

Race/Ethnicity and Income in Relation to the Home Food Environment in US Youth Aged 6 to 19 Years

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ABSTRACT

Background The home food environment is complex and has the potential to influence dietary habit development in young people. Several factors may influence the home food environment, including income and race/ethnicity.

Objective To examine the relationship of income and race/ethnicity with three home food environment factors (ie, food availability frequency, family meal patterns [frequency of family and home cooked meals], and family food expenditures).

Design A cross-sectional analysis of the National Health and Nutrition Examination Survey (NHANES).

Participants A total of 5,096 youth aged 6 to 19 years from a nationally representative sample of US individuals participating in NHANES 2007-10.

Statistical analyses performed Prevalence of food availability frequency was assessed for the entire sample, race/ethnicity, poverty income ratio (PIR), and race/ethnicity stratified by PIR. Mean values of family meal patterns and food expenditures were calculated based on race/ethnicity, PIR, and race/ethnicity stratified by PIR using analysis of variance and least squares means. Tests of main effects were used to assess differences in food availability prevalence and mean values of family meal patterns and food expenditures.

Results Non-Hispanic whites had the highest prevalence of salty snacks ($51.1\% \pm 1.5\%$) and fat-free/low-fat milk ($39.2\% \pm 1.7\%$) always available. High-income homes had the highest prevalence of fruits ($75.4\% \pm 2.4\%$) and fat-free/low-fat milk ($38.4\% \pm 2.1\%$) always available. Differences were found for prevalence of food availability when race/ethnicity was stratified by PIR. Non-Hispanic blacks had the lowest prevalence of fat-free/low-fat milk always available across PIR groups. Differences in mean levels of family meal patterns and food expenditures were found for race/ethnicity, PIR, and race/ethnicity stratified by PIR.

Conclusions Race/ethnicity and PIR appear to influence food availability, family meal patterns, and family food expenditures in homes of youth. Knowledge of factors that influence the home food environment could assist in developing effective strategies to improve food environments for young people.

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US DIETARY INTAKE DATA INDICATE THAT CHILDREN and adolescents fail to meet dietary recommendations.^{1,2} Consumption of snack foods, soft drinks, and total energy has increased in the past 30 years in youth.³⁻⁵ In addition, many children and adolescents are consuming inadequate amounts of fruits and vegetables.^{6,7} These diet trends can lead to short- and long-term health consequences for youth and may increase risk of developing obesity. Researchers have suggested that obesity is, in part, a normal response to an obesogenic environment.⁸ The home food environment is emerging as an influential environment in obesity and behavior development.⁹

The home food environment may strongly influence eating patterns in youth. Despite the growing trend of away-from-home food consumption, approximately 60% of

the food children and adolescents consume is from home.¹⁰ The home food environment includes the political and economic environment, the food physical environment, and the food social environment.^{9,11,12} Home availability of foods is one aspect of the food physical environment.^{11,12} Availability of food in the home is a gauge of exposure and may, thus, influence nutrient intake of youth.¹³ Several studies have demonstrated that availability of food in the home is related to food consumption in youth.¹⁴⁻²¹ Specifically, fruit and vegetable availability in the home has been found to be related to child and adolescent consumption of these foods.¹⁴⁻¹⁷ The same availability/consumption relationship has been reported for energy-dense foods like soft drinks and snack foods.^{18,19} Food available in the home is most often controlled by parents because youth have limited control

over food shopping for the family.^{22,23} Several parent/family factors may influence home food availability and ultimately, dietary intake in youth. These factors include parent education level, parent knowledge of and/or motivation for healthy behaviors, food shopping behaviors, food preparation skills, family food preferences, household size, family income level, and race/ethnicity.^{13,21-28}

Family meal patterns are a component of the food social environment in the home.^{9,11,12} More frequent family meals are associated with better dietary intake.^{26,29-36} Family meal patterns may be influenced by age of the youth in the home, race/ethnicity, and socioeconomic background.^{26,37,38}

Family food expenditures may also be influenced by various factors, including socioeconomic status (SES), differences in neighborhood food landscapes, race-ethnicity, family food preferences, and convenience.³⁹⁻⁴³ Family food expenditures have not been directly tied to the home food environment in current home food environment models.^{9,11,12} However, family SES has been defined as a component of the political and economic environment in the home⁹ and family SES has been shown to influence household food purchasing habits at both supermarkets and restaurants.³⁹⁻⁴¹ Household food purchases may influence dietary intake in youth due to the ability of food purchasing to influence both the availability of foods in the home and role modeling behaviors,⁴⁴ both of which are aspects of the home food environment.^{9,11,12} This indicates that family food expenditures likely influence the home food environment. Thus, in this study, family food expenditures will be considered as one aspect of the home food environment.

Food availability, family meal patterns, and family food expenditures are modifiable areas that could possibly aid in obesity prevention in youth. SES and race/ethnicity are two factors that have been shown to influence food availability, family meal patterns, and family food expenditures.^{13,25-27,37,39-43} No studies to date have assessed the relationship of these factors with variables of the home food environment in a nationally representative sample of youth. These relationships should be examined in a nationally representative sample to gain a more comprehensive understanding of differences in home food environments across SES and race/ethnicity groups. Knowledge of factors that influence the home food environment may assist in tailoring nutrition education programs and public policy to meet the needs of different populations. Therefore, the purpose of our study was to assess the relationship of income level, a measure of SES, and race/ethnicity with three aspects of the home food environment (ie, food availability, family meal patterns, and family food expenditures) in a nationally representative sample of US youth using data from the National Health and Nutrition Examination Survey (NHANES).

METHODS

Study Design and Population

The NHANES is conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention. The NHANES is a cross-sectional, nationally representative health and nutrition survey of the US civilian noninstitutionalized population and includes a home interview and standardized physical examination at a mobile examination center. Since 1999, the NHANES data have been released in 2-year

increments. The NHANES protocol was approved by the National Center for Health Statistics Institutional Review Board and all participants provided written informed consent. Participants younger than age 18 years provided parent or guardian consent. Details regarding the survey design, content, operations, and procedures are available online.⁴⁵ The NHANES 2007-10 sample consisted of 5,096 participants aged 6 to 19 years, all of whom were interviewed. Demographic data and Consumer Behavior Questionnaire data from the NHANES 2007-10 were used in this study.

Data Collection and Measurements

Demographic Questionnaire Data. The NHANES Demographic Questionnaire data were obtained in the home and were used to assess the distribution of demographic information in the youth population. The household interview was conducted in person with a trained interviewer. Participants aged 16 years and older were interviewed directly and a proxy respondent (a responsible adult) provided information for survey participants younger than age 16 years. The NHANES demographic variables used in this study included age, sex, race/ethnicity, and poverty income ratio (PIR). Race/ethnicity were self-reported and categorized as non-Hispanic white, non-Hispanic black, Mexican American, other Hispanic, and other. The "other" category included Asian and multiracial participants and was used in total estimates in this study but not in separate analyses due to small sample size. Specific race/ethnicity categories used in this study included white (non-Hispanic white), black (non-Hispanic black), and Hispanic (Mexican American and other Hispanic). PIR was provided in the NHANES demographic survey information and was calculated using a ratio of the family's income to their poverty threshold as defined by the US Census Bureau. PIR accounts for inflation and family size. In 2008, a PIR of 350% was equivalent to approximately \$77,000 for a family of four and a PIR of 130% was equivalent to approximately \$29,000 for a family of four. The cut point for participation in the Supplemental Nutrition Assistance Program is 130% of the poverty level.⁴⁶ Poverty income categories used in this study were identical to those used in NHANES analyses conducted by the Centers for Disease Control and Prevention⁴⁷ and were <130% (low income), 130% to 349% (middle income), and ≥350% (high income).

Consumer Behavior Questionnaire Data. Consumer Behavior Questionnaire data were obtained in the home as part of the Flexible Consumer Behavior Survey module which was added to NHANES in 2007 and developed in collaboration with the Economic Research Service of the US Department of Agriculture.⁴⁵ The core of the Flexible Consumer Behavior Survey module included the NHANES Consumer Behavior Questionnaire, which was conducted in the home as part of the NHANES Family Questionnaire to obtain data on diet-related consumer behavior at the family level.⁴⁵ Diet-related consumer behaviors addressed included three aspects of the home food environment: home food availability, food expenditures, and family meal patterns.⁴⁵ Food availability was measured using a predefined inventory checklist. One adult respondent from each family answered questions regarding the frequency of availability of fruits, dark green vegetables, salty snacks, fat-free/low-fat milk, and soft drinks

in the home (always, most of the time, sometimes, rarely, or never available). Fruits and dark green vegetables included fresh, dried, canned, and frozen. Salty snacks excluded nuts; fat-free/low-fat milk included 1% fat, skim, or fat-free milk; and soft drinks excluded diet drinks, 100% juice, or sports drinks. Questions regarding family food expenditures (money spent at the supermarket/grocery store, money spent on eating out, and money spent on carryout/delivery foods based on dollars per 30 days) and family meal patterns (number of times someone cooked dinner at home, number of meals family ate together, and number of meals eaten together cooked at home over a 7-day period) were also answered by one adult respondent from each family.

Statistical Analysis

Prevalence of food availability frequency, analyzed separately for each of the categories of availability (always, sometimes, most of the time, rarely, or never), were determined for the entire sample, race/ethnicity groups (white, black, or Hispanic), PIR groups (<130%, 130% to 349%, and $\geq 350\%$), and race/ethnicity by PIR groups to examine interactions between race/ethnicity and income. Means of family food characteristic variables were analyzed using analysis of variance and least squares means based on race/ethnicity, PIR, and race/ethnicity by PIR groups. Tests of main effects were conducted for prevalence of food availability, means of family meal patterns, and means of family food expenditures based on race/ethnicity, PIR, and race/ethnicity by PIR groups. Follow-up tests of paired prevalences were conducted using analysis of variance and least squares means comparisons. Significance for all analyses was set at $P < 0.01$ and no other adjustment to P values were made for the multiple hypotheses tested. All analyses followed the NHANES data analysis protocol, including the use of appropriate sample weights to account for unequal probability of selection from oversampling, nonresponse, and for the stratified multistage probability sample design so that results were representative of the US noninstitutionalized population.⁴⁸ All statistical analyses were conducted using the Statistical Analysis System (version 9.2, 2010, SAS Institute Inc).

RESULTS

Food Availability Frequency

Food availability frequency demographics for the entire youth sample are noted in Table 1. The highest prevalence of availability was found for fruits, with fruit always available in $70.0\% \pm 1.5\%$ of homes. Food availability was assessed based on race-ethnicity (Table 1), PIR (Table 2), and race/ethnicity by PIR (Table 3). Home food availability varied based on race/ethnicity groups (Table 1). Whites had a significantly higher prevalence of salty snacks ($51.1\% \pm 1.5\%$) and fat-free/low-fat milk ($39.2\% \pm 1.7\%$) always available compared with Hispanics and blacks ($P < 0.01$). In addition, whites had a higher prevalence of soft drinks always available ($46.5\% \pm 2.6\%$) compared with blacks ($42.6\% \pm 2.6\%$) and significantly higher compared with Hispanics ($33.6\% \pm 2.3\%$; $P < 0.01$). Blacks had the lowest prevalence of fat-free/low-fat milk always available ($13.9\% \pm 1.4\%$). Similarly, food availability varied based on PIR (Table 2). High-income homes had a significantly higher prevalence of fruits ($75.4\% \pm 2.4\%$) and fat-free/low-fat milk ($38.4\% \pm 2.1\%$) always available, compared with middle- or

low-income homes ($P < 0.01$). Approximately $69.3\% \pm 1.7\%$ of low-income homes had fat-free/low-fat milk never available. High-income homes had a significantly higher prevalence of salty snacks always available ($45.2\% \pm 3.0\%$) compared with low-income homes ($P < 0.01$). Food availability was assessed based on a combination of race/ethnicity and PIR categories (Table 3). High-income homes for all race/ethnicity groups had the highest prevalence of fruits always available compared with low-income homes. For example, $83.2\% \pm 2.8\%$ of high-income white homes had fruits always available compared with $59.2\% \pm 3.5\%$ of low-income white homes ($P < 0.01$). High-income white and Hispanic homes had a significantly higher prevalence of fat-free/low-fat milk always available in the home compared with low- and middle-income homes ($P < 0.01$). Black homes had the lowest levels of fat-free/low-fat milk always available. Low-income blacks had a significantly higher prevalence of dark green vegetables always available in the home compared with low-income whites ($P < 0.01$). Finally, low-income Hispanic homes had a significantly lower prevalence of soft drinks always available compared with black homes ($P < 0.01$).

Family Food Expenditures and Family Meal Patterns

Tables 4 and 5 show mean levels of family food expenditures and meal patterns based on race/ethnicity, PIR, and race/ethnicity by PIR groups. Mean levels of money spent at the supermarket/grocery store and money spent on eating out per 30 days (Table 4) were significantly lower for blacks ($\$409.70 \pm \14.50 and $\$111.40 \pm \6.60 , respectively) compared with Hispanics and whites ($P < 0.01$). For low-income families, mean levels of money spent on eating out and money spent on carry out/delivery foods per 30 days were significantly lower ($\$82.10 \pm \5.30 and $\$17.20 \pm \2.50 , respectively) than for middle- and high-income families ($P < 0.01$). High-income homes spent significantly more money at the supermarket/grocery store per 30 days ($\$532.20 \pm \15.80) compared with low- and middle-income homes ($P < 0.01$). No differences for mean levels of money spent on carry out/delivery foods per 30 days existed across race/ethnicity groups. When race/ethnicity groups were further stratified based on PIR, high-income homes for all race/ethnicity groups had significantly higher mean levels of money spent on eating out per 30 days than low-income families ($P < 0.01$) (Table 4). Mean levels of money spent at the supermarket/grocery store per 30 days were significantly lower in black homes compared with white and Hispanic homes across all income levels ($P < 0.01$). Low-income black homes spent the least amount of money at the supermarket/grocery store per 30 days ($\$383.70 \pm \20.70) and high-income white homes spent the most ($\$608.90 \pm \20.40). Finally, middle- and high-income black homes spent significantly less money on eating out per 30 days compared with middle- and high-income white and Hispanic homes ($P < 0.01$).

Mean levels of family meal patterns differed based on race/ethnicity and PIR (Table 5). Mean levels of the number of times someone cooked dinner at home and the number of meals eaten together cooked at home over a 7-day period were significantly lower for blacks (4.7 ± 0.1 and 4.7 ± 0.2 , respectively) compared with Hispanics and whites ($P < 0.01$). High-income homes had significantly lower mean levels of the number of times someone cooked dinner at home over a

Table 1. Home food availability^a prevalence based on race/ethnicity for youth aged 6 to 19 y in the United States participating in NHANES^b 2007-10

Food item	All participants	Non-Hispanic white	Non-Hispanic black	Hispanic
	←%±standard error→			
Fruit availability	n=5,096	n=1,600	n=1,192	n=1,961
Always	70.0±1.5	70.6±2.4 ^c	58.5±2.6 ^d	67.5±2.3
Most of the time	19.7±1.0	20.3±1.7 ^c	27.8±1.8	22.2±1.6
Sometimes	8.1±0.6	7.2±0.9	10.1±1.1	8.6±1.0
Rarely	2.0±0.4	1.9±0.7	3.0±0.8	1.6±0.5
Never	0.2±0.1	0.1±0.1	0.6±0.2	0.1±0.1
Dark green vegetable availability	n=5,096	n=1,600	n=1,192	n=1,960
Always	57.2±1.1	54.4±1.6	61.6±2.4	55.4±2.5
Most of the time	23.2±1.0	23.5±1.5	25.0±2.3	22.6±1.7
Sometimes	14.2±1.0	14.8±1.6	11.5±1.0	16.7±2.0
Rarely	3.2±0.4	3.9±0.6 ^c	1.4±0.5	4.1±0.8
Never	2.4±0.5	3.4±0.9 ^c	0.5±0.3	1.3±0.4
Salty snack availability	n=5,096	n=1,593	n=1,192	n=1,961
Always	47.5±1.3	51.1±1.5 ^{ce}	37.1±2.3	36.2±2.0
Most of the time	20.0±0.9	22.1±1.3	20.2±1.6	19.1±1.8
Sometimes	23.0±1.1	19.4±1.2 ^{ce}	29.9±2.5	28.8±1.6
Rarely	8.0±0.5	6.4±0.7 ^e	9.4±1.8	11.0±2.0
Never	1.8±0.3	1.0±0.4	3.4±0.9	2.9±0.8
Fat-free/low-fat milk availability	n=5,096	n=1,593	n=1,192	n=1,961
Always	32.9±1.1	39.2±1.7 ^{ce}	13.9±1.4 ^d	24.7±1.9
Most of the time	3.0±0.4	3.0±0.7 ^e	6.1±1.0	3.5±0.8
Sometimes	4.4±0.4	3.4±0.6	6.0±1.5	5.8±0.8
Rarely	5.2±0.5	5.3±1.1	7.1±1.1	5.3±1.0
Never	54.5±1.2	49.2±1.7 ^{ce}	66.9±2.7	60.7±2.7
Soft drink availability	n=5,096	n=1,593	n=1,192	n=1,961
Always	43.4±1.5	46.5±2.6 ^e	42.6±2.6	33.6±2.3
Most of the time	14.8±0.7	15.1±0.9	18.8±1.6 ^d	13.5±1.2
Sometimes	18.9±1.1	15.2±1.8 ^e	23.1±2.3	25.2±1.2
Rarely	14.6±0.9	15.1±1.5	10.5±1.2 ^d	17.5±1.3
Never	8.3±0.6	8.0±0.9	4.9±0.9 ^d	10.3±1.0

^aFood availability based on response to questions regarding frequency of food availability.^bNHANES—National Health and Nutrition Examination Survey.^cSignificant difference between non-Hispanic white and non-Hispanic black at $P<0.01$.^dSignificant difference between non-Hispanic black and Hispanic at $P<0.01$.^eSignificant difference between non-Hispanic white and Hispanic at $P<0.01$.

7-day period (4.7 ± 0.1) compared with low- and middle-income homes ($P>0.01$). When race/ethnicity groups were further stratified based on PIR (Table 5), the number of meals the family ate together over a 7-day period was significantly lower in black homes compared with white and Hispanic homes across all income groups ($P<0.01$). In addition, the number of meals ate together cooked at home and the number of times someone cooked dinner at home over a 7-day period were significantly lower for low- and

middle-income blacks compared with low- and middle-income whites and Hispanics ($P<0.01$).

DISCUSSION

Home availability of food is significantly associated with dietary intake in youth.¹⁴⁻²¹ Studies that have examined the influence of race/ethnicity on home food availability in youth are contradictory and limited. Results from a focus group

Table 2. Home food availability^a prevalence based on poverty income ratio (PIR)^b for youth aged 6 to 19 y in the United States participating in NHANES^c 2007-10

	≤130% PIR	131%-349% PIR	≥350% PIR
	←%±standard error→		
Fruit availability	n=2,030	n=1,637	n=952
Always	56.7±2.0 ^d	64.3±2.4 ^e	75.4±2.4
Most of the time	27.2±1.4 ^d	24.6±1.9	18.5±2.0
Sometimes	12.8±1.2 ^d	8.7±1.1 ^e	4.5±0.9
Rarely	2.7±0.6	2.2±0.7	1.5±0.6
Never	0.6±0.3	0.2±0.2	0.0±0.0
Dark green vegetable availability	n=2,029	n=1,637	n=952
Always	54.8±1.7	56.4±2.1	60.1±2.8
Most of the time	23.2±1.2	22.0±1.5	25.9±2.4
Sometimes	16.1±1.1 ^d	16.6±1.6 ^e	10.4±1.7
Rarely	3.6±0.6	2.7±0.6	3.0±0.8
Never	2.4±0.6	2.2±0.7	0.6±0.3
Salty snack availability	n=2,030	n=1,637	n=952
Always	36.5±2.0 ^d	42.6±2.0	45.2±2.1
Most of the time	20.1±1.6	17.8±1.3	23.5±2.6
Sometimes	31.5±2.4 ^d	26.3±1.6	20.3±2.2
Rarely	9.5±1.2	10.7±1.1	8.7±1.7
Never	2.4±0.4	2.6±0.6	2.3±0.8
Fat-free/low-fat milk availability	n=2,030	n=1,637	n=952
Always	15.1±1.4 ^{df}	24.3±1.5 ^e	38.4±2.1
Most of the time	4.2±0.8	3.7±0.7	4.7±1.0
Sometimes	4.8±0.8	4.6±0.6	5.8±1.4
Rarely	6.6±1.1	5.8±0.9	5.2±0.9
Never	69.3±1.7 ^{df}	61.6±1.7 ^e	45.9±3.0
Soft drink availability	n=2,030	n=1,637	n=952
Always	43.6±2.1	42.7±2.0	36.4±2.3
Most of the time	17.1±1.5	15.8±1.3	14.5±1.8
Sometimes	21.2±1.7	21.4±1.7	20.9±1.9
Rarely	12.1±1.6	13.6±1.1	17.5±1.5
Never	6.0±0.6 ^d	6.5±0.9	10.7±1.2

^aFood availability based on response to questions regarding frequency of food availability.^bPIR category of ≤130%=low income, 131% to 349%=middle income, and ≥350%=high income.^cNHANES=National Health and Nutrition Examination Survey.^dSignificant difference between low income and high income at $P<0.01$.^eSignificant difference between middle income and high income at $P<0.01$.^fSignificant difference between low income and middle income at $P<0.01$.

with African-American, European-American, and Mexican-American children aged 9 to 12 years indicated that home availability of fruits, juices, and vegetables did not differ between race/ethnicity categories.²⁷ Similarly, fruit and vegetable availability in African-American and European-American homes of adolescent boys were not reported to differ.²⁸ These studies^{27,28} had several limitations, including

the lack of large sample sizes and the use of populations limited in geographic range and age groups.

In our study, home food availability frequency differed based on race/ethnicity categories in a nationally representative sample of youth. For example, black homes had the lowest availability of fat-free/low-fat milk compared with white and Hispanic homes. Studies have reported that

Table 3. Home food availability^a prevalence based on race/ethnicity by poverty income ratio (PIR)^b for youth aged 6 to 19 y in the United States participating in NHANES^c 2007-10

	Low Income		Middle Income		High Income	
	Sample size (n)	%±Standard error	Sample size (n)	%±Standard error	Sample size (n)	%±Standard error
Fruit availability^d						
Non-Hispanic white	509	59.2±3.5 ^e	471	69.3±3.7 ^f	525	83.2±2.8 ^g
Non-Hispanic black	497	48.9±3.3 ^{eh}	429	59.5±4.0	169	67.1±3.8
Hispanic	923	62.2±3.3 ^e	641	64.2±3.0	196	76.1±4.4
Dark green vegetable availability^d						
Non-Hispanic white	509	49.1±3.0 ^{eg}	471	53.7±3.9	525	60.4±3.0
Non-Hispanic black	497	61.3±2.9	429	63.5±3.2	169	59.9±5.1
Hispanic	922	53.9±2.1	641	52.2±3.6	196	60.0±5.5
Salty snack availability^c						
Non-Hispanic white	509	36.2±3.3 ^{ei}	471	55.8±3.3 ^{gj}	525	61.2±2.5 ^{gj}
Non-Hispanic black	497	39.1±3.1	429	37.1±3.7	169	34.9±4.1
Hispanic	923	34.1±2.5	641	34.9±2.4	196	39.4±4.5
Fat-free/low-fat milk availability^d						
Non-Hispanic white	509	21.3±2.8 ^{egi}	471	37.1±3.0 ^{fgj}	525	59.0±2.8 ^{gj}
Non-Hispanic black	497	7.6±1.8 ^{hi}	429	16.1±2.3	169	18.0±3.4 ^h
Hispanic	923	16.3±1.8 ^e	641	19.6±3.1 ^f	196	38.3±4.3
Soft drink availability^d						
Non-Hispanic white	509	47.8±3.8	471	47.6±3.7	525	44.1±3.3
Non-Hispanic black	497	48.7±4.3 ^h	429	43.3±4.1	169	35.8±3.9
Hispanic	923	34.3±3.1	641	37.2±3.0	196	29.3±4.8

^aFood availability based on response to questions regarding frequency of food availability.^bPIR category of ≤130%=low income, 131% to 349%=middle income, and ≥350%=high income.^cNHANES=National Health and Nutrition Examination Survey.^dFood availability data for always available response only.^eSignificant difference between low income and high income at $P<0.01$.^fSignificant difference between middle income and high income at $P<0.01$.^gSignificant difference between non-Hispanic white and non-Hispanic black at $P<0.01$.^hSignificant difference between non-Hispanic black and Hispanic at $P<0.01$.ⁱSignificant difference between low income and middle income at $P<0.01$.^jSignificant difference between non-Hispanic white and Hispanic at $P<0.01$.

blacks have the lowest levels of milk consumption^{47,49,50} and approximately 15% of black children meet the MyPlate recommendations for milk (ie, 3 c/day).⁴⁹ In a nationally representative sample of youth, approximately 5% of blacks reported consumption of low-fat milk compared with approximately 10% of Hispanic and 28% of white youth.⁴⁷ The low consumption of milk and low-fat milk by black youth may be due to low availability of milk, specifically fat-free/low-fat milk, in the home indicating the need to study this relationship further. Reduced availability of milk may be due to cultural food preferences, higher incidences of lactose intolerance, or lactose intolerance misperceptions in blacks.⁵⁰

Salty snack availability was found to be greatest for whites in our study. Salty snack intake has increased in US youth during the past 30 years.⁵¹ However, few studies have examined the influence of race/ethnicity on salty snack

intake. In studies that have examined this relationship, conflicting results exist. In adolescents participating in Project Eating Among Teens-I,⁵² Hispanic youth had a significantly higher intake of sweet and salty snacks compared with whites. In the same study, blacks had no difference in intake of sweet and salty snacks compared with whites.⁵² In contrast, whites were found to have a higher intake of desserts and salty snacks compared with Mexican and American-born Mexican Americans.⁵³ It is possible that assessing consumption of desserts, or sweets, and salty snacks in combination yields varying results. In addition to whites having the greatest availability of salty snacks in our study, whites also had the greatest availability of soft drinks closely followed by soft drink availability in blacks. In US youth aged 2 to 19 years, non-Hispanic blacks have been found to have the highest percentage of total daily calories

Table 4. Mean levels of family food expenditures based on race/ethnicity, poverty income ratio (PIR), and race/ethnicity by PIR^a for youth aged 6 to 19 y in the United States participating in NHANES^b 2007-10

Demographic characteristic	Money Spent at Supermarket/Grocery Store (\$/30 d)		Money Spent on Eating Out (\$/30 d)		Money Spent on Carry Out/Delivery Foods (\$/30 d)	
	Sample size (n)	Mean±standard error	Sample size (n)	Mean±standard error	Sample size (n)	Mean±standard error
Race-ethnicity						
Non-Hispanic white	1,491	537.1±11.3 ^c	1,467	174.5±6.5 ^c	1,496	29.1±2.6
Non-Hispanic black	1,091	409.7±14.5 ^d	1,071	111.4±6.6 ^d	1,080	31.2±3.2
Hispanic	2,060	522.0±13.0	1,737	171.9±9.0	1,752	27.6±2.5
PIR						
Low income	1,918	461.4±13.3 ^e	1,887	82.1±5.3 ^{ef}	1,912	17.2±2.5 ^{ef}
Middle income	1,528	475.2±10.5 ^g	1,520	130.3±4.4 ^g	1,533	29.2±2.1 ^g
High income	883	532.2±15.8	868	245.4±12.8	883	41.5±3.4
Race-ethnicity by PIR						
Non-Hispanic white						
Low income	506	478.8±24.8 ^{ce}	498	91.0±8.3 ^{ef}	504	15.2±4.2 ^e
Middle income	464	523.5±15.3 ^{cg}	462	144.6±9.2 ^{cg}	469	29.8±6.6
High income	521	608.9±20.4 ^c	507	287.9±17.1 ^c	523	48.6±5.2 ^c
Non-Hispanic black						
Low income	493	383.7±20.7 ^d	482	75.0±10.6 ^e	489	25.2±6.1
Middle income	429	400.3±21.6 ^d	424	94.1±6.2 ^{dg}	426	29.8±3.5
High income	169	445.1±25.5 ^d	165	165.2±14.4 ^d	165	32.5±3.8
Hispanic						
Low income	919	521.7±16.3	907	80.4±7.3 ^{ef}	919	11.4±1.2 ^{ef}
Middle income	635	501.7±17.9	634	152.2±6.1 ^g	638	28.0±3.7 ^g
High income	193	542.6±25.1	196	283.0±25.3	195	43.4±5.8

^aPIR category of ≤130%—low income, 131% to 349%—middle income, and ≥350%—high income.^bNHANES—National Health and Nutrition Examination Survey.^cSignificant difference between non-Hispanic white and non-Hispanic black at $P<0.01$.^dSignificant difference between non-Hispanic black and Hispanic at $P<0.01$.^eSignificant difference between low income and high income at $P<0.01$.^fSignificant difference between low income and middle income at $P<0.01$.^gSignificant difference between middle income and high income at $P<0.01$.

coming from sugar drinks compared with non-Hispanic whites and Mexican Americans.⁵⁴ Sugary drinks included fruit drinks, sodas, energy drinks, sport drinks, and sweetened bottled waters in the aforementioned study. Similarly, soda consumption in high school-aged youth was greatest for blacks compared with Hispanic and whites.⁵⁵ It is important to note that approximately 40% to 50% of calories from sugar-sweetened beverages occurs away from home indicating the need to address sources of soft-drink availability outside of the home.^{54,56}

The many variations in food availability based on race/ethnicity found in our study may be due to cultural differences, including cultural food preferences, educational attainment of parents, proximity to a grocery store, or higher

rates of poverty in certain racial/ethnic groups.⁵⁷⁻⁶⁰ Importantly, the results from our study indicate the need to examine racial/ethnic variations that may influence the home food environment and, thus, dietary consumption in youth.

Beyond race/ethnicity, home food availability frequency was also found to differ based on PIR categories for US youth in our study. High-income homes have been previously found to have an increased availability of healthful foods in the home.²¹ Our study found a higher prevalence of high-income homes with an increased availability of healthful foods, including fruits and fat-free/low-fat milk as well as unhealthy foods such as salty snacks. Few other studies have examined the influence of family income on home food availability. Income level may directly influence food

Table 5. Mean levels of family meal patterns based on race-ethnicity, poverty income ratio (PIR), and race/ethnicity by PIR^a for youth aged 6 to 19 y in the United States participating in NHANES^b 2007-10

Demographic characteristic	Times Someone Cooked Dinner at Home (n/7 d)		Meals Family Ate Together (n/7 d)		Meals Ate Together Cooked at Home (n/7 d)	
	Sample size (n)	Mean±standard error	Sample size (n)	Mean±standard error	Sample size (n)	Mean±standard error
Race/ethnicity						
Non-Hispanic white	1,505	5.2±0.1 ^c	1,476	6.0±0.2 ^c	1,349	6.0±0.2 ^c
Non-Hispanic black	1,093	4.7±0.1 ^d	1,075	4.3±0.2 ^d	913	4.7±0.2 ^d
Hispanic	1,760	5.5±0.1	1,743	5.9 ±0.2	1,632	5.9±0.2
PIR						
Low income	1,927	5.4±0.1 ^e	1,873	5.4±0.2	1,683	5.8±0.1
Middle income	1,541	5.2±0.1 ^f	1,532	5.3±0.2	1,393	5.4±0.1
High income	890	4.7±0.1	889	5.5±0.2	818	5.4±0.2
Race/ethnicity by PIR						
Non-Hispanic white						
Low income	509	5.5±0.1 ^{ceg}	486	6.0±0.5 ^c	429	6.4±0.4 ^c
Middle income	471	5.2±0.1 ^{cg}	465	5.9±0.2 ^c	432	5.8±0.2 ^c
High income	525	4.8±0.2	525	6.0±0.2 ^c	488	5.8±0.2
Non-Hispanic black						
Low income	495	4.8±0.2 ^d	479	4.4±0.2 ^d	405	4.8±0.2 ^d
Middle income	429	4.7±0.1 ^d	428	4.2±0.3 ^d	364	4.5±0.3 ^d
High income	169	4.7±0.2	168	4.5±0.5 ^d	144	4.7±0.4
Hispanic						
Low income	923	6.0±0.1 ^e	908	6.0±0.2	849	6.1±0.1
Middle income	641	5.7±0.1 ^f	639	5.7±0.3	597	5.7±0.2
High income	196	4.7±0.2	196	6.1±0.5	186	5.7±0.4

^aPIR category of ≤130%=low income, 131% to 349%=middle income, and ≥350%=high income.^bNHANES=National Health and Nutrition Examination Survey.^cSignificant difference between non-Hispanic white and non-Hispanic black at $P<0.01$.^dSignificant difference between non-Hispanic black and Hispanic at $P<0.01$.^eSignificant difference between low income and high income at $P<0.01$.^fSignificant difference between middle income and high income at $p<0.01$.^gSignificant difference between non-Hispanic white and Hispanic at $P<0.01$.

availability in the home due to cost differences in energy-dense and nutrient dense-foods.⁶¹⁻⁶³ In addition to food costs, knowledge and application of healthy behaviors may influence food availability in homes of different incomes. Differences in health behaviors have been reported across education gradients and it is well documented that education and income level are related.^{63,64} In homes of Australian adolescents, SES identified by maternal education level, was associated with food availability.²⁵ Low-SES households reported a higher prevalence of unhealthful foods always available, including soft drinks, salty snacks, sports drinks, and confections.²⁵ Adolescents of lower SES have been found to consume lower amounts of fruits, vegetables, fiber-rich foods, and dairy products,⁶⁵ possibly due to reduced availability of healthful foods in low-SES homes.

Race/ethnicity and income level were found to interact and synergistically influence home availability frequency of certain foods in our study. Prevalence of fat-free/low-fat milk always available increased for white and Hispanic homes as income increased. However, this relationship was not seen for blacks (Table 3). These results provide evidence that race/ethnicity and PIR influence food availability and that these factors may interact with one another indicating a complexity to the home food environment.⁹

Family meal frequency has been correlated with an increase in healthy dietary patterns, including increased fruit and vegetable consumption, as well as decreased weight in youth.^{15,26,29-36,66-69} However, limited studies have examined what factors influence family meal patterns. Our study showed that race/ethnicity and PIR influenced family meal

patterns in homes of youth (Table 5). Prior studies examining the relationship between family meal patterns and SES are contradictory. Families of high SES, defined by parent education level, have been reported by youth to have more family meals.²⁶ However, when assessing SES based on maternal education level attained, high-SES homes or those homes with more-educated mothers had the lowest number of family meals reported. These results were attributed in part to work impeding eating together for 50% of highly-educated mothers.⁷⁰ In homes with highly-educated mothers, a dual-earner scenario with both parents working outside of the home may lead to a higher income level and reduced family meal frequency due to time constraints. In addition to PIR, race/ethnicity may be associated with family meal frequency as indicated in our study, which found that blacks had the lowest frequency of family meals compared with whites and Hispanics. Similarly, African-American youth have been found to have the lowest frequency of family meals when compared with white, Asian-American, Hispanic, and Native-American youth.¹⁵ However, large standard deviations in the aforementioned study indicated substantial differences in family meal frequency within race/ethnicity groups.¹⁵ When assessing meal frequency for a specific meal, racial/ethnic differences have also been found.⁶⁹ The highest frequencies of family breakfast meals have been reported in adolescents of black, Hispanic, Native-American, and mixed race/ethnicity indicating that family meal frequency for different race/ethnicity groups may vary by meal.⁶⁹

Differences in mean levels of family food expenditures were also found across race/ethnicity and PIR categories (Table 4). Higher income households have previously been found to spend more money on eating out compared with lower income households.⁷¹ An increased workload by one or both parents may leave less time for grocery shopping and at home food preparation or a decreased concern about the costs associated with restaurant prepared foods.^{70,72} Black families spent significantly less money at the supermarket/grocery store compared with Hispanic and white families (Table 5). These results may be due to reduced access to supermarkets. An increase in food deserts has been found in low-income areas and areas with a high proportion of African Americans.⁷³ Among the most impoverished neighborhoods in metropolitan Detroit, MI, blacks were on average 1.1 miles further from the nearest supermarket compared with whites.⁷⁴ This racial disparity was not found for the least-impoverished neighborhoods, suggesting that limited access to supermarkets is a problem for low-income blacks in certain US cities.⁷⁴ Additional studies are needed that examine why variations in family meal patterns and family food expenditures exist for different race/ethnicity groups and income levels. Insight into these relationships could assist public health professionals in better tailoring nutrition education programs to address income and race/ethnicity disparities in meal practices and food spending.

Our study is not without limitations. NHANES is a cross-sectional study; therefore, causal statements could not be made. In addition, the use of a predefined inventory survey to assess home food availability has limitations, including the inability to measure quantities of foods available in the home and the influence of data collection timing, in terms of proximity to recent food purchases, on survey results.⁷⁵ However, strengths of this study also exist. This study

analyzed a large nationally representative data set. This data set was collected by trained NHANES staff providing a high-quality data set.

CONCLUSIONS

The home food environment is complex and may be influenced by several factors. These factors may interact with one another increasing the difficulty of examining the relationship of the home food environment and dietary consumption. Food availability, family meal patterns, and family food expenditures are three aspects of the home food environment addressed in our study. Our study showed that race/ethnicity and PIR influence all three of these aspects and that race/ethnicity and PIR may confound one another as they affect the home food environment. Knowledge of factors that influence food availability could assist nutrition educators in tailoring education to increase home availability of certain foods and, therefore, consumption of healthful foods in youth. Additional research examining factors that influence the home food environment is warranted to assist nutrition educators and nutrition policy makers in developing effective strategies to improve food environments for youth.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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