruits and vegetable behaviors, perceptions, and attitude among Maine high school students (n = 765). Over half (57%) reported participating in physical activity for >40 minutes per day. Only 6% reported eating five or more servings of fruits and vegetables per day. However, nearly half of the students (49%) reported eating enough fruits and vegetables "Always/Most of the time." A significant positive relationship was found between environmental indicators and daily intake of fruits and vegetables. Results highlight the need to promote fruits and vegetables consumption among high school students.

Introduction

Obesity continues to be a major health issue for Americans of all ages. The National Health and Nutrition Examination Survey (NHANES) (NCHS, 2007) showed a more than three-fold increase in the prevalence of overweight among adolescents in the past five decades (5% in 1966 vs. 17% in 2004).

In Maine, 11% of 9th-12th graders are overweight, and 14% are at risk of becoming overweight (Maine YRBS, 2005). Overweight adolescents are more likely to become overweight or obese adults, increasing the risk of adult mortality and morbidity due to chronic diseases such as arteriosclerosis, hypertension, and even certain types of cancer (Ferraro, Thorpe, Wilkinson, 2003; Freedman, Khan, Srinivasan, & Berenson, 2001).

Evidence suggests that increases in sedentary lifestyles and unhealthy diets are the major causes of the overweight/obesity epidemic in the United States (French, Story, & Jeffery, 2001; Goran & Treuth, 2001;

Hill & Peters, 1998). The NHANES study, examining children aged 8 to 16 years during the years 1988-94, reported that boys and girls who watch 4 or more hours of television each day had higher body fat and body mass index than children who watched fewer than 2 hours of television per day (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998). Giugliano and Carneiro (2004) observed a positive relationship between lack of physical activity and increased adiposity in school-age children.

Similarly, nutrition epidemiological studies found a significant association between improper adolescent nutrition, overweight/obesity, and related diseases later in life (Ogden, Flegal, Carroll, & Johnson, 2002; Cavadini, Siega-Riz, & Popkin, 2000). According to 2005 Youth Risk Behavior Survey results, 80% of high school students do not eat fruits and vegetables five or more times per day (CDC, 2006). According to the 1994-1996 Continuing Surveys of Food Intakes by Individuals (CSFII) results, average daily intake of vegetables among adolescents was 3.7 servings compared to the USDA Food Guide Pyramid recommendation of three - five servings daily (Dixon, Cronin & Krebs-Smith, 2001). Fruit intake documented in the two CSFII surveys ranged from 1.1 to 1.4 servings daily, below the Food Guide Pyramid recommendation for two - four servings daily.

The Maine YRBS (2005) reported that only 19% of Maine high school students consumed five or more servings of fruits and vegetables per day (Maine YRBS, 2005), far from the Healthy Maine 2010 goal of 35% (Healthy Maine 2010, 2002). Comparatively, a larger proportion of Maine high school students (69%) met the current physical activity recommendation of vigorous activity for 20 minutes at a time on 3 or more days per week (Maine YRBS, 2005).

A socio-ecological model suggests that environmental factors play an important role in predicting health behaviors. Review of cardiovascular health interventions by Matson-Koffman and colleagues revealed that policy and environmental strategies, which provide increased access to and availability of fruits and vegetables, led to increased intake among adults (Matson-Koffman, Brownstein, Neiner, & Greaney, 2005). Kligerman, Sallis, Ryan, Frank, and Nader (2007), studying the physical activity levels of adolescents, reported a significant association between the walkability index of the neighborhood and the moderate to vigorous physical activity levels of the study group. A nutrition education intervention among sixth graders by McAleese and Rankin (2007) revealed that in an intervention group practice learning by vegetable gardening led to increased intake of fruits and vegetables compared to the groups with nutrition education only or no nutrition education.

The primary objective of the study reported here was to estimate high school students' behaviors, perceptions, and attitudes towards physical activity and fruits and vegetables, and the relationship between these two health indicators. Additionally, analyses were conducted to estimate whether the surrounding environment affected physical activity level and fruit and vegetable consumption among high school students. Household practices such as home gardens and purchasing at farmers' markets were compared to fruit and vegetable consumption. Similarly, neighborhood connectivity was compared with the frequency of walking or biking to school and physical activity levels among youth.

Methods

Participants

Maine is a predominantly white (97%), rural state, with 60% of the population living in rural areas (U.S. Census, 2000). The survey was conducted in a high school located in one of the southwestern counties of Maine. The median household income of the town was \$34,668, below the statewide median of \$37,240. The town had a poverty level of 13%, well above the statewide level of 8% (U.S. Census, 2000). During the study year, the high school enrollment was 1,276, with 33% participating in the free or reduced school lunch

program.

Data Collection

We developed the multiple choice survey questionnaire specifically for the study. The survey gathered information about students' behaviors, perceptions, and attitudes concerning physical activity and intake of fruits and vegetables. We also asked students their perceptions about 1) family practices concerning shopping at farmers' markets and growing vegetables in home gardens, 2) the availability and quality of fruits and vegetables in local grocery stores, and 3) how well sidewalks connect the school to the surrounding area.

The questionnaire included 15 multiple choice questions at the reading grade level of 6.8 (Flesch-Kincaid method). The school health coordinator and the health education staff at the high school reviewed the survey questionnaire for its relevance and appropriateness. Most or all the comments were accepted, and, accordingly, the research team made changes in the survey questionnaire. The survey was administered in one high school located in semi-rural town in a southwestern Maine county.

School health officials administered the survey to 9th - 12th grade students during health education classes on a single day during the winter of 2006. Prior to distributing the questionnaire, health education teachers explained the purpose of the questionnaire and read each question with the options in the classroom. Students were encouraged to ask if any of the survey questions or options were not clear to them.

The research team did not seek Institutional Review Board approval for the survey because the survey collected no identifiable personal information, including name, grade, or sex. Neither individual student assent nor parental consent was sought; however, school personnel emphasized that participation in the survey was completely voluntary. On average, student took approximately 10 minutes to fill out the survey. School health administrators boxed the surveys and mailed them to the researchers for analysis.

Statistical Analyses

Data were entered and analyzed using SPSS version 14.0 (Chicago, IL). Statistical analyses consisted of frequencies and Chi-square analyses. Statistical significance was considered at $p < 0.05$.

Results

The high school enrollment at the time of the survey was 1,276 students; 765 students completed the survey, a response rate of 60%. Responses indicated that meeting physical activity recommendations was more common among high school students than meeting the fruit and vegetable recommendations (Table 1). Just over half of the respondents (51%) reported physical activity is "Very important." A slightly larger proportion (57%) reported, on average, engaging in physical activity for >40 minutes per day.

Participants were asked to select activities they do from a list of common physical activities. On average, students were involved in three (mean = 2.7) physical activities. Walking and sports such as soccer, basketball, and hockey were the most frequently reported activities. Nearly two-thirds of respondents (63%) reported doing enough physical activity "Always" or "Most of the time" (Table 1).

Addressing the question of the importance of eating fruits and vegetables every day, the majority of high school students (82%) reported it was "Very important" or "Important" (Table 1). Nearly half of the students (49%) reported eating enough fruits and vegetables "Always" or "Most of the time"; however, only 6% reported eating ≥ 5 servings of fruits and vegetables per day (Table 1).

Table 1.

Physical Activity and Fruits and Vegetables Attitude, Behavior and Perception among High School Students in Maine (n=765)

Physical Activity		Fruits & Vegetables	
Importance of Physical Activity	%	Importance of Fruits & Vegetables	%
Very important	51	Very Important	39
Important	37	Important	43
Not very Important	12	Not very important	18
Minutes Physical Activity/Day	%	Servings of Fruits & Vegetables/Day	%
> 40 minutes	57	>=5 servings	6
21-40 minutes	29	3-4 servings	29
0-20 minutes	14	<1-2 servings	65
Do you think you do enough physical activity every day?	%	Do you think you eat enough fruits and vegetables every day?	%
Always	29	Always	21
Mostly	34	Mostly	28
Sometimes	23	Sometimes	32
Never	14	Never	19

Farmers' Market and Home Fruits and Vegetables Garden

Just under half (48%) of the respondents reported it was "Very common" or "Common" for their families to buy fruits and vegetables at the local Farmers' Market. Over a third of respondents (40%) indicated that it is "Very common" or "Common" for their families to grow fruits and vegetables in a home garden. As shown in Table 2, a significant positive relationship was seen between consumption of fruits and vegetables and both the frequency of farmers' market fruit and vegetable purchases and the growing of fruits and vegetables in home gardens.

Table 2.

Association between Environmental Factors and Fruit and Vegetable and Physical Activity Behavior Among High School Students (n = 747)[§]

Fruits and Vegetables (F & V)			
Servings of F & V/Day			
Farmers Market Purchases <1-23-4>= 5 p			
Very Common	12%	18%	40%.000*
Common	33%	33%	24%
Uncommon	55%	49%	36%
Grow F&V in Home Garden p			

Very Common	10%	14%	29%	.001*
Common	26%	31%	29%	
Uncommon	64%	55%	42%	
Freshness of F&V at Local Grocery Stores <i>p</i>				
Very good	18%	24%	39%	.011*
Good	53%	52%	37%	
Fair	23%	21%	14%	
Poor	6%	3%	10%	
Variety of F&V at Local Grocery Store <i>p</i>				
Very good	21%	24%	31%	.169
Good	47%	49%	38%	
Fair	27%	22%	18%	
Poor	5%	5%	13%	
Physical Activity (PA)				
PA in minutes/per day				
Walking/Biking to School 0-20 21-40 >40 <i>p</i>				
Always/Frequently	23%	16%	20%	.167
Sometimes	14%	25%	24%	
Never	63%	59%	56%	

* Statistically significant at $P \leq 0.05$.

The analyses is conducted after excluding missing data and "Don't know" responses, hence $n = 747$.

Freshness and Variety of Fruits and Vegetables in Local Grocery Stores

To the question, "How would you rate the freshness of fruits and vegetables at local grocery stores?," the majority of students (69%) reported it as either "Good" (49%) or "Very good" (20%). To the similar question on variety, nearly two-thirds of the respondents (65%) rated the variety of fruits and vegetables as "Good" (44%) or "Very good" (21%). There was a mixed response in estimating relationship between daily intake and perceptions of quality/freshness and variety of fruits and vegetables in local grocery stores (Table 2). As shown in Table 2, perception of good or very good quality or freshness of fruits and vegetables was associated with increased intake of fruits and vegetables among high school students. However, this relationship was not seen for the availability or variety of fruits and vegetables in local grocery stores (Table 2).

Sidewalk Connectivity

Responding to the question, "How well do sidewalks connect the high school to nearby neighborhoods and businesses?," over half of respondents (57%) reported the sidewalks "Connect very well" (18%) or "Connect adequately" (39%). Over a third of respondents (35%) indicated sidewalks "Connect some parts," while less than one-tenth of respondents (8%) indicated sidewalks "Do not connect at all."

Biking and Walking

One-fifth of respondents (20%) reported "Always" or "Frequently" biking or walking to school. No significant association was seen between biking or walking to school and physical activity level among high school students (Table 2). Chi-square analysis was conducted to examine the relationships between the frequency of biking or walking to school and the perception of sidewalk connectivity. No significant relationship was seen. In other words, frequency of walking or biking to school was not related to students' perception of sidewalk connectivity in the neighborhood, ($p = 0.283$, not shown in table).

Relationship Between Physical Activity and Fruit and Vegetable Attitudes and Behaviors

We performed Chi-square analyses to examine the relationship between physical activity attitudes and behaviors, and fruits and vegetables attitudes and behaviors (Table 3). Students who reported being active for >40 minutes per day participated in a higher number of physical activities than members of the two groups who were active for <40 minutes per day ($p = .021$) (Table 3). A significantly higher percentage of active students considered physical activity "Very important" compared to less active students ($p = .000$) (Table 3). Though a higher percentage of the physically active group considered fruits and vegetables very important, intake of fruits and vegetables was nearly identical among the different physical activity levels (Table 3).

Table 3.

Relationship Between Physical Activity and Fruit and Vegetable Attitudes and Behaviors in High School Students ($n = 765$)

	Minutes of Physical Activity (PA)/Day			
	0-20	21-40	>40	<i>p</i>
Number of PA Activities				
1-2 activities	83%	58%	38%	.000*
3-4 activities	14%	34%	44%	
5-9 activities	3%	8%	18%	
PA Importance				
Very important	28%	41%	61%	.000*
Important	40%	44%	33%	
Not very important	32%	15%	6%	
Importance of Fruits & Veg.				
Very Important	31%	40%	41%	.021*
Important	40%	41%	44%	
Not very important	29%	19%	15%	
Servings Fruits & Veg./Day				
<1-2 servings	68%	65%	66%	.094
3-4 servings	31%	31%	27%	
>=5 servings	1%	4%	7%	
* Statistically significant at $P \leq 0.05$.				

Discussion and Implications

Our results show that a higher percentage of high school students meet daily physical activity recommendations than daily fruits and vegetables recommendations. Similar to Maine YRBS 2005 results, our study found a substantial difference between meeting physical activity recommendations and fruits and vegetables recommendations among high school students.

Santos, Gomes, and Mota (2005) reported that physically active adolescents were more likely to participate in moderate intensity activity than members of the physically inactive group. Similarly, in our survey, high school students who indicated being active for >40 minutes per day participated in a higher number of physical activities than youth who were active for <40 minutes per day.

Our study results indicate discordance between students' perceptions and behaviors related to fruit and vegetable intake. While nearly half of the high school students in our sample reported eating enough fruits and vegetables, only 6% indicated eating five or more servings of fruits and vegetables a day. This illustrates that high school students do not have accurate knowledge of fruit and vegetable recommendations and as a result they perceive their minimal intake as a sufficient intake.

We did not find a positive relationship between physical activity level and fruit and vegetable intake. Students meeting physical activity recommendations do not necessarily practice good nutrition behavior, shown by their low rates of fruits and vegetables consumption. Most of the participants in our survey had the perception of eating enough fruits and vegetables while they reported eating less than four - five servings per day.

A significant positive relationship was found between environmental indicators such as home vegetable gardening and daily intake of fruits and vegetables among youth. This indicates that the surrounding environment affects fruit and vegetable intake. Further research is needed to evaluate the effectiveness of environmental strategies to improve fruits and vegetables intake among high school students.

These findings point to a greater need to focus on nutrition education with this age group. Increasing physical activity among youth who do not meet the current physical activity recommendations remains an important goal; however, the extremely low proportion of youth (6%) consuming ≥ 5 servings of fruits and vegetables per day illustrates the critical need to focus on increasing fruit and vegetable consumption among this age group.

Structured physical activity opportunities at school, including school sponsored sports programs, help youth to meet physical activity recommendations. But in the case of nutrition, there are no structured programs at school to promote healthy eating and meet dietary recommendations. Through different Extension programs, including 4-H and agriculture and natural resources, Extension educators have a unique ability to work with school-aged youth at both the individual and community levels.

Limitations

There are a number of limitations to the study. The survey developed for the study was not validated or tested for reliability. The anonymous nature of the survey prevented sorting sample data by grade level, age, gender, or any other demographic variable. All sub-setting of the sample is based on responses to survey questions. Our findings offer a snapshot of high school youth in a rural Maine town with minimal or no ethnic diversity; hence the external validity of the study is limited.

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