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## The Association of Meal Practices and Other Dietary Correlates With Dietary Intake Among High School Students in the United States, 2010

**Zewditu Demissie, PhD, MPH,**

Epidemic Intelligence Service and the Division of Adolescent and School Health at the Centers for Disease Control and Prevention, Atlanta, GA 30333

**Danice K. Eaton, PhD, MPH,**

Division of Adolescent and School Health; National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; Centers for Disease Control and Prevention; 1600 Clifton Road MS E-75; Atlanta, GA 30333;

**Richard Lowry, MD, MS,**

Division of Adolescent and School Health; National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; Centers for Disease Control and Prevention; 1600 Clifton Road MS E-75; Atlanta, GA 30333;

**Sonia A. Kim, PhD,**

Division of Nutrition, Physical Activity, and Obesity; National Center for Chronic Disease Prevention and Promotion; Centers for Disease Control and Prevention; 4770 Buford Hwy NE MS K-77; Atlanta, GA 30341;

**Sohyun Park, PhD [Epidemiologist],**

Division of Nutrition, Physical Activity, and Obesity; National Center for Chronic Disease Prevention and Promotion; Centers for Disease Control and Prevention; 4770 Buford Hwy NE MS K-77; Atlanta, GA 30341;

**Kirsten A. Grimm, MPH,**

Division of Nutrition, Physical Activity, and Obesity; National Center for Chronic Disease Prevention and Promotion; Centers for Disease Control and Prevention; 4770 Buford Hwy NE MS K-77; Atlanta, GA 30341;

**Caitlin Merlo, MPH, RD,**

Division of Population Health; National Center for Chronic Disease Prevention and Promotion; Centers for Disease Control and Prevention; 4770 Buford Hwy NE MS K-78; Atlanta, GA 30341;

**Diane M. Harris, PhD, MPH, CHES**

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corresponding author: Epidemic Intelligence Service; Centers for Disease Control and Prevention; Atlanta, GA 30333, Division of Adolescent and School Health; Centers for Disease Control and Prevention; 1600 Clifton Road MS E-75; Atlanta, GA 30333; [izj5@cdc.gov](mailto:izj5@cdc.gov); Phone 404-718-8138; Fax 404-718-8010.

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Division of Nutrition, Physical Activity, and Obesity; National Center for Chronic Disease Prevention and Promotion; Centers for Disease Control and Prevention; 4770 Buford Hwy NE MS K-77; Atlanta, GA 30341;

## Abstract

**Purpose.**—To examine behavioral and environmental factors that may be related to dietary behaviors among U.S. high school students.

**Design.**—Data were obtained from the 2010 National Youth Physical Activity and Nutrition Study, across-sectional study.

**Setting.**—The study was school-based.

**Subjects.**—Study subjects were a nationally representative sample of students in grades 9 to 12 (n=11,458).

**Measures.**—Variables of interest included meal practices, in-home snack availability, and intakes of healthful foods/beverages (fruits, vegetables, water, and milk) and less healthful foods/beverages (fried potatoes, pizza, and sugar-sweetened beverages).

**Analysis.**—Sex-stratified logistic regression models were used to examine associations of meal practices and snack availability with dietary intake. Odds ratios (ORs) were adjusted for race/ethnicity and grade.

**Results.**—Eating breakfast daily, frequent family dinners, and bringing lunch from home were associated with higher odds of consuming at least three healthful foods or beverages. High fast-food intake was associated with lower odds of healthful dietary intake and higher odds of sugar-sweetened beverage intake (female OR=3.73, male OR=4.60). Students who mostly/always had fruits and vegetables available at home had increased odds of fruits (female OR=3.04, male OR=2.24), vegetables (female OR=2.12, male OR=1.65), water (female OR=1.82, male OR=1.85), and milk intake (female OR=1.45, male OR=1.64).

**Conclusion.**—Encouraging daily breakfast consumption, frequent family dinners, and fruit and vegetable availability at home may lead to higher intakes of healthful foods among high school students.

## Keywords

Adolescent; Behavior; Diet; Meals; Schools; Prevention Research

## PURPOSE

Unhealthy dietary behaviors— such as low consumption of fruits, vegetables, and fiber and high consumption of high-fat foods, refined carbohydrates, sweets, and desserts— play an important role in increasing risks for obesity and various chronic diseases such as type 2 diabetes, cardiovascular disease, osteoporosis, and some cancers.<sup>1-4</sup> Additional health concerns related to unhealthy dietary intake include iron deficiency, eating disorders, malnutrition, poor bone health, and dental caries.<sup>5</sup> Inadequate nutrition during adolescence, a time when total nutrient requirements are higher than any other stage in life, can also

negatively affect growth and delay sexual maturation.<sup>6</sup> Further, adolescence is an important time period to encourage healthy dietary behaviors because these behaviors may continue into adulthood.<sup>7</sup>

The *Dietary Guidelines for Americans, 2010* recommends a diet rich in fruits, vegetables, low-fat and fat-free dairy products, and whole grains with limited intake of calories from solid fats and added sugars.<sup>1</sup> However, the majority of adolescents do not meet the minimum recommendations for fruit, vegetable, and dairy intake and their solid fats and added sugars intake exceeds the maximum discretionary energy allowance.<sup>8,9</sup> Pizza is the leading source of solid fats, and sugar-sweetened beverages (SSBs) are the main source of added sugars among U.S. adolescents.<sup>10</sup>

Dietary intake is influenced by a variety of biological, social, and physical determinants.<sup>11</sup> Previous literature indicates differences in adolescent eating behaviors by sex, specifically fruit, vegetable, dairy, and essential vitamin and mineral intake.<sup>5</sup> Trends over time in eating practices include decreasing meal frequency, increasing meal skipping, increasing snacking, and increasingly obtaining meals from outside the home.<sup>12,13</sup> These practices are related to poorer diet quality because they are associated with one or more of the following factors — overeating (i.e., due to increased hunger resulting from food restraint), lower nutritional value, higher energy intake, and higher intakes of less healthful foods and beverages.<sup>12,13</sup> Eating breakfast on a regular basis and participating in frequent family dinners are associated with healthful dietary intake while fast food and foods eaten away from home are associated with less healthful dietary intake among adolescents.<sup>13–15</sup>

The food environment also influences diet quality among adolescents. For example, research has indicated that the home environment influences fruit and vegetable intake.<sup>7</sup> One of the strongest correlates of fruit and vegetable intake among adolescents is availability of fruits and vegetables in the home.<sup>16</sup> However, students spend more time in schools than any other environment outside of the home, and a substantial proportion of total energy intake is consumed at school.<sup>17</sup> Thus, schools are an important setting to influence students' diets through foods that are available during the school day, especially during meal times.

It is necessary to understand the behavioral and environmental correlates of dietary intake among adolescents in order to develop effective strategies for improving nutrition among this age group. Therefore, the objective of this cross-sectional study was to examine how individual behaviors and environmental dietary factors are associated with dietary intake among U.S. high school students. Though studies have looked at these types of associations previously,<sup>16,18–21</sup> this study adds to the literature by detailing results from a large, nationally representative sample of adolescents enrolled in both public and private schools. Further, while previous studies tend to report on a limited number of dietary correlates and/or outcomes, this study examines a larger number of factors and outcomes in a single study.

## METHODS

### Design and Sample

The National Youth Physical Activity and Nutrition Study (NYPANS), the data source for this analysis, was conducted by the Centers for Disease Control and Prevention (CDC) in 2010. NYPANS included a self-administered survey assessing physical activity and dietary behaviors and correlates of these behaviors among a nationally representative, cross-sectional sample of U.S. high school students.

A three-stage cluster-sample design that oversampled African-American/black and Hispanic/Latino students was used to obtain a nationally representative sample of public and private school students in grades 9–12 in the U.S. In each participating school, one or two classrooms from either a required subject (e.g., English or social studies) or a required period (e.g., homeroom or second period) were randomly selected. All students in selected classes were eligible to participate. The school response rate was 82% and the student response rate was 89%, resulting in an overall response rate of 73%. After excluding 29 questionnaires that failed quality control, data from 11,429 students were available for analysis.

Parental permission was obtained before survey administration following local procedures and participation by schools and students was voluntary. Students anonymously completed the self-administered, 120-item questionnaire in their classrooms during a regular class period in the spring of 2010. Responses were recorded directly on a computer-scannable questionnaire booklet. This study was approved by the study contractor's (ICF Macro) institutional review board.

### Measures

The NYPANS questionnaire included items assessing behavioral and environmental correlates of dietary intake, including meal frequency, meal practices at home and at school, and snack availability at home. Students were specifically asked about frequencies of breakfast, lunch, and dinner consumption, eating dinner with a parent or guardian, and fast food consumption during the past week. They were also asked about their usual school lunch source, how often they brought their own lunch to school from home, and their usual dinner location. Item wording and response coding can be found in Table 1. The questionnaire was developed based on extensive literature reviews and consultation with topic experts from CDC, other federal agencies, and academic institutions. Questionnaire items developed specifically for this study were subjected to cognitive testing, which resulted in the revision or deletion of problematic questions.

The outcome of interest was dietary intake. The NYPANS questionnaire included six questions to determine students' fruit and vegetable intake during the 7 days before the survey; students were asked about their consumption of 100% fruit juices, fruit, green salad, carrots, potatoes (not counting French fries, fried potatoes, or potato chips), and other vegetables. Other dietary intake variables used in this analysis included intake of French fries or other fried potatoes, pizza, regular soda or pop, sports drinks, energy drinks, other SSBs, water, and milk. With the exception of milk, the response options for the dietary

behavior questions were: none, during the past 7 days, 1 to 3 times during the past 7 days, 4 to 6 times during the past 7 days, 1 time per day, 2 times per day, 3 times per day, and 4 or more times per day. The response options for milk used the word “glasses” instead of “times.”

“Past 7 day” response option values were divided by 7 to determine daily intake. The number of times/day during the past 7 days a student drank 100% fruit juices and ate fruit were summed to represent total fruit intake. This was categorized into <2 and ≥2 times/day as derived from Healthy People 2010 objectives, the national objectives during the study period.<sup>22</sup> The number of times/day during the past 7 days a student ate green salad, carrots, potatoes (not counting French fries, fried potatoes, or potato chips), and other vegetables were summed to represent total vegetable intake. This was categorized into <3 and ≥3 times/day as derived from Healthy People 2010 objectives.<sup>22</sup> The *Dietary Guidelines for Americans, 2010* defines sugar-sweetened beverages as “liquids that are sweetened with various forms of sugars that add calories. These beverages include, but are not limited to, soda, fruit ades and fruit drinks, and sports and energy drinks.”

Responses to regular soda or pop, sports drinks, energy drinks, and other SSB questions were summed to represent total SSB intake and categorized into <3 times/day and ≥3 times/day. This cutpoint was based on a study of Americans aged 2 years and above which found that the estimated 90th percentile of energy intake from SSB on any given day was 450 kcal (equivalent to three 12-oz cans of soda).<sup>23</sup> Cutpoints for milk and water are similar to those previously published.<sup>24,25</sup> Item wording and response coding for all dietary intake variables can be found in Table 2.

Dietary intake variables were categorized into two overarching categories: healthful and less healthful. Higher intakes of fruit, vegetables, water, and milk were considered healthful. Higher intakes of fried potatoes, pizza, and SSBs were considered less healthful.<sup>1</sup> Although the milk question does not specify fat content (e.g., low-fat/fat free), we included milk in the healthful category based on the content of key nutrients (e.g., protein, vitamin D, and calcium).

## Analysis

Analyses were conducted on weighted data from 11,429 students using SUDAAN (version 10.0, 2008, RTI International), a software package that accounts for the complex sampling design. Bivariate analysis was conducted to determine the prevalence and 95% confidence intervals (CIs) of dietary correlates and dietary intake and  $\chi^2$  tests were performed to determine sex differences. A p-value <0.05 was considered statistically significant. Multivariable logistic regression models, adjusted for race/ethnicity and grade, were used to estimate adjusted odds ratios (ORs) and 95% CIs for associations between dietary correlates and dietary intake. Preliminary analyses showed sex differences in associations between dietary correlates and intake and therefore analyses were stratified by sex. Additional multivariable logistic regression analysis was conducted to explore in more detail the association between school lunch source and dietary intake among students who usually got lunch at school.

## RESULTS

The demographic distribution of students was 49.4% female; 57.7% non-Hispanic white, 14.9% non-Hispanic black, 18.9% Hispanic, and 8.5% of other race/ethnicity; 27.8% in 9<sup>th</sup> grade, 25.9% in 10<sup>th</sup> grade, 23.8% in 11<sup>th</sup> grade, and 22.5% in 12<sup>th</sup> grade (data not shown).

The prevalence (and 95% CIs) of dietary correlates and intake by sex are presented in Table 3. Regarding correlates, male students were significantly more likely than female students to eat breakfast, lunch, and dinner every day during the past 7 days; usually get a complete school lunch when they get lunch at school; and eat fast food. Male students were significantly less likely than female students to bring their lunch from home. No sex differences were found for eating dinner at home, eating dinner with a parent or guardian 5–7 days during the past 7 days, and snack availability at home.

Regarding dietary intake, male students were significantly more likely than female students to consume fruits 2 times/day, fried potatoes 1 time/day, pizza 1 time/day, SSBs 3 times/day, and 2 glasses of milk/day. No sex differences were found for eating vegetables 3 times/day and drinking water 3 times/day.

### Associations Between Dietary Correlates and Dietary Intake: Female Students

The adjusted ORs and 95% CIs for the associations between dietary correlates and dietary intake among female students are presented in Table 4. Both eating breakfast 7 days/week and most of the time/always having fruits and vegetables to snack on in the home were associated with significantly higher odds of all four healthful dietary intake variables. Bringing lunch to school from home 4–5 days during an average week and eating dinner with a parent or guardian 5–7 days during the past week was associated with increased odds of three healthful dietary intake variables (consuming fruits 2 times/day, vegetables 3 times/day, and water 3 times/day). Eating at least one meal/snack from a fast food restaurant 4–7 days during the past week was significantly associated with lower odds of all four healthful dietary intake variables. Usually getting a complete school lunch, eating fast food 1–3 days during the past week, and most of the time/always having chips, cookies, or cakes to snack on in the home were associated with lower odds of three dietary intake variables (consuming fruits 2 times/day, vegetables 3 times/day, and water 3 times/day).

Eating at least one meal/snack from a fast food restaurant 4–7 days during the past week was associated with higher odds of all less healthful dietary intake variables. Usually eating dinner at home and most of the time/always having fruits and vegetables at home were significantly associated with lower odds of all three less healthful dietary intake variables.

### Associations Between Dietary Correlates and Dietary Intake: Male Students

The adjusted ORs and 95% CIs for the associations between dietary correlates and dietary intake among male students are presented in Table 5. Eating breakfast 7 days during the past week, bringing lunch to school from home on 1–3 days during an average week, and most of the time/always having fruits and vegetables to snack on in the home were significantly associated with higher odds of all four healthful intake variables. Eating dinner with a parent or guardian 5–7 days during the past week was significantly associated with higher odds of

three healthful intake variables (consuming fruits 2 times/day, water 3 times/day, and milk 2 glasses/day). No correlate was associated with lower odds of all four healthful dietary intake variables. Eating at least one meal/snack from a fast food restaurant 1–3 days during the past week was significantly associated with lower odds of consuming fruits 2 times/day, vegetables 3 times/day, and water 3 times/day.

Eating at least one meal/snack from a fast food restaurant 4–7 days during the past week was significantly associated with higher odds of all three less healthful dietary intake variables while usually eating dinner at home was significantly associated with lower odds of all three of these variables.

### **School Lunch Choice: Female and Male Students**

Results of the sex-stratified associations between usual school lunch choice and dietary intake among students who get lunch from school (73.1% of the total NYPANS sample) are presented in Table 6. Among both female and male students, compared to students who usually got a complete school lunch when they got lunch at school, usually getting lunch from the salad bar was significantly associated with higher odds of consuming fruits 2 times/day and vegetables 3 times/day. Among female students, usually getting lunch from the salad bar was also significantly associated with higher odds of consuming water 3 times/day. Among male students, usually getting à la carte items for lunch was significantly associated with lower odds of consuming fruit 2 times/day, water 3 times/day, and milk 2 times/day. Among both female and male students, usually getting fast food from the school cafeteria was significantly associated with higher odds of all less healthful dietary intake variables. Among male students, getting fast food from the school cafeteria was also associated with higher odds of eating vegetables 3 times/day and lower odds of drinking milk 2 times/day.

## **DISCUSSION**

This study found that some individual and environmental factors among adolescents were consistently associated with components of a healthful diet, while others were associated with components of a less healthful diet. For both male and female students, eating breakfast 7 days during the past week, bringing lunch to school from home, usually eating dinner at home, eating dinner with a parent or guardian 5–7 days during the past week, and most of the time/always having fruits and vegetables to snack on in the home were mostly associated with healthful dietary behaviors; eating at least one meal/snack per week from a fast food restaurant and most of the time/always having chips, cookies, or cakes to snack on in the home were largely associated with less healthful dietary behaviors.

In the present study, eating breakfast 7 days during the past week was associated with higher odds of all healthful dietary intake variables and lower odds of drinking SSBs 3 times/day. These results support previous research demonstrating health benefits associated with regular breakfast consumption, which include better diet quality and making better dietary choices throughout the day.<sup>27,28</sup>

When eating lunch at school, students' choices include bringing lunch from home, participating in the federally sponsored National School Lunch Program, or choosing competitive foods (foods and beverages that are offered outside the school meal program).<sup>28</sup> Consistent with findings from the present study, a previous study found that lunches brought from home were associated with diets that were considered more healthful.<sup>20</sup> In that study, adolescent students who brought their lunch from home on a regular basis ate less fast food, fried potatoes, and high-sugar foods; drank less soda; and ate more fruits and vegetables than students who never brought their lunch to school.<sup>20</sup> A more recent study among younger students found contradictory results, however.<sup>29</sup> More research is needed to better understand the quality of lunches brought from home and the association between these meals and dietary intake among students in different age groups.

In the current study, usually getting a complete school lunch (as compared to all other school lunch options) was positively associated with only one healthful dietary intake variable, drinking 2 glasses of milk/day. It was also negatively associated with pizza intake among both sexes and negatively associated with the three other healthful dietary intake variables among female students. Although the third School Nutrition Dietary Assessment Study (SNDA-III) showed that students who participate in the school lunch program are more likely than non-participants to drink milk, SNDA-III also found that students eating school lunch were more likely to eat fruits and vegetables and less likely to eat desserts, snacks, and beverages that are not milk or 100% juice at lunch;<sup>30</sup> findings that appear in contrast to the current study. Possible explanations for these contrasting findings are that the SNDA-III study collects data only from public schools, reports dietary intake during school meal times (not the complete day), and used a 24-hour dietary recall (which measures a different aspect of individual dietary intake than the NYPANS). While findings from the current study indicate that students who get a complete school lunch may be less likely to eat fruits 2 times/day and/or vegetables 3 times/day, school lunches can still be an important source of fruits and vegetables, especially for students who may not have easy access to fruits and vegetables outside of school.

When looking in more detail at the associations of various school lunch choices and dietary intake among students who got lunch from school, we found that students who usually got lunch from the salad bar had higher odds of eating fruits 2 times/day and vegetables 3 times/day compared to students who usually got a complete school lunch. Competitive foods tend to be less nutritious and more energy-dense than complete school lunch programs and are not recommended as a regular lunch choice,<sup>33,34</sup> but salad bars appear to be a healthful lunch choice that may be incorporated into the school lunch program or provided as an alternative. Additionally, new changes to the school meal requirements and pending nutrition standards for competitive foods will help to improve the nutritional quality of food and beverages available to students during the school day including more fruits, vegetables, and whole grains.<sup>35</sup>

Similar to our findings, previous research has also indicated that frequent family dinners are associated with better nutrition and more healthful eating patterns during adolescence, with meals consisting of more fruits and vegetables, more dairy products, higher vitamin intake, less fried foods, less soda, and less fat.<sup>13-15</sup> Further, research shows that adolescents



who frequently eat dinner with their family are more likely to have better diet quality and meal patterns in young adulthood.<sup>21</sup> Therefore, families can consider eating together given its positive association with dietary quality.

Fast food restaurants are one common source of food away from home. In our study, getting at least one meal/snack from a fast food restaurant 4–7 days during the past week was associated with lower odds of all healthful dietary intake variables (except milk intake among male students) and higher odds of all less healthful dietary intake variables. Foods from fast food restaurants are large in portion size and have contribute to overall diets of poorer nutritional quality (e.g., high calories, fat, and sodium and low fiber).<sup>7,13–15</sup> According to previous research, fast food consumption is associated with higher intake of SSBs and lower intakes of fruits, vegetables, and milk.<sup>7,14,15,24</sup> Limiting fast food among adolescents therefore may lead to more healthful dietary intake.

Parents can influence the dietary behaviors of their children through the home environment by deciding which foods are available in the home. Similar to the current study, the literature has shown that the availability of healthful foods is associated with higher fruit and vegetable intake while the availability of less healthful foods is associated with lower intake of fruits and vegetables and higher intakes of energy-dense foods, both cross-sectionally and prospectively.<sup>18,36,37</sup> Therefore, it may be important to both provide access to healthful food items as well as limit the availability of less healthy ones.

In general, the direction of the associations was the same for both female and male students. Overall, there were a greater number of significant associations between dietary correlates and dietary behaviors among female students as compared to male students. However, there were some differences by sex in which associations were significant. Different significant associations were also observed in the detailed school lunch choice analysis; however, there were a greater number of significant associations among male students as compared to male students. These results are novel in that few previous studies have examined associations by sex. This may suggest that dietary correlates impacts female and male students differently. However, future research would be needed to further explore this. One study of Brazilian adolescents that did examine sex differences also found correlates of junk food and healthy food differed by sex.<sup>38</sup>

This study is subject to at least six limitations. First, NYPANS data are cross-sectional; therefore, causality and directionality cannot be concluded. Second, psychometric testing was not conducted for questionnaire items included in this analysis; therefore validity and reliability information is unavailable. Third, the data used in this study are self-reported; students may underreport or overreport their behaviors and may not accurately categorize their usual school lunch choice. A fourth limitation is that usual school lunch categories may overlap; a salad bar can be part of a complete school lunch. A fifth limitation is that NYPANS does not provide data on socioeconomic status, a correlate of daily dietary intake that could be controlled for in analyses. Finally, these data apply only to adolescents who attend school and therefore may not be representative of all persons in this age group. Nationwide, in 2009, of persons aged 16–17 years, approximately 4% were not enrolled in a high school program and had not completed high school.<sup>39</sup> One particular strength of this

study is that, in contrast to much of the literature, it examines a variety of dietary correlates with multiple dietary intake outcomes— both healthful and less healthful.

## Conclusion

The present study reports on individual and environmental factors related to four healthful dietary intake variables— fruits, vegetables, milk, and water— and three less healthful dietary intake variables— fried potatoes, pizza, and SSBs. The results from this study suggest that meal frequency, meal practices, and snack availability may all contribute to the dietary consumption of adolescents. If changing these factors can change adolescent diets needs to be evaluated in future research studies. Encouraging daily breakfast consumption, frequent family dinners, and fruit and vegetable availability at home may lead to higher intakes of healthful foods among high school students. Parents can support healthful adolescent food and beverage intake by providing a social and physical home environment supportive of healthful choices. Schools can help contribute to students' fruit and vegetable intake by providing a salad bar at lunch. These findings may be useful to health promotion practitioners by suggesting targets for health promotion messages and activities.

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## **SO WHAT? Implications for Health Promotion Practitioners and Researchers**

### **What is already known on this topic?**

Previous literature provides evidence that dietary intake is influenced by a variety of social and physical determinants among adolescents. Adolescence is an important time period to encourage healthy dietary behaviors because these behaviors may continue into adulthood.

### **What does this article add?**

This cross-sectional, school-based study found that both individual meal practices (eating breakfast daily, frequent family dinners, and bringing lunch from home) and environmental factors (fruit and vegetable availability at home) are associated with healthful dietary intake. The study also reports sex differences in significant associations between different school lunch options and dietary intake.

### **What are the implications for health promotion practice or research?**

The study findings suggest that opportunities at home and school can help promote healthful dietary choices among students. The findings also suggest targets for health promotion messages and activities.

Table 1

Question Wording, Response Options, and Analytic Coding for Included Correlates of Dietary Behaviors—National Youth Physical Activity and Nutrition Study, 2010

Correlate	Questionnaire Item	Response Options	Analytic Coding
<i>Meal frequency</i>			
Breakfast	During the past 7 days, on how many days did you eat <b>breakfast or a morning meal</b> ?	0–7 days	<7 days (referent) vs. 7 days
Lunch	During the past 7 days, on how many days did you eat <b>lunch</b> ?	0–7 days	<7 days (referent) vs. 7 days
Dinner	During the past 7 days, on how many days did you eat <b>dinner or an evening meal</b> ?	0–7 days	<7 days (referent) vs. 7 days
<i>Meal practices</i>			
Usual school lunch source	When you get lunch at school, what do you usually get?	(a) I do not get lunch at school; (b) A complete school lunch from the school cafeteria (a meal sold at the school that costs the same price every day); (c) A la carte items from the school cafeteria (items sold separately from a complete school lunch); (d) Salad bar from the school cafeteria; (e) Fast food from the school cafeteria (such as McDonald's, Taco Bell, or KFC); (f) Food from a school vending machine, school canteen, or school store	Main analysis: A complete school lunch from the school cafeteria vs. all other options (referent) Detailed school lunch analysis: A complete school lunch from the school cafeteria (referent) vs. all other options. Excludes students who choose "I do not get lunch at school."
How often lunch was brought from home	In an average week when you are in school, on how many days do you <b>bring your own lunch to school from home</b> ?	0–5 days	0 days (referent), 1–3 days, 4–5 days
Usual dinner location	On school days, <b>where do you usually eat dinner</b> ?	(a) I do not usually eat dinner on school days; (b) At home; (c) At school; (d) At a restaurant, including fast food restaurants; (e) In a car, bus, or train; (f) At a friend or relative's house; (g) Some place else	Not at home (referent), Home
Ate dinner with a parent/guardian at home	During the past 7 days, on how many days did you eat dinner at <b>home with at least one of your parents or guardians</b> ?	0–7 days	0–4 days (referent) 5–7 days
Fast food frequency	During the past 7 days, on how many days did you eat at least one meal or snack from a fast food restaurant such as McDonald's, Taco Bell, or KFC?	0–7 days	0 days (referent), 1–3 days, 4–7 days
<i>Snack availability</i>			
Had fruits or vegetables to snack on in home	How often are there <b>fruits or vegetables to snack on in your home</b> , such as carrots, celery, apples, bananas, or melon?	Never; Rarely; Sometimes; Most of the time; Always	Never/rarely/sometimes (referent), Most of the time/always
Had chips, cookies, or cakes to snack on in home	How often are there foods such as <b>chips, cookies, or cakes to snack on in your home</b> ?	Never; Rarely; Sometimes; Most of the time; Always	Never/rarely/sometimes (referent), Most of the time/always

Table 2

## Question Wording and Analytic Coding for Included Dietary Intake Variables—National Youth Physical Activity and Nutrition Study, 2010

Dietary Intake	Questionnaire Item(s)	Analytic Coding
Fruits	Combination of two items: 1) During the past 7 days, how many times did you eat <b>fruit</b> ? (Do <b>not</b> count fruit juice). 2) During the past 7 days, how many times did you drink <b>100% fruit juices</b> such as orange juice, apple juice, or grape juice? (Do <b>not</b> count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.)	For combined variable: <2 times/day (referent) vs. 2 times/day
Vegetables	Combination of four items: 1) During the past 7 days, how many times did you eat <b>green salad</b> ? 2) During the past 7 days, how many times did you eat <b>potatoes</b> ? (Do <b>not</b> count French fries, fried potatoes, or potato chips.) 3) During the past 7 days, how many times did you eat <b>carrots</b> ? 4) During the past 7 days, how many times did you eat <b>other vegetables</b> ? (Do <b>not</b> count green salad, potatoes, or carrots.)	For combined variable: <3 times/day (referent) vs. 3 times/day
Fried potatoes	During the past 7 days, how many times did you eat <b>French fries or other fried potatoes</b> , such as home fries, hash browns, or tater tots? (Do <b>not</b> count potato chips.)	<1 time/day (referent) vs. 1 time/day
Pizza	During the past 7 days, how many times did you eat <b>pizza</b> ? (Count pizza from a restaurant or school, frozen pizza, and pizza you made at home.)	<1 time/day (referent) vs. 1 time/day
Sugar-sweetened beverages	Combination of four items: 1) During the past 7 days, how many times did you drink a can, bottle, or glass of <b>soda or pop</b> , such as Coke, Pepsi, or Sprite? (Do <b>not</b> count diet soda or diet pop.) 2) During the past 7 days, how many times did you drink a can, bottle, or glass of a <b>sports drink</b> such as Gatorade or PowerAde? (Do <b>not</b> count low-calorie sports drink such as Propel or G2.) 3) During the past 7 days, how many times did you drink a can, bottle, or glass of an <b>energy drink</b> such as Red Bull or Jolt? (Do <b>not</b> count diet energy drinks or sports drinks such as Gatorade or PowerAde.) 4) During the past 7 days, how many times did you drink a can, bottle, or glass of a <b>sugar-sweetened beverage</b> such as lemonade, sweetened tea or coffee drinks, flavored milk, Snapple, or Sunny Delight? (Do <b>not</b> count soda or pop, sports drinks, energy drinks, or 100% fruit juice.)	For combined variable: <3 times/day (referent) vs. 3 times/day
Water	During the past 7 days, how many times did you drink a bottle or glass of plain <b>water</b> ? Count tap, bottled, and unflavored sparkling water.	<3 times/day (referent) vs. 3 times/day
Milk	During the past 7 days, how many <b>glasses of milk</b> did you drink? (Count the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)	<2 glasses/day (referent) vs. 2 glasses/day

**Table 3**

Prevalence (and 95% Confidence Intervals) of Dietary Correlates and Dietary Intake During the Past 7 Days Among U.S. High School Students—National Youth Physical Activity and Nutrition Study, 2010

	Female students	Male students
<b><i>Dietary correlates</i></b>		
<b><i>Meal frequency</i></b>		
Ate breakfast 7 days/week <sup>†</sup>	34.0 (31.1, 37.1)	39.6 (37.7, 41.6)*
Ate lunch 7 days/week <sup>†</sup>	56.9 (53.9, 59.9)	66.5 (63.8, 69.1)*
Ate dinner 7 days/week	72.5 (69.8, 75.0)	81.1 (78.9, 83.0)*
<b><i>Meal practices</i></b>		
Usually gets a complete school lunch when the student gets lunch at school	44.4 (39.4, 49.6)	55.4 (51.1, 59.6)*
<b><i>School lunch choice<sup>‡</sup></i></b>		
Complete school lunch	63.5 (55.6, 70.0)	72.7 (69.1, 76.0)*
A la carte	14.5 (11.2, 18.6)	13.3 (10.5, 16.6)*
Salad bar	9.1 (7.1, 11.5)	4.1 (3.1, 5.3)*
Fast food	5.5 (3.0, 9.9)	5.6 (3.8, 8.2)*
Vending/canteen/school store	7.4 (5.3, 10.3)	4.4 (3.4, 5.7)*
<b><i>Brought lunch to school from home</i></b>		
0 days	63.5 (58.2, 68.5)	73.7 (68.7, 78.2)*
1–3 days	14.5 (12.5, 16.8)	11.5 (9.6, 13.6)*
4–5 days	22.0 (17.7, 27.0)	14.8 (11.7, 18.6)*
Usually eats dinner at home	89.0 (87.4, 90.4)	88.5 (87.3, 89.7)
Ate dinner with a parent or guardian 5–7 days <sup>†</sup>	59.0 (55.5, 62.4)	62.4 (59.7, 65.0)
<b><i>Ate at least one meal or snack from a fast food restaurant<sup>†</sup></i></b>		
0 days	27.4 (23.4, 31.8)	22.9 (20.3, 25.7)*
1–3 days	57.1 (54.0, 60.3)	60.1 (57.6, 62.5)*
4–7 days	15.4 (13.4, 17.8)	17.0 (14.9, 19.4)*
<b><i>Snack availability</i></b>		
Most of the time/always have fruits and vegetables to snack on in home	70.1 (66.8, 73.2)	68.7 (65.0, 72.1)
Most of the time/always have chips, cookies, or cakes to snack on in home	49.9 (47.0, 52.8)	48.5 (46.1, 51.0)
<b><i>Dietary intake</i></b>		
<b><i>Healthful</i></b>		
Fruits 2 times/day	39.1 (36.3, 42.0)	42.8 (41.2, 44.4)*
Vegetables 3 times/day	18.3 (16.3, 20.5)	18.6 (17.3, 20.1)
Water 3 times/day	44.9 (42.2, 47.7)	47.3 (44.7, 50.0)
Milk 2 glasses/day	19.7 (17.7, 21.8)	31.7 (28.5, 35.2)*
<b><i>Less healthful</i></b>		
Fried potatoes 1 time/day	7.6 (6.2, 9.3)	11.4 (9.7, 13.4)*



	Female students	Male students
Pizza 1 time/day	6.2 (5.1, 7.5)	8.0 (6.7, 9.5)*
Sugar-sweetened beverages <sup>§</sup> 3 times/day	18.1 (15.5, 21.1)	26.4 (23.1, 30.0)*

\*  $P < 0.05$  based on  $\chi^2$  tests.

<sup>†</sup> During the past 7 days.

<sup>‡</sup> Among students who get lunch from school.

<sup>§</sup> Includes regular soda, fruit-flavored drinks, flavored milk, sweetened tea or coffee drinks, sports drinks, and energy drinks.

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Adjusted\* Odds Ratio (OR) and 95% Confidence Interval (CI) for the Associations of Dietary Correlates with Healthful and Less Healthful Dietary Intake During the Past 7 Days Among U.S. Female High School Students—National Youth Physical Activity and Nutrition Study, 2010

Table 4

	Healthful dietary intake			Less healthful dietary intake			
	Fruits 2 times/day	Vegetables 3 times/day	Water 3 times/day	Milk 2 times/day	Fried potatoes 1 time/day	Pizza 1 time/day	SSBs† 3 times/day
<i>Meal frequency</i>							
Ate breakfast 7 days/week ‡	<b>1.70 (1.37, 2.11)</b>	<b>1.55 (1.20, 1.99)</b>	<b>1.38 (1.14, 1.67)</b>	<b>1.70 (1.40, 2.07)</b>	0.88 (0.64, 1.22)	0.82 (0.50, 1.35)	<b>0.63 (0.49, 0.81)</b>
Ate lunch 7 days/week ‡	1.01 (0.86, 1.19)	1.00 (0.82, 1.21)	1.12 (0.96, 1.31)	1.17 (0.92, 1.49)	1.09 (0.82, 1.44)	0.74 (0.52, 1.05)	0.80 (0.62, 1.03)
Ate dinner 7 days/week ‡	1.11 (0.91, 1.36)	<b>1.52 (1.12, 2.04)</b>	<b>1.32 (1.07, 1.63)</b>	1.04 (0.88, 1.24)	1.30 (0.94, 1.79)	1.06 (0.69, 1.61)	0.98 (0.78, 1.23)
<i>Meal practices</i>							
Usually gets a complete school lunch when the student gets lunch at school	<b>0.68 (0.55, 0.85)</b>	<b>0.59 (0.44, 0.79)</b>	<b>0.76 (0.63, 0.91)</b>	<b>1.31 (1.01, 1.71)</b>	0.79 (0.57, 1.10)	<b>0.60 (0.40, 0.92)</b>	0.94 (0.78, 1.13)
Brought lunch to school from home							
1–3 days	1.15 (0.87, 1.52)	<b>2.24 (1.75, 2.86)</b>	<b>1.35 (1.04, 1.74)</b>	1.15 (0.88, 1.49)	1.33 (0.94, 1.88)	1.29 (0.87, 1.90)	0.81 (0.62, 1.06)
4–5 days	<b>2.58 (1.79, 3.72)</b>	<b>2.11 (1.39, 3.20)</b>	<b>1.65 (1.34, 2.03)</b>	1.32 (0.96, 1.82)	<b>0.55 (0.33, 0.89)</b>	0.84 (0.38, 1.83)	<b>0.44 (0.32, 0.61)</b>
Usually eats dinner at home	1.14 (0.84, 1.54)	1.00 (0.71, 1.40)	1.30 (1.00, 1.68)	1.03 (0.71, 1.48)	<b>0.47 (0.32, 0.68)</b>	<b>0.39 (0.25, 0.61)</b>	<b>0.46 (0.34, 0.62)</b>
Ate dinner with a parent or guardian 5–7 days ‡	<b>1.38 (1.12, 1.70)</b>	<b>1.57 (1.23, 2.00)</b>	<b>1.22 (1.01, 1.47)</b>	1.16 (0.92, 1.45)	1.00 (0.72, 1.39)	<b>0.64 (0.49, 0.83)</b>	<b>0.77 (0.63, 0.94)</b>
Ate at least one meal or snack from a fast food restaurant ‡							
1–3 days	<b>0.61 (0.46, 0.81)</b>	<b>0.48 (0.34, 0.68)</b>	<b>0.65 (0.55, 0.77)</b>	0.75 (0.55, 1.01)	<b>1.69 (1.12, 2.56)</b>	1.42 (0.87, 2.33)	<b>1.82 (1.30, 2.56)</b>
4–7 days	<b>0.56 (0.43, 0.73)</b>	<b>0.47 (0.31, 0.71)</b>	<b>0.50 (0.38, 0.66)</b>	<b>0.59 (0.39, 0.89)</b>	<b>3.53 (2.49, 4.99)</b>	<b>2.62 (1.59, 4.34)</b>	<b>3.73 (2.47, 5.66)</b>
<i>Snack availability</i>							
Most of the time/always have fruits and vegetables to snack on in home	<b>3.04 (2.49, 3.72)</b>	<b>2.12 (1.65, 2.73)</b>	<b>1.82 (1.51, 2.18)</b>	<b>1.45 (1.09, 1.94)</b>	<b>0.76 (0.61, 0.95)</b>	<b>0.59 (0.40, 0.88)</b>	<b>0.74 (0.59, 0.93)</b>
Most of the time/always have chips, cookies, cakes to snack on in home	<b>0.84 (0.74, 0.95)</b>	<b>0.61 (0.49, 0.75)</b>	<b>0.66 (0.56, 0.77)</b>	0.88 (0.71, 1.10)	1.33 (0.96, 1.83)	0.97 (0.70, 1.34)	<b>2.01 (1.68, 2.40)</b>

Bold= significant association based on 95% CI; SSBs, sugar-sweetened beverages.

\* Adjusted for race/ethnicity and grade.

† Includes regular soda, fruit-flavored drinks, flavored milk, sweetened tea or coffee drinks, sports drinks, and energy drinks.

‡ During the past 7 days.

Table 5

Adjusted\* Odds Ratio (OR) and 95% Confidence Interval (CI) for the Associations of Dietary Correlates with Healthful and Less Healthful Dietary Intake During the Past 7 Days Among U.S. Male High School Students—National Youth Physical Activity and Nutrition Study, 2010

	Healthful dietary intake				Less healthful dietary intake			
	Fruits 2 times/day	Vegetables 3 times/day	Water 3 times/day	Milk 2 times/day	Fried potatoes 1 time/day	Pizza 1 time/day	SSBs† 3 times/day	
<i>Meal frequency</i>								
Ate breakfast 7 days/week ‡	<b>1.55 (1.32, 1.82)</b>	<b>1.46 (1.19, 1.78)</b>	<b>1.55 (1.28, 1.87)</b>	<b>1.68 (1.38, 2.05)</b>	0.77 (0.54, 1.10)	0.80 (0.62, 1.04)	<b>0.66 (0.54, 0.81)</b>	
Ate lunch 7 days/week ‡	1.18 (0.96, 1.45)	0.90 (0.70, 1.15)	1.13 (0.95, 1.35)	<b>1.39 (1.20, 1.62)</b>	1.15 (0.86, 1.55)	<b>0.72 (0.56, 0.93)</b>	0.97 (0.80, 1.19)	
Ate dinner 7 days/week ‡	1.10 (0.86, 1.41)	1.09 (0.84, 1.41)	<b>1.57 (1.27, 1.95)</b>	1.17 (0.89, 1.52)	1.09 (0.83, 1.44)	<b>0.61 (0.46, 0.81)</b>	1.12 (0.85, 1.48)	
<i>Meal practices</i>								
Usually gets a complete school lunch when the student gets lunch at school	1.01 (0.86, 1.19)	0.91 (0.72, 1.15)	1.01 (0.87, 1.18)	<b>1.35 (1.14, 1.59)</b>	1.04 (0.77, 1.41)	<b>0.70 (0.53, 0.93)</b>	0.93 (0.71, 1.20)	
Brought lunch to school from home								
1–3 days	<b>1.54 (1.12, 2.10)</b>	<b>1.47 (1.09, 1.97)</b>	<b>1.31 (1.04, 1.64)</b>	<b>1.42 (1.06, 1.90)</b>	0.81 (0.51, 1.29)	<b>1.58 (1.02, 2.44)</b>	1.08 (0.90, 1.29)	
4–5 days	<b>1.29 (1.05, 1.58)</b>	1.27 (0.88, 1.85)	1.14 (0.91, 1.42)	1.28 (0.99, 1.65)	<b>0.56 (0.35, 0.89)</b>	0.78 (0.49, 1.24)	<b>0.50 (0.39, 0.65)</b>	
Usually eats dinner at home	0.90 (0.69, 1.17)	<b>0.57 (0.44, 0.73)</b>	<b>1.42 (1.03, 1.96)</b>	1.11 (0.80, 1.54)	<b>0.45 (0.33, 0.61)</b>	<b>0.25 (0.17, 0.37)</b>	<b>0.42 (0.31, 0.58)</b>	
Ate dinner with a parent or guardian 5–7 days ‡	<b>1.22 (1.02, 1.44)</b>	1.17 (0.89, 1.55)	<b>1.29 (1.05, 1.58)</b>	<b>1.23 (1.02, 1.47)</b>	1.02 (0.70, 1.48)	<b>0.61 (0.44, 0.85)</b>	1.02 (0.83, 1.25)	
Ate at least one meal or snack from a fast food restaurant ‡								
1–3 days	<b>0.71 (0.61, 0.84)</b>	<b>0.65 (0.48, 0.87)</b>	<b>0.66 (0.54, 0.81)</b>	0.88 (0.68, 1.12)	1.23 (0.88, 1.71)	0.90 (0.63, 1.28)	<b>1.35 (1.12, 1.64)</b>	
4–7 days	0.82 (0.64, 1.03)	1.04 (0.76, 1.44)	<b>0.64 (0.51, 0.79)</b>	0.76 (0.50, 1.15)	<b>3.74 (2.57, 5.43)</b>	<b>2.74 (1.88, 3.99)</b>	<b>4.60 (3.34, 6.33)</b>	
<i>Snack availability</i>								
Most of the time/always have F&V to snack on in home	<b>2.24 (1.90, 2.65)</b>	<b>1.65 (1.39, 1.97)</b>	<b>1.85 (1.55, 2.21)</b>	<b>1.64 (1.33, 2.02)</b>	0.82 (0.65, 1.03)	<b>0.52 (0.42, 0.65)</b>	<b>0.57 (0.45, 0.72)</b>	
Most of the time/always have chips, cookies, cakes to snack on in home	0.91 (0.78, 1.06)	<b>0.71 (0.58, 0.88)</b>	<b>0.68 (0.56, 0.82)</b>	0.87 (0.71, 1.07)	<b>1.50 (1.27, 1.78)</b>	0.96 (0.68, 1.35)	1.59 (1.31, 1.93)	

Bold= significant association based on 95% CI; SSBs, sugar-sweetened beverages.

\* Adjusted for race/ethnicity and grade.

† Includes regular soda, fruit-flavored drinks, flavored milk, sweetened tea or coffee drinks, sports drinks, and energy drinks.

‡ During the past 7 days.

Table 6

Adjusted\* Odds Ratio (OR) and 95% Confidence Interval (CI) for the Associations of Usual School Lunch Choice with Healthful and Less Healthful Dietary Intake Among U.S. High School Students Who Get Lunch at School†—National Youth Physical Activity and Nutrition Study, 2010

Outcome	Complete school lunch	A la carte	Salad bar	Fast food	Vending/canteen/school store
<b>Female students</b>					
<i>Healthful dietary intake</i>					
Fruits 2 times/day	1.00	0.94 (0.67, 1.32)	<b>1.73 (1.23, 2.43)</b>	1.23 (0.81, 1.86)	0.95 (0.58, 1.56)
Vegetables 3 times/day	1.00	1.27 (0.87, 1.84)	<b>3.19 (1.92, 5.30)</b>	1.43 (0.77, 2.65)	1.08 (0.57, 2.03)
Water 3 times/day	1.00	1.03 (0.73, 1.47)	<b>1.86 (1.23, 2.82)</b>	1.66 (0.64, 4.31)	0.91 (0.64, 1.29)
Milk 2 times/day	1.00	0.71 (0.50, 1.01)	0.89 (0.52, 1.53)	0.98 (0.41, 2.33)	0.59 (0.32, 1.09)
<i>Less healthful dietary intake</i>					
Fried potatoes 1 time/day	1.00	1.36 (0.76, 2.43)	1.04 (0.57, 1.90)	<b>3.01 (1.93, 4.69)</b>	1.33 (0.66, 2.69)
Pizza 1 time/day	1.00	<b>2.16 (1.30, 3.59)</b>	1.00 (0.44, 2.27)	<b>3.06 (1.84, 5.07)</b>	<b>1.99 (1.27, 3.12)</b>
Sugar-sweetened beverages‡ 3 times/day	1.00	1.00 (0.69, 1.45)	1.09 (0.69, 1.71)	<b>2.55 (1.73, 3.77)</b>	1.19 (0.67, 2.12)
<b>Male students</b>					
<i>Healthful dietary intake</i>					
Fruits 2 times/day	1.00	<b>0.75 (0.56, 1.00)</b>	<b>1.99 (1.01, 3.90)</b>	1.29 (0.62, 2.70)	0.81 (0.54, 1.22)
Vegetables 3 times/day	1.00	1.03 (0.79, 1.34)	<b>2.41 (1.43, 4.06)</b>	<b>2.04 (1.40, 2.96)</b>	1.09 (0.65, 1.82)
Water 3 times/day	1.00	<b>0.73 (0.58, 0.92)</b>	1.46 (0.92, 2.31)	1.03 (0.60, 1.76)	0.83 (0.53, 1.32)
Milk 2 times/day	1.00	<b>0.68 (0.49, 0.93)</b>	0.77 (0.40, 1.48)	<b>0.63 (0.47, 0.85)</b>	0.66 (0.38, 1.13)
<i>Less healthful dietary intake</i>					
Fried potatoes 1 time/day	1.00	1.19 (0.85, 1.67)	0.80 (0.39, 1.63)	<b>1.84 (1.09, 3.12)</b>	1.06 (0.57, 1.97)
Pizza 1 time/day	1.00	1.36 (0.85, 2.17)	1.53 (0.86, 2.75)	<b>5.26 (3.47, 7.97)</b>	1.61 (0.87, 2.96)
Sugar-sweetened beverages‡ 3 times/day	1.00	1.22 (0.80, 1.87)	1.36 (0.79, 2.35)	<b>2.67 (1.97, 3.62)</b>	1.31 (0.81, 2.13)

BOLD= significant based on 95% CI.

\* Adjusted for race/ethnicity and grade.

† A total of 73.1% of the NYPANS sample get lunch at school.

‡ Includes regular soda, fruit-flavored drinks, flavored milk, sweetened tea or coffee drinks, sports drinks, and energy drinks.