Original Research

Multiple Sociodemographic and Socioenvironmental Characteristics Are Correlated with Major Patterns of Dietary Intake in Adolescents

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ABSTRACT

Background Few studies have used dietary pattern analysis, a useful method to summarize dietary intake, in adolescents.

Objective Examine sociodemographic and socioenvironmental correlates of habitual dietary patterns.

Design Data for this cross-sectional/prospective analysis were drawn from Project EAT (Eating Among Teens), a population-based study.

Subjects/setting Project EAT-I (Time 1), collected data on 4,746 adolescents in 1998-1999. Project EAT-II (Time 2) resurveyed 53% (n=2,516) of the original cohort 5 years later in 2003-2004. Dietary intake was assessed using the Youth/Adolescent Food Frequency Questionnaire.

Main outcome measures/statistical analysis performed Factor analysis identified four dietary patterns at Time 1 (vegetable, fruit, starchy food, and snack food) and Time 2 (vegetable and fruit, fast food, starchy food, and snack food). Linear regression was used to examine the relationship of Time 1 socioeconomic status and race (mutually adjusted) on factor scores for each dietary pattern, and then of Time 1 socioenvironmental characteristics (adjusted for socioeconomic status and race) on these factor scores.

Results In prospective analyses, socioeconomic status, family meal frequency, and home availability of healthy food were positively associated with the vegetable and fruit and starchy food patterns and inversely associated with the fast food pattern. Home availability of unhealthy food was inversely associated with the vegetable and fruit and starchy food patterns and positively associated with the fast food and snack food patterns. Maternal, paternal, and peer support for healthy eating were positively associated with the vegetable and fruit pattern and inversely associated with the fast food pattern. Similar associations were seen in cross-sectional analyses.

Conclusions Multiple correlates of dietary patterns were identified. Health professionals should target these factors to improve the dietary quality of habitual eating practices in adolescents by encouraging parents to decrease home availability of unhealthy food while increasing availability of healthy food, family meal frequency, and parental support for healthy eating.
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Few youth consume a diet that aligns with current dietary guidelines, especially with respect to fruit and vegetable intake (1). The poor dietary intake exhibited by many adolescents is of concern given the high prevalence of obesity and other health-related outcomes associated with diet (2). The development of healthy eating habits is critical in this age group to decrease disease risk in adulthood (3). Understanding characteristics of adolescents with less-than-optimal diets is crucial for developing more targeted and effective interventions focused on improving dietary intake.

Adolescent eating behavior is a function of multiple levels of influence, and Social Cognitive Theory and ecologic models can be helpful in understanding the different levels of influence (4). One important level of influence is an adolescent's social environment (4). Peers can have a significant influence on an adolescent's eating behavior (4). Adolescents spend a substantial amount of time with their peers and eating is often an important part of this socializing (4). In addition, adolescents eat the majority of their meals and snacks at home, and families influence eating behavior by being the provider of food while also influencing attitudes, preferences, and values surrounding food (4). Sociodemographic factors such as income, education level, and race can influence all of the above.

Adolescent dietary intake has customarily been examined in terms of single foods or nutrients, but dietary pattern analysis has recently emerged as an important alternative to these traditional methods (5-7). The dietary pattern approach has intuitive appeal because the human diet does not consist of a single nutrient or food,

Table 1. Study characteristics of the Time 1 Project EAT (Eating Among Teens) cohort by age and sex subgroup

	High School		Middle School	
	Girls	Boys	Girls	Boys
Characteristic	(n=1,154)	(n=1,168)	(n=465)	(n=453)
	← *mean ± standard deviation* →			
Age (y)	15.8±0.8	15.9±0.8	12.8±0.8	12.9±0.8
Body mass index	23.7±4.8	23.6±4.5	22.2±4.8	21.8±5.0
Energy intake (kcal/d)	1,871±829	2,251±1,071	2,199±1,153	2,302±1,151
	← *%* →			
Weight status[a]				
Underweight	4.4	5.3	4.0	5.1
Average weight	65.4	64.6	60.6	63.3
Overweight	19.7	14.8	20.5	15.0
Obese	10.4	15.2	14.9	16.7
Race/ethnicity				
White	60.1	65.2	40.7	41.0
Black	12.0	11.4	15.1	17.7
Hispanic	3.2	4.7	6.7	8.7
Asian	19.8	15.0	23.5	24.2
Hawaiian/Pacific Islander	0.4	0.5	0.0	0.4
Native American	2.0	1.5	7.3	4.4
Mixed	2.5	1.7	6.7	3.6
Socioeconomic status				
Low	16.0	11.6	20.8	17.4
Middle low	19.8	17.4	18.1	17.7
Middle	25.2	22.8	24.3	30.7
Middle high	24.9	32.3	20.8	19.0
High	14.1	15.9	16.1	15.1

[a]Weight status classified using sex- and age-specific cutoff points based on reference data from the Centers for Disease Control and Prevention growth chart tables (41-43).

but instead represents a complex set of highly correlated dietary exposures (8,9). Statistical methods such as factor analysis are often used to derive empirical dietary patterns, and can be a useful technique to summarize dietary intake and relate that intake to specific characteristics of a research population (3,10). Few studies have examined dietary patterns in adolescents, especially in the United States. This approach has been used successfully in multiple adult populations and additional research in adolescent populations is warranted (3).

To our knowledge, only four other studies have examined characteristics associated with dietary patterns in adolescent populations, and all took place outside of the United States (10-13). These studies examined sociodemographic (10-13) and lifestyle characteristics (12,13), but none examined the association between socioenvironmental characteristics and dietary patterns. Our study contributes to the literature by examining both sociodemographic and modifiable socioenvironmental characteristics associated with specific habitual dietary patterns of adolescents. It is one of only a handful of studies to identify dietary patterns in adolescents in the United States, and has the benefit of a large and ethnically and socioeconomically diverse cohort.

The primary aim of this study was to investigate the cross-sectional and prospective relationship between baseline sociodemographic and socioenvironmental char-

acteristics and habitual dietary patterns identified at baseline and 5 years later. Understanding the characteristics of adolescents consuming specific dietary patterns is crucial. This knowledge will help determine what subgroups and specific modifiable characteristics should be targeted in dietary interventions, ultimately increasing the influence and efficiency of these interventions.

METHODS
Study Design and Population
Project EAT (Eating Among Teens) is an observational study of the socioenvironmental, personal, and behavioral determinants of dietary intake and weight status among a large and ethnically diverse adolescent population. In Project EAT-I (Time 1), 4,746 middle school and high school students in 31 Minnesota schools completed in-class surveys and anthropometric measures during the 1998-1999 academic year. Trained Project EAT staff administered surveys and measurements. Project EAT-II (Time 2) aimed to resurvey all original participants 5 years later, in 2003-2004. During this follow-up, 2,516 participants completed mailed surveys, representing 69% of those who could be contacted, and 53% of the original cohort. Study characteristics of the Project EAT cohort can be found in Table 1. The University of Minnesota's Institutional Review Board Human Subjects Committee