

# Fast-Food Intake and Diet Quality in Black and White Girls

## *The National Heart, Lung, and Blood Institute Growth and Health Study*

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**Objective:** To examine trends in fast-food consumption and its relationship to calorie, fat, and sodium intake in black and white adolescent girls.

**Design:** A longitudinal multicenter cohort study of the development of obesity and cardiovascular risk factors in black and white female adolescents. Data collection occurred annually using a validated 3-day food record and a food-patterns questionnaire.

**Subjects and Settings:** A biracial and socioeconomically diverse group of 2379 black and white girls recruited from 3 centers.

**Main Outcome Measure:** Three-day food records and a food-patterns questionnaire were examined for intake of fast food and its association with nutrient intake. We compared patterns of exposure to fast food and its impact on intake of calories, fat, and sodium.

**Results:** Fast-food intake was positively associated with intake of energy and sodium as well as total fat and saturated fat as a percentage of calories. Fast-food intake increased with increasing age in both races. With increasing consumption of fast food, energy intake increased with an adjusted mean of 1837 kcal for the low fast-food frequency group vs 1966 kcal for the highest fast-food frequency group ( $P < .05$ ). Total fat in the low fast-food frequency group was 34.3% as opposed to 35.8% in the highest fast-food frequency group ( $P < .05$ ). Saturated fat went from 12.5% to 13% and sodium increased from 3085 mg to 3236 mg in the lowest vs the highest fast-food frequency group ( $P < .001$ ).

**Conclusions:** Dietary intake of fast food is a determinant of diet quality in adolescent girls. Efforts to reduce fast-food consumption may be useful in improving diet and risk for future cardiovascular disease.

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CHILDREN AND ADOLESCENTS are reported to be eating an increasing proportion of their meals away from home.<sup>1-4</sup> Because time considerations and convenience are major factors that contribute to an adolescent's food choice,<sup>5</sup> it is not surprising that fast-food establishments serve as popular sites for those meals eaten outside of the home environment. One study showed that adolescents visit fast-food establishments 2 times a week on average.<sup>4</sup> It also showed that fast-food use was more common in children, adolescents, and those with a higher income.<sup>4</sup> Children and adolescents who eat fast food consume an average of 187 Kcal per day more than those who did not.<sup>6</sup> They also consume more fats, carbohydrates, added sugars, and energy and less dietary fiber.<sup>6</sup>

Fast foods are often high in energy and fat and also often contain a significant

amount of saturated fat, cholesterol, and sodium.<sup>1,4,6-9</sup> They may often displace healthier food options such as fruits, vegetables, milk, and breads and cereals.<sup>4,6,10,11</sup> Fast food may also be associated with large portion size,<sup>2,12</sup> and the trends show that the largest food portions reported were from fast-food restaurants.<sup>13</sup>

The purpose of this present report is to (1) provide age and ethnic group data on the frequency of fast-food intake for black and white girls longitudinally during adolescence and (2) evaluate the association between the frequency of fast-food consumption and the intake of energy, total fat, saturated fat, and sodium.

## METHODS

### SUBJECTS

The National Heart, Lung, and Blood Institute Growth and Health Study was a collabo-

rative cohort study with data collection beginning in 1987. It was conducted at 3 clinical centers: the University of California at Berkeley, Berkeley; the University of Cincinnati–Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio; and Westat, Inc, Rockville, Md, in association with a Washington, DC, metropolitan-area health maintenance organization.<sup>14</sup> The Maryland Medical Research Institute in Baltimore served as the coordinating center. The National Heart, Lung, and Blood Institute project office also participated in the design and conduct of this study. Institutional review board approval was obtained at all participating centers. Girls were eligible for enrollment in the study if (1) they declared themselves as being either black or white; (2) they were aged 9 or 10 years at the time of the first clinical visit; (3) they had parents or guardians who identified themselves as the same ethnicity as the child; and (4) their parents or guardians completed a household demographic information form and gave informed consent for the children to participate.

In total, 2379 girls were enrolled in the study, including 1213 black girls and 1166 white girls. Because of variable annual participation rates, sample sizes varied from year to year. Participation rates from the cohort were 96% and 94% in years 2 and 3, declined from 91% to 78% in years 4 through 6, and increased from 82% to 89% in years 7 through 10. Those participants missing data for age or who were pregnant at the time of their visits were excluded from the analysis of data for that age. Those who were older than 19 years at the time of the 10th visit were also excluded.

## INSTRUMENTS AND PROCEDURE

Dietary data were collected annually in the first 5 years and then again in years 7, 8, and 10 at clinic visits. If the girl could not travel to the center, the data were collected at the girl’s home. Across all centers, standard probes were used to respond to girls’ questions and to clarify incomplete responses. Details of the measurements have been previously reported.<sup>14</sup> Only instruments of relevance to the present report are described here.

## DIETARY MEASUREMENT METHODS

Nutrient intakes were obtained from 3-day food records. This method was selected after validity testing of 3 dietary assessment methods. The results of the dietary validation and dietary intake of the cohort study are published elsewhere.<sup>15,16</sup>

The girls were instructed in keeping a 3-day food record. Taught with age-appropriate materials, girls learned to record all food and drink consumed during 3 consecutive days, 2 weekdays and 1 weekend day. Girls were also instructed to record the time of eating and place of food origin (eg, home, school, or restaurant).

Nutritionists were trained and certified by the University of Minnesota Nutrition Coordinating Center (Minneapolis) in the first 2 years of the study and subsequently by the Cincinnati Dietary Data Entry Center (Cincinnati). These nutritionists reviewed food records individually with the girls. During these interviews, girls were asked to elaborate on food preparation, brand names, and portion sizes. Portion sizes were determined using rulers and sets of graduated bowls, glasses, spoons, and pictures of geometric shapes.

Girls’ food records were handled in a confidential manner. We did not seek supplementary information from parents because confidentiality was given a high priority compared with additional detail on foods or food preparation. If a girl could not provide specific data regarding the amounts, types, or preparation of foods she ate, default values were used. A comprehensive default system was adapted from that developed by the

University of Minnesota Nutrition Coordinating Center, using actual information obtained from girls in the study on the types of foods eaten and average portion sizes. Approximately 15% of the food items recorded by the girls required default information for coding. The largest numbers of defaults were in reference to the description, cut, or preparation of meat, followed by missing information on homemade items and brand names of commercial items.

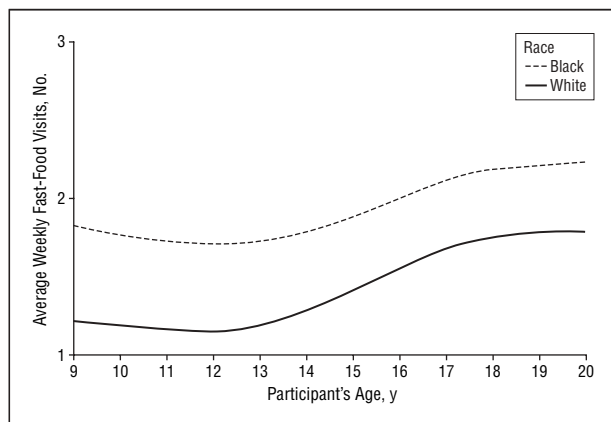
The use of defaults was reduced by the use of labels and label pictures to help the girls describe foods. Food records were coded and analyzed for nutrients using the most up-to-date version of the Nutrition Coordinating Center nutrient database, Food Table version 19.<sup>17</sup> The 3 days were averaged to reduce within-subject variance and to allow for a more accurate quantification of individual nutrient intake. Nutrients evaluated included total energy in kilocalories, percentage of calories from total fat and saturated fat, and milligrams of sodium.

## FREQUENCY OF FAST-FOOD INTAKE

At the same clinic visit each year, girls completed a nutrition-patterns form. Participants were asked, “How often do you eat food from a place like McDonald’s, Kentucky Fried Chicken, Pizza Hut, Burger King, or some other fast-food restaurant?” *Fast food* was defined as food associated with paying before eating and using paper or plastic to serve it. For purposes of this report, frequency of fast-food consumption was categorized as follows: never or less than 1 time per week (low intake); 1 to 3 times per week (medium intake); or 4 or more times per week (high intake).

## DATA ANALYSIS

Analyses used dietary data for girls between the ages of 9 and 19 years. Mean values for energy, percentage of energy from total and saturated fat, and sodium intake are presented by age, ethnic group, and fast-food frequency group. To examine the associations of age and ethnicity with energy and nutrient intake, we fitted multiple linear regression models using the generalized estimating equation method<sup>18</sup> using PROC GENMOD in SAS (SAS Institute, Cary, NC). The general model included the macronutrient as the dependent variable and fast-food frequency, age, race, maximum household education, and significant 2-way interactions as independent variables. A traditional linear model was assumed, using SAS type 3 analysis. We used a repeated statement with an autoregressive correlation structure to address the multiple observations per subject. This treatment of within-subject data assumes that observations nearest to each other temporally will be more highly correlated than those that are farther apart. Age was included in these models to examine intake over time. Age was calculated as the number of days from birth date to visit date divided by 365.25. Ethnicity was included in all models to estimate the effect of race. Maximum educational level attained in the household was included in the models to adjust for differences in socioeconomic status. The 3 levels coded for maximum educational level were less than high school graduate, less than 4 years of college, and 4 or more years of college. All main effects were included in all analyses. Initially, all 2-way interactions between main effects were included in the models. We used a backward-stepping removal procedure to remove all interactions that were not statistically significant. (For the purposes of this article,  $P < .05$  is considered statistically significant.) Further, we removed any interactions involving nonsignificant main effects using a backward-stepping procedure until the model achieved significance of the main effect or no interactions remained for that main effect. To help clarify comparisons, we show the means adjusted for other effects in the model. These means were cal-



**Figure 1.** Weekly frequency of fast-food consumption vs age. For the number of visits per week, the estimated average for group 1 is 0.5; group 2, 2; and group 3, 5.

culated using the SAS statement LSMEANS. We compared differences between LSMEANS using a Wald  $\chi^2$  test. For example, this allows comparisons of mean levels of macronutrients between black and white girls, after adjustment for differences in age and proportion of subjects in each frequency of fast-food consumption and socioeconomic status category. We used SAS for all analyses.<sup>19</sup> For visual presentation, we combined subjects into 3 age groups. Group 1 includes data from girls aged 9 to 12 years, group 2 includes girls aged 13 to 16 years, and group 3 includes girls aged 17 to 19 years.

## RESULTS

### PARTICIPATION RATES

The percentage of girls completing diet records and pattern forms ranged from 78% to 95% per year, with no observable trend over time. There were more black girls who had missing food record data ( $P < .001$ ), and those without food-record data tended to be from the lowest household income group and the lowest educational group (both  $P < .001$ ). Of 914 subjects who had complete data for all visits, only 109 were in the same fast-food frequency group throughout.

### FREQUENCY OF FAST-FOOD INTAKE

For black girls and white girls combined, frequency of fast-food consumption increased with age ( $P < .001$ ). This is shown in **Figure 1**. For this figure, fast-food consumption was given a numeric value considered to be the approximate mean for each category: less than 1 time a week was given a value of 0.5, 1 to 3 times a week was given a value of 2, and 4 or more times a week was given a value of 5. Across all ages, black girls consumed fast foods more frequently than white girls ( $P < .001$ ). Frequency of fast-food consumption increased with age in both black girls and white girls.

### RELATIONSHIP OF FAST-FOOD CONSUMPTION TO NUTRIENT INTAKE VARIABLES

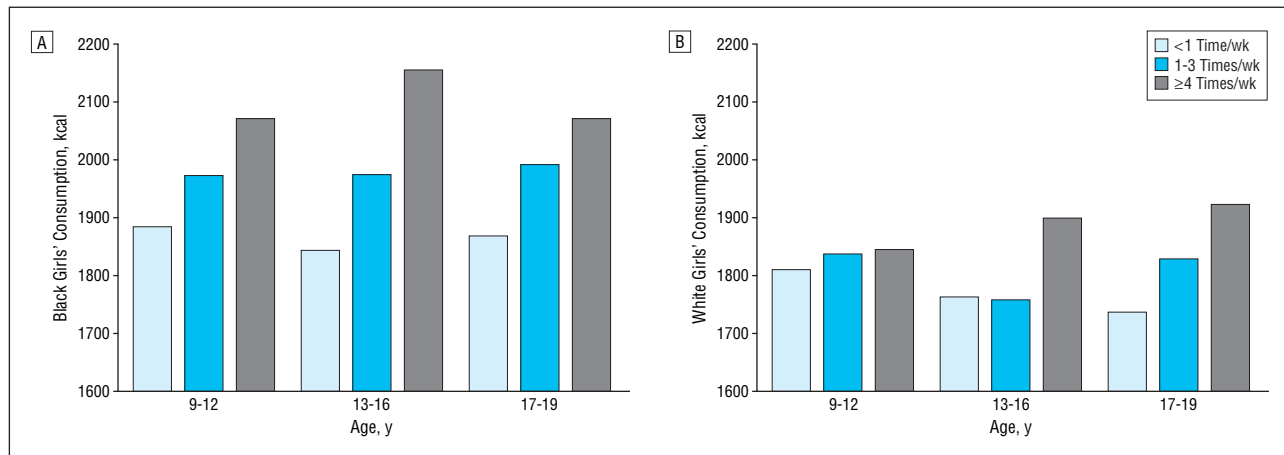
For the entire cohort, the frequency of fast-food consumption was positively associated with caloric con-

sumption (**Figure 2A** and **B**). The adjusted means were 1837 kcal for the low fast-food intake group; 1894 kcal for the middle intake group; and 1966 kcal for the high intake group (all comparisons,  $P < .001$ ). Over all ages and fast-food intake groups, black girls reported consumption of more calories per day than white girls, with black girls consuming an adjusted mean of 1978 kcal vs 1820 kcal for the white girls ( $P < .001$ ). There was no significant change in reported caloric consumption with increasing age for black and white girls combined.

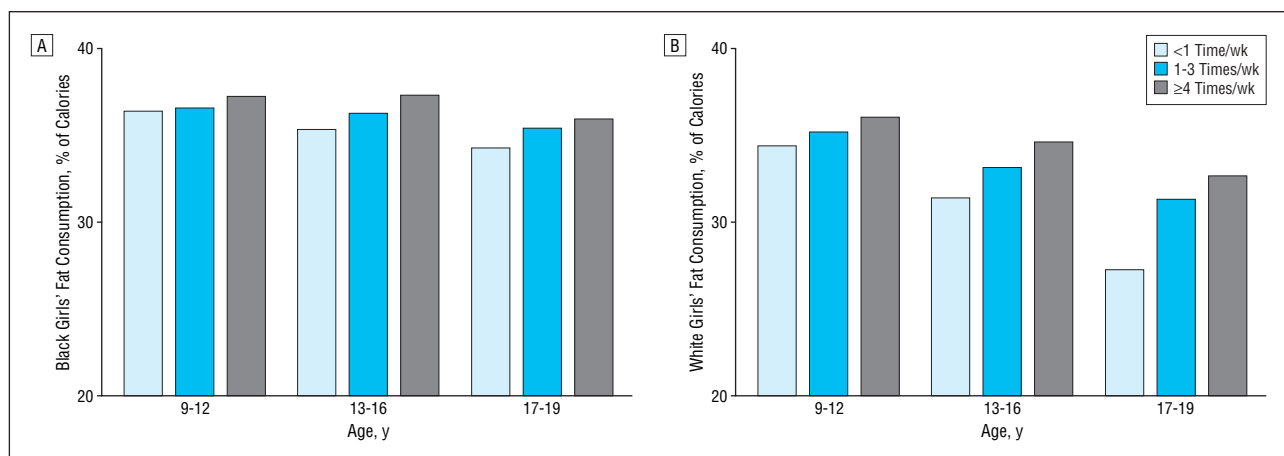
The frequency of fast-food intake was significantly associated with the proportion of total calories from fat consumed (**Figure 3A** and **B**). The low fast-food intake group consumed 34.3% of calories from fat, the middle fast-food intake group consumed 35.0% of calories from fat, and the high fast-food intake group consumed 35.8% of calories from fat (all comparisons,  $P < .001$ ). Black girls reported consumption of a higher proportion of calories from fat than white girls, with black girls at 36.1% and white girls at 33.9% ( $P < .001$ ). Overall, the girls tended to eat less total fat as a percentage of calories as they got older ( $P < .001$ ). Girls in the lowest fast-food category tended to eat a lower percentage of calories from fat as they got older compared with girls in the higher categories (age  $\times$  frequency of fast-food consumption interaction,  $P < .001$ ). White girls tended to eat less fat as a percentage of calories over time compared with black girls (race  $\times$  age interaction,  $P < .001$ ). Frequency of fast-food consumption tended to have a greater effect on white girls, who had a greater increase in proportion of calories from fat with an increase in frequency of fast food, than on black girls (race  $\times$  fast-food frequency interaction,  $P < .05$ ).

There was a positive association between fast-food frequency and saturated-fat consumption as a percentage of calories (**Figure 4A** and **B**). The low fast-food intake group consumed 12.5% of their calories as saturated fat, the middle fast-food intake group consumed 12.9% as saturated fat, and the high fast-food intake group consumed 13.0% as saturated fat (middle and high vs low, each  $P < .001$ ). Although white girls consumed slightly less saturated fat as a percentage of calories than black girls (12.7% vs 12.9%), this difference was not statistically significant ( $P > .05$ ). For the entire cohort, saturated fat as a percentage of calories decreased over time ( $P < .001$ ). Girls with the lowest frequency of fast-food consumption tended to have reduced saturated-fat consumption as a percentage of calories more than other girls with increasing age (fast-food frequency  $\times$  age interaction,  $P < .001$ ). Over all ages, white girls tended to decrease saturated-fat consumption as a percentage of calories more than black girls with increasing age (race  $\times$  age interaction,  $P < .001$ ).

There was a positive association between the frequency of fast food and sodium consumption (**Figure 5A** and **B**). The daily mean sodium intake for the low fast-food intake group was 3085 mg; for the medium fast-food intake group, 3134 mg; and for the high fast-food intake group, 3236 mg (low vs medium,  $P < .05$ ; low vs high,  $P < .001$ ). There was an overall increase in sodium consumption with age ( $P < .001$ ). Black girls, in general, consumed about 400 mg more sodium per day than white



**Figure 2.** A, Calorie consumption by age and frequency of fast-food consumption for black girls. B, Calorie consumption by age and frequency of fast-food consumption for white girls.



**Figure 3.** A, Total fat consumption by age and frequency of fast-food consumption for black girls. B, Total fat consumption by age and frequency of fast-food consumption for white girls.

girls (LSMEANS for blacks, 3344 mg vs 2941 mg for whites,  $P < .001$ ).

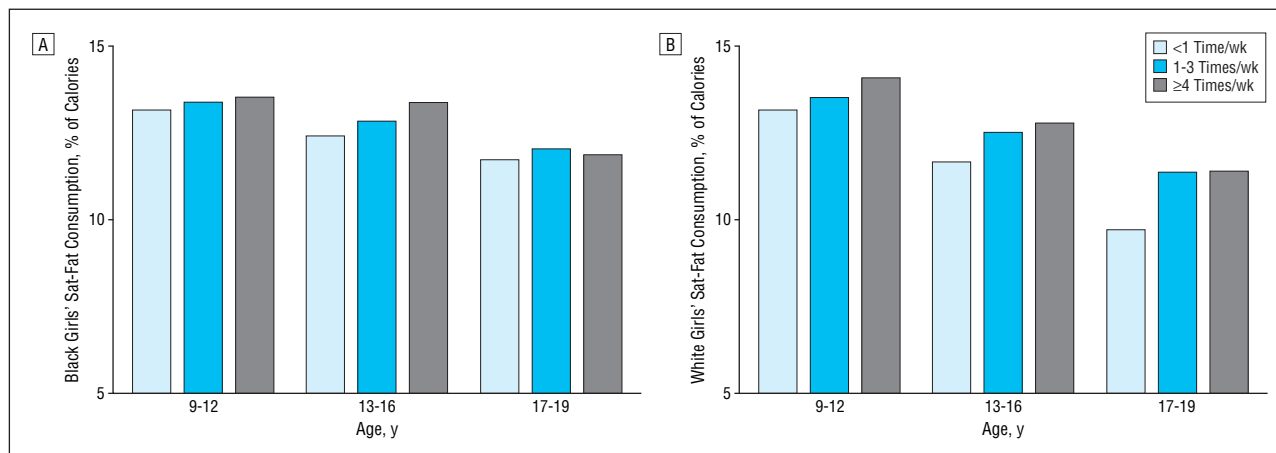
#### COMMENT

The results of the present longitudinal study show that frequency of fast-food consumption increases with age for both black and white adolescent girls. This is consistent with the girls becoming more independent with increasing age and eating fast food more frequently, as would be seen in adults, because of the convenience and value.<sup>4</sup> Higher frequency of fast-food intake was positively associated with higher levels of energy intake as well as higher intake levels of total fat, saturated fat, and sodium. This finding may be related to the types of foods as well as the large portion sizes often served in fast-food restaurants. Fast foods typically do not include many fruits and vegetables or milk but often include foods and drinks such as french fries, hamburgers, and soft drinks, which are high in calories and fat and prepared with salt. The large portion sizes are usually priced for value, which encourages greater consumption.<sup>2</sup>

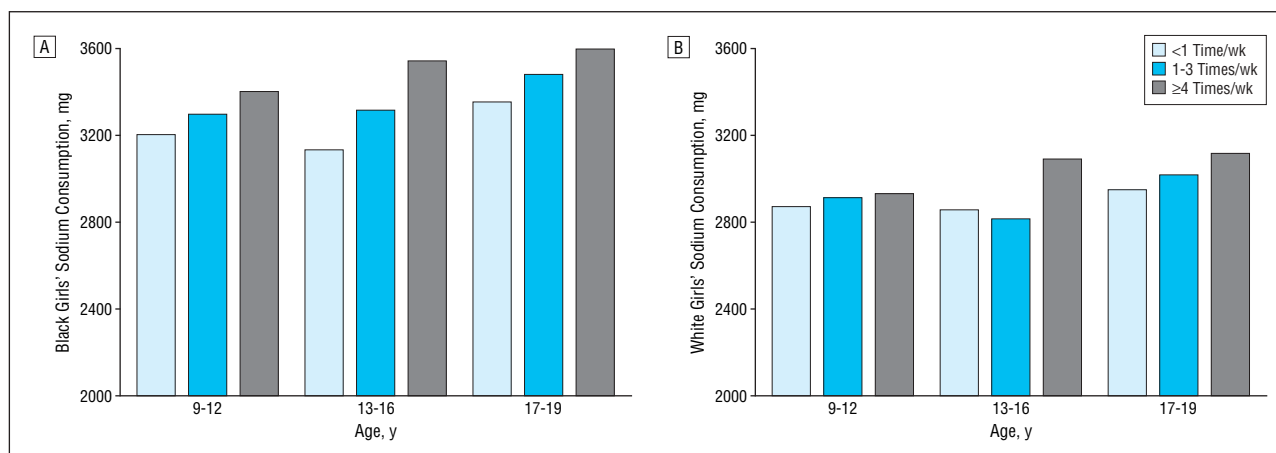
We found that fast-food intake was associated with consumption of a higher proportion of calories from total and saturated fat in the total cohort, as was found in other studies.<sup>8</sup>

Although the proportion of calories from fat was positively associated with fast-food frequency, this proportion decreased over time as girls became older. This decrease may be due to a conscious effort by the girls to choose less of the higher-fat foods or an effort on the part of the fast-food industry to offer a wider range of foods and reduce fat levels in food over the period of this study.

Overall, black girls tended to consume more fast food, and consequently more calories, total fat, saturated fat, and sodium, than white girls. Furthermore, their fat consumption was elevated at each level of fast-food intake in comparison with white girls. Higher intake of fat has been shown to be associated with cardiovascular risk factors in children such as being overweight and having elevated cholesterol values.<sup>3</sup> White girls in the lowest fast-food intake group substantially lowered their total fat and saturated fat intake, but not sodium intake, over time compared with the other groups. This pattern may reflect the girls' choices for more healthful foods in the group that



**Figure 4.** A, Saturated-fat (Sat-Fat) consumption by age and frequency of fast-food consumption for black girls. B, Saturated-fat consumption by age and frequency of fast-food consumption for white girls.



**Figure 5.** A, Sodium consumption by age and frequency of fast-food consumption for black girls. B, Sodium consumption by age and frequency of fast-food consumption for white girls.

ate less fast food. In addition, no overall trends of reduced sodium intake with increasing age were observed in girls of either race. Girls either do not consciously choose to decrease their sodium intake as they grow older, or consuming lower amounts of sodium is difficult in the current market place, particularly when fast food is consumed frequently. These results suggest that decreasing fast-food consumption to a lower level could be a useful strategy for reducing intake of total calories and further reducing total and saturated fats. However, additional dietary strategies and changes in the food supply and market may be needed to reduce dietary sodium.

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