HHS Public Access

Author manuscript

Appetite. Author manuscript; available in PMC 2017 January 01.

Published in final edited form as:

Appetite. 2016 January 1; 96: 80–86. doi:10.1016/j.appet.2015.08.026.

Food availability, modeling and restriction: How are these different aspects of the family eating environment related to adolescent dietary intake?

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Abstract

Objectives—To examine individual associations between aspects of the family eating environment (home food availability, parental modeling, and food restriction) and adolescent dietary intake and explore the combined relationship (i.e., environment profiles) between these aspects of the family eating environment and adolescent dietary intake.

Methods—Adolescents [14.4 years old (SD = 2.0)] and their parents (N=2383 parent-adolescent pairs] participated in 2 coordinated, population-based studies. Adolescent surveys were completed at school and parent surveys were conducted via mail or phone.

Results—Healthy home food availability was positively associated with fruit/vegetable intake and negatively associated with soda and snack food intake in adolescents. Healthy parental

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Financial disclosures: The authors have no financial disclosures.

Conflicts of interest: The authors have no conflicts of interest.

K Loth and R MacLehose had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

The authors have no potential conflicts of interest and no commercial relationships to disclose.

modeling was negatively associated with adolescent soda consumption. Food restriction was positively associated with fruit/vegetable consumption and snack food intake. Examination of family eating environment profiles revealed that it was the home food availability component of the profiles that was associated with observed differences in fruits/vegetable consumption, whereas the parental modeling and food restriction components contributed to differences in soda and snack foods consumption.

Conclusions—Findings indicate that among the three aspects of the family eating environment explored, making healthy food available at home was most consistently associated with healthy dietary intake in adolescents.

Introduction

National data indicate that the majority of adolescents fail to comply with dietary recommendations for health.[1] Since making healthful food choices during adolescence is important to support growth, maintain physical health, prevent chronic disease and promote a healthful weight trajectory, there remains an important need for research to inform strengthening of current intervention efforts designed to improve dietary patterns.[2] In particular, the need to identify factors with the potential to positively impact adolescent dietary intake patterns is a public health priority.[3–5]

Research has demonstrated that parents can positively influence their children's dietary intake by providing healthful foods at home and modeling healthful food choices.[6–12] Research has also shown that children exposed to a high level of food restriction are more likely to engage in unhealthy eating behaviors (e.g. emotional eating, eating in the absence of hunger),[11,13–16] and have overall less healthful dietary intake (e.g. more frequent consumption of palatable snack foods, less frequent consumption of fruits and vegetables).[14,16–18] However, questions remain as to the most effective way for parents to positively influence the dietary patterns of their adolescent child, while allowing for age-appropriate autonomy over food choices. One significant limitation in the current literature is that the relationship between different types of parental influence and adolescent dietary intake (e.g. home food availability, parent modeling, and food restriction) are typically examined separately.[11] Given the reality that multiple forms of parental influence on adolescent dietary intake co-occur, it is critical to further explore a combination of parental behaviors. For example, a parent models dietary intake for their child daily, while at the same time exerting a certain level of food restriction through the food rules (e.g. vegetables before dessert), limits (e.g. just one cookie), and norms (e.g. no sweets at home). Furthermore, both parent modeling and food restriction behaviors occur within the context of home food availability influenced by the parents. Developing a better understanding of these complexities could inform more effective nutrition interventions and would allow physicians to provide more comprehensive recommendations to parents.

A 2014 article by Couch, et al. aimed to fill this gap by examining the amount of variance in child dietary quality that could be explained by a combination of sociocultural and physical home food environment variables.[19] Overall, Couch et al found that the combination of sociocultural and physical home food environment variables assessed explained 9% to 21%

of the variance in various measures of child dietary quality and therefore concluded that factors associated with both food-related parenting practices and food availability need to be considered when designing dietary interventions for children. The authors also noted that generalizability of study findings was limited to highly educated parents of children in the 6–11 age range[19], leaving additional unanswered questions about the role of the overall home food environment in the dietary intake patterns of adolescents from diverse backgrounds.

The overall goal of the current paper is to extend results from previous research[19–21] by exploring the individual and combined relationships between three aspects of the overall family eating environment and dietary intake outcomes within a racially/ethnically and socioeconomically diverse sample of parent-adolescent pairs. Thus, the first aim of this research study is to examine associations among three aspects of parental influence in the home that contribute to the overall family eating environment (home food availability, role modeling, and food restriction), and markers of adolescent dietary intake, including fruits/vegetables, sugar-sweetened beverages, and palatable (low nutrient energy dense) snack foods. The second aim is to explore the combined relationship between these three aspects of the family eating environment and adolescent dietary intake. Based on findings from previous research,[11,14,22–28] we hypothesized that a family eating environment characterized by the combination of access to healthy foods at home, healthful parental role modeling, and low food restriction would be associated with a healthy dietary intake in adolescents. We further hypothesized that a family eating environment characterized by poor access to healthy foods at home, unhealthy parental modeling, and high overall food restriction would be associated with unhealthy adolescent dietary intake.

Methods

Study Design and Population

Data for these analyses were drawn from two coordinated, population-based studies. EAT 2010 (Eating and Activity in Teens) is a population-based study of 2,793 adolescents from 20 urban public schools in Minnesota designed to examine dietary intake, weight status, and associated factors. Adolescents completed surveys and anthropometric measures during 2009–2010. Project F-EAT (Families and Eating and Activity among Teens) was designed to examine factors within the family environment of potential relevance to adolescent weight-related behaviors. Survey data for Project F-EAT were collected via mail or phone from up to two parents or other caregivers identified by the adolescents in EAT 2010 (77.6% response rate, n=3709). Additional details on study design, data collection methods, and survey development can be found elsewhere.[25,29–31] All study procedures were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee and participating school districts.

The current analytic sample includes EAT 2010 participants who completed both the EAT 2010 student survey and the Youth and Adolescent Food Frequency Questionnaire (FFQ)[32,33] and had at least one parent/caregiver that they lived with at least 50% of the time respond to the Project F-EAT parent survey. When two parents/caregivers responded separately to the Project F-EAT parent survey, an algorithm was utilized to identify a

primary parent to include in the current analyses; the algorithm took into account parent gender (preference given to mothers) and parent/child relationship (e.g. preference given to biological parent over stepparent and parent over grandparent). The final sample consisted of 2,382 adolescent-parent pairs. Additional details about the sample demographics are included in Table 2.

Survey Development and Measures

Items were drawn from both the EAT 2010 student survey and Project F-EAT parent survey to allow for a comprehensive assessment of the family eating environment. Information on home food availability, parent modeling, adolescent dietary intake, and demographics were reported by adolescents on the EAT 2010 student survey and FFQ. Information on parents' food restriction and demographics were collected on the Project FEAT parent survey. Both the EAT 2010 and F-EAT surveys underwent extensive piloting, including test-retest reliability testing by adolescents and parents, respectively. The Project FEAT parent survey was additionally reviewed by an interdisciplinary panel of content experts and bi-cultural staff from the Wilder Research Foundation for cultural appropriateness and face validity. Additional details on survey development have been previously published.[25,29,30] All measures used in analyses are described in detail in Table 1.

Statistical Analysis

Scores for each of the three family eating environment constructs (home food environment, parent modeling, and overall food restriction) were dichotomized at the median (Table 1). Please note that we chose to examine and report categorical data, rather than use raw scores of these three measured factors in an effort to facilitate ease of interpretation of the results for each of the subsequent analyses conducted. It is important to highlight, however, that Results presented in Table 3, rerun using continuous scales, were largely the same. This suggests that, overall, findings were robust across both analytical approaches.

Using these three dichotomized constructs (home food environment, parent modeling and overall food restriction), an eight level categorical variable was created to summarize the distribution of different combinations of home food availability, parental role modeling, and food restriction. Demographic variables and weight status were compared across the eight overall family eating environment profiles (e.g. high healthy home food environment/high positive parent modeling/low food restriction or low healthy home food environment/low positive parent modeling/high food restriction) using chi-square and F-tests.

Next, a series of linear regression models was fit to examine associations among three aspects of parental influence that contribute to the overall family eating environment, and markers of adolescent dietary intake (Aim 1). Each of the dichotomous family eating environment variables (availability, modeling, and restriction) was included as the main predictor variable in separate regression models. Nine separate linear regression models were fit; each of 3 dichotomous family eating environment variables (availability, modeling, and restriction) was included as the main predictor variable in separate regression models for each of the 3 dependent variables (daily servings of fruits and vegetables, sugar-sweetened beverages, and palatable snack foods). Adolescent age, gender, race/ethnicity, and

socioeconomic status were included as covariates in all models. Following each of the linear models, the adjusted mean daily servings for the dependent variables was computed for each level of the independent eating environment variables of interest.

Finally, to estimate whether markers of adolescent dietary intake differed by overall family eating environment profiles (Aim 2), we modeled each of the 3 dependent dietary intake variables using separate linear regression models, with all combinations of home food availability, parent modeling, and food restriction as the main predictor. This overall family eating environment profile was a categorical 8 level variable (Table 1) and was modeled using dummy variables for maximum flexibility. Adolescent age, gender, race/ethnicity, and socioeconomic status were included as covariates in all models. All analyses were performed in Stata v13.

Results

Family eating environment profiles and demographic characteristics of adolescents and families

Home food environments generally differed by adolescent race/ethnicity and family socioeconomic status (Table 2). For example, in unadjusted analyses, differences across adolescent race/ethnicity ($p<0.01$) were observed by the family eating environment profile. For example, the combination of home healthy food availability, a high level of healthy parental role modeling, and low use of food restriction, which is the conceptualized “most healthful family eating environment profile” was observed in 12.8% of white adolescents, 4.7% of African American adolescents, 5.0% of Asian American (primarily Hmong) adolescents, 6.1% of Hispanic adolescents, and 3.8% of adolescents with a mixed/other racial background.

Associations between home food availability, parent modeling, and parent food restriction and adolescent dietary intake

Results from the models examining associations between home food availability, parent modeling, and food restriction with markers of adolescent dietary intake are presented in Table 3. Each of the models described below included age, gender, race/ethnicity, and socioeconomic status as covariates.

Home healthy food availability was positively associated with daily consumption of fruits and vegetables (High: 3.31 daily servings vs. Low: 2.31 daily servings; $p<0.01$). A significant, negative association between healthy home food availability and consumption of sugar-sweetened beverages (High: 0.65 daily servings vs Low: 0.95 daily servings; $p<0.01$) and palatable snack foods (High 2.23 daily servings vs Low: 2.62 daily servings; $p<0.01$) was observed. Positive parent modeling was associated with greater daily consumption of fruits and vegetables (High: 3.03 daily servings vs Low: 2.79 daily servings; $p=0.03$). Further, positive parent modeling was also found to be associated with consumption of fewer sugar-sweetened beverages (High: 0.64 daily servings vs. Low 0.84 daily servings; $p<0.01$) and fewer palatable snack foods (High 2.27 daily servings vs. Low 2.53 daily servings; $p=0.04$). Food restriction was positively associated with daily consumption of

fruits and vegetables (High: 2.97 daily servings vs. Low 2.71 daily servings; $p<0.01$) and palatable snack foods (High: 2.58 daily servings vs. Low 2.31 daily servings; $p=0.01$). Food restriction was not significantly associated with sugar-sweetened beverage consumption.

Associations between family eating environment profiles and adolescent dietary intake

Profiles were created to summarize the distribution of different combinations of home food availability, parental role modeling, and food restriction. Associations between these eight family eating environment profiles and adolescent dietary intake are outlined in Table 4. These models also included age, gender, race/ethnicity, and socioeconomic status as covariates.

Home food availability was the component of the family eating environment profile that contributed most heavily to significant differences in daily fruit and vegetable servings. Food environment profiles that differed on parental modeling or level of food restriction were not associated with statistically significant differences in daily fruit and vegetable consumption among adolescents.

Daily consumption of palatable snack foods was lowest among adolescents who lived in an environment characterized by high healthy home food availability, positive parent modeling and a low level of food restriction [1.86 daily servings] and highest among adolescents living in an environment characterized by low healthy home food availability, poor parent modeling and a high level of food restriction [2.87 daily servings].

With regard to daily consumption of sugar-sweetened beverages, adolescents who lived in an environment characterized by high healthy home food availability, positive parental modeling, and a low level of food restriction consumed the fewest daily servings of sugar-sweetened beverages [0.49 daily servings]. Adolescents exposed to low healthy home food availability and a high level of overall restriction consumed the most daily servings of sugar-sweetened beverages, whether parental modeling was positive (1.01 daily servings) or poor (0.98 daily servings). Results indicate that in some instances the food restriction component of the home environment profile was a significant contributing factor to observed differences. For example, among adolescents exposed to low healthy home food availability and unhealthy parent modeling, those who experienced a low level of restriction consumed 0.64 daily servings of sugar-sweetened beverages as compared to the 0.98 consumed by adolescents who experienced a high level of restriction ($p<0.01$).

Discussion

This paper examined individual and combined associations between three aspects of the family eating environment (home food availability, parental modeling, and food restriction) and markers of adolescent dietary intake. Findings revealed that healthy home food availability was positively associated with intake of fruits/vegetables and negatively associated with intake of sugar-sweetened beverages and palatable snack foods. Parental modeling of healthful eating was negatively associated with sugar-sweetened beverage consumption in adolescents. Food restriction was positively associated with consumption of fruits and vegetables and palatable snack foods. Examination of associations between family

eating environment profiles and adolescent dietary intake revealed that it was the home food availability component of the family eating environment profiles that was associated with observed differences in the average daily servings of fruits/vegetables consumed, whereas the parental modeling and food restriction components contributed to observed significant differences in the consumption of sugar-sweetened beverages and palatable snack foods.

In general, findings indicate that among the three aspects of the family eating environment explored, access to a healthy home food environment was most strongly and consistently associated with markers of healthy dietary intake among adolescents. For example, with a few nuances, the level of healthy home food availability was the primary environment profile factor to contribute to observed differences in daily intake of fruits and vegetables. These findings suggest that while adolescents have an elevated level of autonomy over food choices compared to younger children, both as a result of time spent outside of the home (e.g. school, friend's homes, etc.) and an increased ability to seek out foods on their own (e.g. more spending money; increased ease of self-transportation via bus, bike, motor vehicle, etc.), the foods available to them in their home environment continue to play a significant role in their daily intake of healthful foods.

The relationship between restrictive food-related parenting practices on child weight and dietary intake patterns has recently emerged as a topic of discussion and debate within the field. Findings from several laboratory research studies have suggested that while parents often adopt restrictive feeding practices in an effort to promote healthy eating behaviors the use of food restriction can be counterproductive, possibly leading to avoidance or dislike of "pressured foods" and overconsumption of "restricted foods" once parental control is removed. On the other hand, several cross-sectional and prospective research studies have found a high level of parental enforcement of limits and restrictions to be associated with improved markers of dietary intake.[19,24,34,35] Thus, although the use of less-controlling food-related parenting practices is increasingly supported as a method to promote a healthy dietary intake and a healthy weight for children,[36] evidence of the clear association between food-related parenting practices and dietary intake remains equivocal and the results of this study contribute new information to this conversation. The examination of the relationship between food restriction and adolescent dietary intake outcomes yielded several significant associations. Individually, food restriction was found to be positively associated with both healthful (i.e., fruit and vegetable intake), as well as unhealthful (i.e., sugar-sweetened beverage intake) adolescent dietary intake. Further, the food restriction component of the overall family food environment profiles sometimes contributed to observed differences in palatable snack foods and sugar-sweetened beverages. When examining individual associations, higher levels of food restriction were only found to be significantly associated with greater daily consumption of palatable snack foods. Further, food restriction as a component of the overall family eating environment profile contributed significantly to some observed differences in palatable snack food and sugar-sweetened beverage consumption, although some heterogeneity of associations was also observed. For example, adolescents exposed to low levels of food restriction consumed fewer daily servings of palatable snack foods and sugar-sweetened beverages than their counterparts living in otherwise similar healthy environments (high healthy home food availability and high positive parent modeling) who were exposed to high levels of restriction.

The current study was marked by several strengths. The large, diverse, population-based sample in the current study allows for generalizability of the study findings to other similarly diverse populations. Further, the large number of measures assessing unique components of the overall home food environment allowed for a novel exploration into how these variables, both individually and in combination, are associated with dietary intake in adolescents. However, because data were collected within a large epidemiological study, it was not feasible to use "gold-standard" measures for all items assessed. Some of our items were well-validated and comprehensively measured constructs (e.g. food restriction) whereas other measures were more limited in scope (e.g. parental modeling); observed findings should be interpreted with limitations of these measures in mind. Further, this paper did not explore the potential role of child or parent BMI in the relationship between aspects of home food environment and adolescent dietary intake.

Finally, it is important to note that given the cross-sectional nature of the data in the current study, it is not possible to discern the direction of the observed associations; for example, it might be that food restriction by parents leads to greater consumption of particular food items (e.g. soda, sweets) once this restriction is removed (e.g. adolescent is not with the parent), or it might be that parents utilize a higher level of restriction in response to adolescents who are already over-consuming unhealthy food items. It is highly likely that the relationship between parental food restriction and dietary intake is bidirectional; that is, whereas high levels of food restriction have been shown to lead to overconsumption of restricted food items, parents are compelled to utilize higher levels of food restriction with adolescents who over-consume unhealthy foods in an effort to help curb their child's intake of these food items. Clearly, additional research, utilizing mixed-methods approaches (e.g., longitudinal survey data in conjunction with observational data collection or ecological momentary assessment) is needed to help clarify the relationship between parental food restriction and child dietary intake prior to making specific recommendations to parents and health care providers.

Conclusion

Previous research has suggested that parents have the opportunity to influence their child's dietary intake in a variety of ways, including through decisions they make about what foods are available within their home, what food choices they model for their adolescent child, and the level of food restriction they exert over their child. Results from this investigation indicate that, among the three aspects of the family eating environment explored, the provision of a home healthy food environment was most consistently associated with markers of a healthy dietary intake in adolescents.

Acknowledgments

The project described was supported by Grant Numbers R01HL084064 and R01HL093247-02 (PI: D. Neumark-Sztainer) from the National Heart, Lung, and Blood Institute. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Health. K. Loth's time was funded by Grant T32 MH082761-01 from the National Institute of Mental Health. The contents of this presentation are solely the responsibility of the authors and do not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Mental Health.

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Highlights

- Healthy food at home was positively associated with fruit/vegetable intake.
- Healthy food at home was negatively associated with soda consumption.
- Healthy food at home was negatively associated with palatable snack food intake.
- Food restriction was positively associated with fruit/vegetable consumption.
- Food restriction was positively associated with palatable snack food intake.

Table 1

Measures of Adolescent Dietary Intake, Home Food Environment, Parent Modeling, Food Control, and Socio-demographic Characteristic Variables used in the Analyses

Measure	Description/Questions
Exposure Variables: Overall Family Eating Environment	
Home Food Environment	The home food environment was assessed by asking adolescents eight questions about the availability of different food items in their home[27]: • How often are the following true? 'Fruits and vegetables are available in my home'; Vegetables are served at dinner in my home'; 'In my home, there is fresh fruit on the counter, table or somewhere where I can easily get it'; 'In my home there are cut-up vegetables in the fridge for me to eat'; 'I have junk food in my home'; 'Potato chips or other salty snack foods are available in my home'; 'Chocolate or other candy is available in my home'; and 'Soda pop is available in my home. • For each question, four response options were offered ranging from never to always. An overall home food environment score was created by adding 1 point for an adolescent response of 'usual' or 'always' for each of the possible healthy home food availability questions (fruits/vegetables, vegetables at dinner, fresh fruit on the counter, cut-up vegetables in the fridge) and by subtracting 1 point for an adolescent response of 'usual' or 'always' for each of the 4 possible unhealthy home food availability questions (junk food, potato chips, chocolate, and soda pop). • An overall home food environment score was assigned, ranging from −4 (unhealthy home food environment) to +4 (healthy home food environment) and dichotomized at the median of this range with lower scores representing an unhealthy overall home food environment. • Test re-test r's for the individual items that made up this score ranged from 0.54–0.74.
Parent Modeling	Parent role modeling was assessed by parents response to four questions: Thinking back over the past week, how many servings of fruit did you eat on a typical day? (A serving is a half cup of fruit or 100% fruit juice, or a medium piece of fruit). Thinking back over the past week, how many servings of vegetables did you eat on a typical day? (A serving is a half cup of cooked vegetables or 1 cup of raw vegetables). *Response options included 'zero servings per day', 'less than one serving per day', '1 serving per day', '2 servings per day', '3 servings per day', '4 servings per day', and '5 or more servings per day'.* Thinking back over the past week, how often did you drink sugar-sweetened beverages (regular soda pop, Kool-Aid)? *Response options included 'less than once per week', '1 drink per week', '2–4 drinks per week', '5–6 drinks per week', '1 per day', '2 or more per day'.* In the past week, how often did you eat something from a fast food restaurant, such as McDonald's, Burger King, Domino's or similar places? *Response options included, 'never', '1–2 times', '3–4 times', '5–6 times', '7 times', and 'more than 7 times'.* • A total parent role modeling score was created by averaging responses to each of these four questions to assign an overall food modeling score ranging from −2 (poor overall modeling) to +2 (high overall modeling) and dichotomized at the median of this range with lower scores representing poor overall modeling. • Test re-test r's for the individual items that made up this score ranged from 0.55–0.72.
Overall Food Control	Overall food control was measured by combining scores from two constructs of food-related parenting practices (i.e. food restriction and pressure-to-eat) taken from the Child Feeding Questionnaire[37]. • Food restriction was measured using six items from the eight-item Restriction Subscale, a subscale designed to measure a parent's attempt to control a child's eating by restricting access to palatable foods. The two items not included from the original restriction subscale were addressed measures less appropriate for an adolescent population (e.g. using food as a reward). • The four response options were available ranging from disagree to agree. The food restriction score was created by averaging responses across all six items to assign an overall restriction score ranging from 1 (low restriction) to 4 (high restriction) and dichotomized at the midpoint of this range with lower scores representing low overall food control.

Measure	Description/Questions
	• Restriction: test-retest r= 0.72, Cronbach's Alpha 0.86; Pressure-to-eat: test-retest r= 0.73, Cronbachs Alpha = 0.70)
Overall Family Eating Environment Profiles	Each home environment was assigned a score of high or low (cutpoints described above) for each of three environmental influences (home environment, parental modeling, and food restriction) resulting in the creation of eight unique overall family eating environment profiles.
Outcome Variable: Adolescent Dietary Intake	
Fruits and vegetables, Sugar Sweetened Beverages, and Snack Foods	Dietary intake was assessed with the 149-item Youth and Adolescent FFQ.[32,33] Intakes of fruits and vegetables, sugar-sweetened beverages and palatable snack foods (low nutrient, energy dense) were examined. Specific foods included in each of these groups have previously been described.[1,28,38] • A serving of snack food was defined by units such as one small bag, one pack, and one slice as appropriate for the item. The total number of daily snack food servings was estimated by summing the reported consumption of the 21 food items. • The sugar-sweetened drinks included were non-diet soda and fruit drinks with one serving defined as the equivalent of a glass or can. • The reliability and validity of the Youth and Adolescent FFQ have been examined in prior studies that concluded the tool provides acceptable estimates of dietary intake for groups. [32,33,39]
Covariates: Socio-demographic characteristics	
Race/ethnicity, age, socioeconomic status	Adolescents' and parents' race/ethnicity, age and parents' educational attainment were assessed by self-report in adolescents and parents respectively.

Appetite. Author manuscript; available in PMC 2017 January 01.

Table 2

Family Eating Environment Profiles by Adolescent Demographic Characteristics

		Low[1] Healthy Home Food Availability				High[1] Healthy Home Food Availability			
Adolescent Characteristics		**Unhealthy Modeling, High Restrict**	**Unhealthy Modeling, Low Restrict**	**Healthy Modeling, High Restrict**	**Healthy Modeling, Low Restrict**	**Unhealthy Modeling, Low Restrict**	**Unhealthy Modeling, High Restrict**	**Healthy Modeling, High Restrict**	**Healthy Modeling, Low Restrict**
Overall	**N**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
	2112	18.4	5.1	18.1	4.9	21.0	16.3	9.4	6.7
Gender									
Male	968	17.3	4.9	17.6	5.3	21.4	18.0	10.0	**5.6**
Female	1146	19.4	5.3	18.6	4.6	20.7	14.9	8.8	**7.7**
Race/ethnicity									
White	460	**9.3**	3.7	**21.3**	**2.0**	**19.6**	**25.2**	**6.3**	**12.8**
Black	550	**24.2**	4.4	**18.4**	**4.9**	**20.2**	**14.0**	**9.3**	**4.7**
Asian	365	**17.**	5.0	**18.2**	**1.9**	**26.5**	**17.4**	**8.3**	**5.0**
Hispanic	440	**21.4**	8.4	**12.3**	**12.1**	**18.6**	**6.4**	**14.8**	**6.1**
Mixed/other	295	**18.4**	3.8	**21.5**	**2.7**	**21.8**	**20.1**	**7.9**	**3.8**
Socioeconomic Status									
Low	793	**22.3**	5.3	**20.7**	**6.8**	**18.1**	12.3	9.6	**4.9**
Low-middle	456	**20.0**	5.7	**20.2**	**5.3**	**22.6**	14.5	8.3	**3.5**
Middle	351	**16.2**	5.4	**18.0**	**2.9**	**24.2**	16.5	9.4	**7.4**
Middle-high	289	**13.5**	2.8	**14.9**	**3.8**	**22.8**	23.9	9.0	**9.3**
High	174	**4.0**	5.2	**9.8**	**1.7**	**20.7**	29.3	10.9	**18.4**

Notes:

[1] High and low categories for the home food availability and parental modeling were determined by cutting at the median of the scale range. High and low categories for the food restriction scale were determined by cutting at the measure midpoint.

** Bolding indicates a significant difference with columns separate for each demographic characteristic. Statistically significant difference set at $p<0.05$ level.

Table 3

Adjusted Mean Daily Servings of Food Items Consumed by Adolescents at High versus Low Levels of Healthy Home Food Availability, Positive Parent Modeling, and Food Restriction

	Daily Servings Consumed Adjusted[1] mean (95% CI)		
Family Eating Environment Variables	**Fruits and Vegetables**	**Palatable (Low Nutrient Energy Dense) Snack Foods**	**Sugar-sweetened Beverages**
Healthy home food availability			
High[2]	3.31 (3.16, 3.41)	2.23 (2.09, 2.38)	0.65 (0.60, 0.70)
Low	2.31 (2.18, 2.45)	2.62 (2.46, 2.78)	0.95 (0.89, 1.00)
p-value	<0.01	<0.01	<0.01
Healthy parent modeling			
High[2]	3.03 (2.85, 3.21)	2.27 (2.05, 2.48)	0.64 (0.57, 0.72)
Low	2.79 (2.68, 2.90)	2.53 (2.40, 2.65)	0.84 (0.80, 0.88)
p-value	0.03	0.04	<0.01
Food restriction			
High[2]	2.97 (2.84, 3.10)	2.58 (2.43, 2.73)	0.79 (0.74, 0.84)
Low	2.71 (2.57, 2.84)	2.31 (2.15, 2.47)	0.79 (0.73, 0.84)
p-value	<0.01	0.01	0.87

Notes:

[1]Models were adjusted for adolescent age, race/ethnicity, and socioeconomic status.

[2]High and low categories for the home food availability and parental modeling were determined by cutting at the median of the scale range. High and low categories for the food restriction scale were determined by cutting at the measure midpoint.

Appetite. Author manuscript; available in PMC 2017 January 01.

Table 4

Adjusted daily servings[1] of food items consumed by adolescents with different overall family eating environment profiles

Family Eating Environment Profiles			Daily Servings Consumed Adjusted[1] Mean (95% CI)		
			Fruits and Vegetables	Palatable (Low Nutrient Energy Dense) Snack Foods	Sugar Sweetened Beverages[†]
High[2] Healthy Home Food Availability	Healthy Modeling	Low[2] Restriction	3.34 (2.99,3.70)[a]	1.86 (1.45, 2.27)[a]	0.49 (0.35,0.63) [a]
		High Restriction	3.31 (3.01, 3.61)[a]	2.22 (1.87, 2.57)[b]	0.65 (0.53, 0.77) [ab]
	Unhealthy Modeling	Low Restriction	3.12 (2.89, 3.34)a	2.17 (1.91, 2.44)[b]	0.67 (0.58, 0.76) [b]
		High Restriction	3.38 (3.18,3.58)[a]	2.39 (2.16, 2.63) [b]	0.68 (0.60, 0.76) [b]
Low Healthy Home Food Availability	Healthy Modeling	Low Restriction	2.63 (2.21, 3.05)[b]	2.81 (2.32, 3.30) [bc]	0.83 (0.66, 0.99) [bc]
		High Restriction	2.19 (1.98, 2.40)[b]	2.46 (2.20, 2.71) [b]	1.01 (0.93, 1.10) [c]
	Unhealthy Modeling	Low Restriction	2.36 (1.95, 2.76)[b]	2.18 (1.70, 2.65) [b]	0.64 (0.48, 0.81) [ab]
		High Restriction	2.35 (2.13, 2.57)[b]	2.87 (2.62, 3.13) [c]	0.98 (0.89, 1.07) [c]

Notes:

[1] Adjusted for adolescent age, race/ethnicity, and socioeconomic status.

[2] High and low categories for the home food availability and parental modeling were determined by cutting at the median of the scale range. High and low categories for the food restriction scale were determined by cutting at the measure midpoint.

** Different superscript letters indicate statistically significant differences observed between set of 8 values within each column. Statistically significant difference set at $p<0.05$ level.