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Article *in* PEDIATRICS · February 2004

DOI: 10.1542/peds.113.1.112

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Pediatrics 2004;113;112-118
DOI: 10.1542/peds.113.1.112

Effects of Fast-Food Consumption on Energy Intake and Diet Quality Among Children in a National Household Survey

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ABSTRACT. *Background.* **Fast food has become a prominent feature of the diet of children in the United States and, increasingly, throughout the world. However, few studies have examined the effects of fast-food consumption on any nutrition or health-related outcome. The aim of this study was to test the hypothesis that fast-food consumption adversely affects dietary factors linked to obesity risk.**

Methods. **This study included 6212 children and adolescents 4 to 19 years old in the United States participating in the nationally representative Continuing Survey of Food Intake by Individuals conducted from 1994 to 1996 and the Supplemental Children's Survey conducted in 1998. We examined the associations between fast-food consumption and measures of dietary quality using between-subject comparisons involving the whole cohort and within-subject comparisons involving 2080 individuals who ate fast food on one but not both survey days.**

Results. **On a typical day, 30.3% of the total sample reported consuming fast food. Fast-food consumption was highly prevalent in both genders, all racial/ethnic groups, and all regions of the country. Controlling for socioeconomic and demographic variables, increased fast-food consumption was independently associated with male gender, older age, higher household incomes, non-Hispanic black race/ethnicity, and residing in the South. Children who ate fast food, compared with those who did not, consumed more total energy (187 kcal; 95% confidence interval [CI]: 109–265), more energy per gram of food (0.29 kcal/g; 95% CI: 0.25–0.33), more total fat (9 g; 95% CI: 5.0–13.0), more total carbohydrate (24 g; 95% CI: 12.6–35.4), more added sugars (26 g; 95% CI: 18.2–34.6), more sugar-sweetened beverages (228 g; 95% CI: 184–272), less fiber (−1.1 g; 95% CI: −1.8 to −0.4), less milk (−65 g; 95% CI: −95 to −30), and fewer fruits and nonstarchy vegetables (−45 g; 95% CI: -58.6 to −31.4). Very similar results were observed by using within-subject analyses in which subjects served as their own controls: that is, children ate more total energy and had poorer diet quality on days with, compared with without, fast food.**

Conclusion. **Consumption of fast food among children in the United States seems to have an adverse effect on dietary quality in ways that plausibly could increase risk for obesity.** *Pediatrics* **2004;113:112–118;** ***fast food, obesity, dietary composition, diet quality, energy intake.***

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Received for publication Jul 10, 2003; accepted Aug 7, 2003.

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ABBREVIATIONS. CSFII, US Department of Agriculture's Continuing Survey of Food Intakes by Individuals; BMI, body mass index; MSA, metropolitan statistical area.

From its origins in the 1950s, fast food has grown into a dominant dietary pattern among children in the United States today.[1,2] Consumption of fast food by children increased a remarkable fivefold from 2% of total energy in the late 1970s to 10% of total energy in the mid-1990s.[3] The number of fast-food restaurants more than doubled from 1972 to 1995 and now totals an estimated 247 115 nationwide.[4] Fast food pervades virtually all segments of society including local communities, public schools, and hospitals.[5–7] These trends seem to have been driven by massive advertising and marketing campaigns aimed at children and their parents.[2]

Several dietary factors inherent to fast food may cause excessive weight gain such as massive portion size, high energy density, palatability (appealing to primordial taste preferences for fats, sugar, and salt), high content of saturated and trans fat, high glycemic load, and low content of fiber.[8] However, few studies have examined the effects of fast-food consumption in children.[9–11] In the absence of such data, professional nutritional agencies in the United States[12] presently support industry claims that fast food can be part of a healthful diet.[13,14]

The aims of this study were first to examine national patterns of fast-food consumption among children and second to determine whether fast food adversely affects diet quality in ways that might plausibly increase risk for obesity.

METHODS

Subjects

Data from the US Department of Agriculture's Continuing Survey of Food Intakes by Individuals (CSFII) 1994 to 1996 and the Supplemental Children's Survey conducted in 1998 were used for the study.[15] The 1998 sample involved only children from birth through 9 years old, and the 1994 to 1996 sample involved persons of all ages. These surveys, conducted by the US Department of Agriculture as part of its ongoing national nutrition-monitoring activities, are nationally representative and include all 50 states and Washington, DC. For between-subject comparisons, children who had complete food-intake recalls on the first day of the

survey were categorized into 3 age groups: 4 to 8 years old, 9 to 13 years old, and 14 to 19 years old. Within-subject comparisons included children 4 to 19 years old with complete food-intake recalls on both nonconsecutive days of the survey who had fast food on one but not both survey days.

Design

In these nationally representative household population surveys, the primary hypothesis was that subjects who consumed food obtained at fast-food restaurants, compared with those who did not, would exhibit higher total energy intake and poorer diet quality over the day studied. Multiple regression was used to control for potentially confounding demographic, socioeconomic, and anthropometric covariates. We also conducted within-subject comparisons on a subset of individuals who were discordant in fast-food consumption on the 2 survey days, because such models control for between-subject confounding variables.

Assessment of Diet and Other Variables

CSFII 1994 to 1996 and CSFII 1998 collected dietary intake data on 2 nonconsecutive days, 3 to 10 days apart. For between-subject comparisons, we used data from the first survey day because of the higher overall response rate (for all participants including children and adults, the response rate in CSFII 1994 to 1996 was 80.0% on day 1 compared with 76.1% on day 2; and in CSFII 1998, the response rate was 85.6% on day 1 compared with 81.7% on day 2). Dietary data were obtained through an interviewer-administered 24-hour recall by using a multiple-pass technique to reduce under-reporting. Survey instruments were tested in a pilot study, and, based on the study results, the instruments were revised appropriately. Food coders, field supervisors, and interviewers were trained before the survey.[16] Measuring guides were used to help respondents estimate the amount of food and beverages consumed. Spanish-language questionnaires were used when appropriate. The accuracy and utility of translations were checked before the survey. If a sampled person spoke neither English nor Spanish, a family member or neighbor ≥16 years old served as an interpreter.

In the surveys, children ≥12 years old provided information on their dietary intakes. Children 6 to 11 years old were asked to describe their own food intakes and were assisted by an adult household member (proxy) who was responsible for preparing the child's meals. Proxy interviews were conducted for children <6 years old and any sampled person who could not report for themselves because of physical or mental limitations. Information on height and weight was obtained from the sampled persons or their proxy person. Body mass index (BMI) was calculated by dividing weight by height-squared and expressed as kg/m^2.

The surveys sought information as to where each food or beverage was obtained and included: stores such as supermarkets, farmer's markets, commissaries, or specialty stores; restaurants; bars, taverns, or lounges; fast-food or pizza places; vending machines; school cafeterias; soup kitchens; meals on wheels; child care or adult day care centers; and food grown or caught by the respondents or someone known to the respondent. In this study, foods obtained at fast-food and pizza places were grouped collectively as obtained from fast-food places.

We used nutrients and food groups as defined in the CSFII 1994 to 1996.[17] Food amounts were determined from the weight in grams of foods and beverages in the form reported consumed (including water present in beverages such as tea, coffee, fruit drinks made from dry mixes, cocoa, and milk drinks; excluding water drunk separately such as tap and bottled water). Energy density was determined as total energy intake in kilocalories divided by total weight in grams, excluding beverages.

At the screening interview, conducted to determine whether any household member was eligible to participate, information was collected on the number of people living in a household, their names, date of birth, age, sex, race, ethnicity, and household income.

The 4 geographic regions (Northeast, Midwest, South, and West) in the CSFII are as defined by the US Department of Commerce for the 1990 census population. A metropolitan statistical area (MSA) is a geographic area consisting of a large population nucleus together with adjacent communities that have a high degree of economic and social integration with the nucleus, according to the Office of Management and Budget.

Statistical Analyses

For between-subject comparisons, we calculated mean food and nutrient intakes of those who ate fast food and those who did not eat fast food on the first survey day. In addition, we estimated independent associations between fast food and measures of diet quality by using multiple regression. In the baseline model, fast-food consumption status, age, and gender were the independent variables. In a second model, race/ethnicity, household income groups, urbanization, and geographic region were added to the baseline model. A third model included BMI with the independent variables in the second model. Of 6212 children in the study, 832 had no BMI values and therefore were excluded from the third regression model. Because of the large amount of missing data and concerns about the validity of youth and parent reports of weights and heights, BMI was used as a covariate in some analyses and not as a primary analysis variable.

For within-subject comparisons, we calculated mean food and nutrient intakes of 2080 children discordant in fast-food consumption on the 2 survey days, comparing the day that fast food was eaten with the day that fast food was not eaten. We adjusted the difference in consumption levels between days for age, gender, race/ethnicity, household income groups, urbanization, geographic region, and order effect (whether fast food was eaten on survey day 1 or 2).

The SUDAAN software package (SAS-Callable Mainframe SUDAAN for Solaris, release 8.0.1, Research Triangle Institute, Research Triangle Park, NC) was used for regression analysis and for the estimation of percentages, means, standard errors of the means, and pairwise comparisons ($P < .05$) among groups. SAS was used only for variable selection, variable manipulation, and running SAS callable-SUDAAN (SAS for SunOS, release 8.2, 1999–2001, Cary, NC). All the surveys used a complex, multistage probability sampling design to provide representative samples of noninstitutionalized children and adolescents in the United States. Estimates in this study are based on weighted observations and reflect the probability of selection, nonresponse, and poststratification adjustments. Detailed descriptions of the samples have been published elsewhere.[16,17] All P values are 2-tailed.

RESULTS

Of the 6212 children in the study, 51% were males and 49% were females (Table 1). Racial/ethnic composition was 66% whites, 16% non-Hispanic blacks, 14% Hispanics, and 5% other. On a typical day, 1720 children (30.3% of the total) ate fast food. Fast-food consumption was prevalent among all age groups, both genders, all household income levels, all racial/ethnic groups, all degrees of urbanization, and all regions of the country. Multiple logistic regression analyses controlling for socioeconomic and demographic variables (Table 2) indicated that increased fast-food consumption was independently associated ($P < .05$) with male gender, older age, higher household incomes, non-Hispanic black race/ethnicity, and residency in the South.

Table 3 shows unadjusted intakes of total energy, nutrients, and food groups by age category according to whether fast food was consumed. Children eating fast food obtained a mean of 29% to 38% of total energy from fast food depending on age category. Comparing fast-food consumers to nonconsumers, total energy intake was 63 kcal or 3.6% greater per day in 4- to 8-year-olds (P = not significant), 132 kcal or 6.4% greater in 9- to 13-year-olds ($P < .05$), and 379 kcal or 16.8% greater in 14- to 19-year-olds ($P < .05$). Fast-food consumers also ate more total fat, more saturated fat, more total carbohydrate, more added sugars, more sugar-sweetened beverages, less fluid milk, and fewer fruits and nonstarchy vegetables, differences that were statistically

TABLE 1. Socioeconomic and Demographic Characteristics of Study Sample by Fast-Food Intake Status

Characteristics (Percent of Total Sample)	Percent Having Fast Food	
	Weighted Mean	95% CI
Age groups		
4–8 years old (32.0%)	24.6	22.6–26.6
9–13 years old (32.2%)	26.4	23.9–28.9
14–19 years old (35.8%)	39.0	35.3–42.7
Gender		
Males (51.0%)	32.3	29.5–35.1
Females (49.0%)	28.3	26.0–30.6
Household income as % poverty		
0%–130% (26.2%)	24.9	20.8–29.0
131%–350% (43.9%)	30.4	27.5–33.3
>350% (29.9%)	35.1	31.2–39.0
Race		
Non-Hispanic whites (65.8%)	31.4	28.9–33.9
Non-Hispanic blacks (15.8%)	33.3	28.9–37.7
Non-Hispanic other races (4.7%)	27.1	18.5–35.7
All Hispanics (13.7%)	23.2	19.2–27.2
Urbanization		
MSA, central city (29.0%)	29.2	26.1–32.3
MSA, suburban areas (49.2%)	32.6	29.8–35.4
Non-MSA, rural (21.8%)	26.7	21.5–31.9
Region		
Northwest (18.6%)	27.3	23.2–31.5
Midwest (24.1%)	32.5	28.0–37.0
South (34.8%)	33.6	30.7–36.5
West (22.5%)	25.6	23.0–28.2

Of 6212 children 4 to 19 years old 1720 (30.3%) had fast food.
CI indicates confidence interval.

significant in most age categories. Nonbeverage energy density was greater in all age categories by ~15% among children who were fast-food consumers.

Table 4 shows adjusted intakes of total energy, nutrients, and food groups among all children in the study according to whether fast food was consumed. After adjustment for potentially confounding demographic and socioeconomic factors, fast-food consumption remained significantly and positively associated with total energy, total fat, saturated fat, total carbohydrate, added sugars, sugar-sweetened beverages, and nonbeverage energy density. Fast-food consumption was significantly and inversely associated with consumption of fiber, milk, fruits, and nonstarchy vegetables. These findings were not materially affected by further adjustment for BMI (data not shown).

Table 5 presents within-subject comparisons of total energy, nutrients, and food groups among the 2080 children who ate fast food on one but not both of the survey days, with adjustment for covariates. The results were similar to those obtained using between-subject comparisons (Table 4).

DISCUSSION

The prevalence of obesity in children has increased threefold or more during the last 3 decades,[18,19] raising serious public health concerns. A number of environmental factors undoubtedly have contributed to this epidemic. The present study suggests that fast-food consumption may be one such factor. Children who ate fast food consumed an average of 187 kcal/day more than those who did not. In additional analyses using subjects as their own controls, children ate 126 kcal/day more on days with, compared with without, fast food. These within-subject comparisons provide a high level of confidence that the associations between fast food and dietary factors are causally related and not the consequence of confounding by unrecognized or incompletely controlled socioeconomic or demographic factors. The relatively small differences in point estimates obtained from these 2 types of analyses may have resulted in part from differences in subject samples: the within-subject comparisons did not include those individuals who ate fast food most or least frequently (that is, on both days or neither day).

Because 30.3% of study participants ate fast food on any given day, these foods seem to contribute an additional 57 kcal (187 kcal × 30.3%) to the daily diet of the average child in the United States. This energy increment theoretically could account for an additional 6 pounds of weight gain per child per year, assuming 3500 kcal/pound of body weight, if energy expenditure were unchanged. Preliminary findings from a prospective study of 5114 young adults support this possibility. The odds of becoming obese over a 15-year period increased by 86% among young white adults (but not among blacks) visiting fast-food restaurants more than twice per week, compared with those visiting fast-food restaurants less than once per week, after adjustment for potential confounders.[20]

Several factors inherent to fast food may increase energy intake, thus promoting a positive energy balance and increasing risk for obesity. Children and adolescents who ate fast food on a typical day, compared with those who did not, consumed more total and saturated fat, more total carbohydrate and added sugars, less dietary fiber, and more energy per gram of solid food (ie, higher nonbeverage energy density). This profile reflects the composition of typical fast-food fare (cheeseburgers, french-fried potatoes, sugar-sweetened beverages, etc) popular among youth.[21] The high energy density and palatability of fat may promote excess energy intake,[22] and total dietary fat has been directly associated with adiposity in some[23,24] but not all[25,26] studies. Because fast-food meals are high in refined starch and added sugars, they have a high glycemic index and glycemic load.[27] High glycemic load meals seem to elicit a sequence of physiologic events that promote energy intake in the short term,[28] although the relevance of glycemic index and glycemic load in the long-term control of body weight is a subject of debate.[29,30] Dietary fiber promotes satiation and satiety[31] and may protect against excessive weight gain via effects that could be mediated by and/or independent of glycemic index.[32] Furthermore, fast food is served in increasingly large portion sizes.[33] Portion size has been linked to voluntary energy intake in several recent studies.[34,35]

Fast food may also compromise diet quality in ways that might affect body weight by displacing more healthful food options. Children who ate fast food, compared with those who did not, consumed more sugar-sweetened beverages, less milk, and fewer fruits and nonstarchy vegetables. Prospective

TABLE 2. Logistic Regression Analyses of Fast-Food Consumption by Gender, Age, and Other Sociodemographic Characteristics

Independent Variables	Dependent Variable = Fast-Food Consumption Status			
	Odds Ratio	95% Lower Limit	95% Upper Limit	*P* Value
Gender				
Female	1.00	1.0	1.0	
Male	1.21	1.00	1.45	.049
Race/ethnicity				
Non-Hispanic whites	1.00	1.0	1.0	
Non-Hispanic blacks	1.28	1.04	1.57	.02
Non-Hispanic other races	0.91	0.57	1.44	.67
All Hispanics	0.86	0.61	1.23	.40
Household income				
0%–130%	1.0	1.0	1.0	
131%–350%	1.28	0.94	1.75	.12
<350%	1.54	1.10	2.15	.01
Urbanization				
MSA-Central city	1.0	1.0	1.0	
MSA-Suburban	1.16	0.92	1.46	.19
Non-MSA-Rural	0.90	0.67	1.21	.47
Region				
Northeast	1.0	1.0	1.0	
Midwest	1.28	0.97	1.71	.08
South	1.33	1.02	1.73	.04
West	1.00	0.79	1.26	.98
Age in years (continuous variable)	1.07	1.05	1.08	<.0001

TABLE 3. Mean* Intakes of Energy-Selected Nutrients; and Food Groups Among 4- to 19-Year-Old Children by Fast-Food Intake Status (Between-Subject Comparisons for Data Obtained on Survey Day 1)

Energy, Nutrients, and Food Groups	4- to 8-Year Olds			9- to 13-Year Olds			14- to 19-Year Olds		
	Had No Fast Food Intake (*N* = 2,948)	Had Fast Food Intake (*N* = 987)	From Fast Food (*N* = 987)	Had No Fast Food Intake (*N* = 881)	Had Fast Food Intake (*N* = 320)	From Fast Food (*N* = 320)	Had No Fast Food Intake (*N* = 663)	Had Fast Food Intake (*N* = 413)	From Fast Food (*N* = 413)
Energy (calories)	1773 ± 22[a]	1836 ± 27[a]	540	2052 ± 34[c]	2184 ± 56[d]	747	2258 ± 59[e]	2637 ± 56[f]	1005
Total fat (g)	64 ± 1.1[a]	68 ± 1.3[b]	23	75 ± 1.7[c]	81 ± 2.5[c]	32	82 ± 2.7[e]	99 ± 2.5[f]	43
Saturated fat (g)	24 ± 0.5[a]	25 ± 0.5[a]	8	27 ± 0.6[c]	30 ± 1.1[d]	11	29 ± 0.9[e]	35 ± 0.9[f]	15
Total carbohydrate (g)	242 ± 3[a]	251 ± 4[a]	64	279 ± 5[c]	298 ± 9[d]	89	303 ± 8[e]	351 ± 9[f]	119
Added sugars† (g)	74 ± 1[a]	89 ± 3[b]	NA	95 ± 3[c]	122 ± 6[d]	NA	108 ± 4[e]	150 ± 7[f]	49
Dietary fiber (g)	12 ± 0.2[a]	11 ± 0.2[b]	3	15 ± 0.4[c]	13 ± 0.5[d]	4	16 ± 0.5[e]	15 ± 0.5[e]	5
Protein (g)	63 ± 1[a]	61 ± 1[a]	19	72 ± 2[c]	72 ± 2[c]	28	81 ± 2[e]	88 ± 2[e]	37
Total fluid milk‡ (g)	332 ± 9[a]	276 ± 14[b]	11	320 ± 14[c]	251 ± 21[d]	7	256 ± 20[e]	194 ± 16[e]	2
Fruits and nonstarchy vegetables§(g)	155 ± 5[a]	94 ± 6[b]	9	146 ± 8[c]	98 ± 11[d]	15	143 ± 11[e]	111 ± 10[f]	25
Nondiet carbonated beverages‖ (g)	89 ± 5[a]	215 ± 12[b]	126	220 ± 14[c]	450 ± 42[d]	205	390 ± 31[e]	704 ± 39[f]	319
Nonbeverage energy density (kcal/g)	2.0 ± 0.01[a]	2.3 ± 0.03[b]	2.63	2.1 ± 0.03[c]	2.4 ± 0.03[d]	2.61	2.1 ± 0.03[e]	2.4 ± 0.04[f]	2.57

NA indicates not available.

* Includes mean ± standard error of the mean. Pairwise mean comparisons were made within same age groups. Means having different superscripts are significantly different from each other at $P < 0.05$: a and b, used for 4- to 8-year-old age group; c and d, for 9- to 13-year-old age group; and e and f, for 14- to 19-year-old age group.

† Includes all sugars used as ingredients in processed and prepared foods, sugars added to foods at the table, and sugars eaten separately. Does not include sugars present naturally in foods such as lactose in milk and fructose in fruits. Information on added sugars from fast food are not available for children 4 to 13 years old because the CSFII 1998 public-release data did not include added sugars from individual foods reported consumed.

‡ Fluids include whole, low-fat, skim, and acidophilus milk; buttermilk; reconstituted dry milk; evaporated milk; and sweetened condensed milk. Milk drinks are not included.

§ Includes citrus, dried, and other fruits; mixtures having fruit as a main ingredient; dark-green and deep-yellow vegetables; tomatoes; lettuce; other vegetables; and mixtures having vegetables as a main ingredient. Not included are citrus and other fruit juices and potatoes of all types, corn, green peas, and lima beans.

‖ Includes all carbonated soft drinks except unsweetened and sugar-free types.

studies indicate a positive association for sugar-sweetened soft drinks[36] and an inverse association for milk[37] with the odds for becoming obese in children or young adults. Fruits and nonstarchy vegetables may protect against excessive weight gain because of their low energy density, high fiber content, and low glycemic index. Moreover, inadequate consumption of fruits and vegetables has been associated with obesity-related morbidities such as cardiovascular disease[38,39] and diabetes.[40]

The food and nutrient profiles of subjects who ate fast food closely reflect dietary patterns among chil-

TABLE 4. Mean* Intakes of Energy and Selected Nutrients and Food Groups Among 4- to 19-Year-Old Children by Fast-Food† Intake Status, Adjusted for Potentially Confounding Demographic and Socioeconomic Factors (Between-Subject Comparisons for Data Obtained on Survey Day 1)

Energy, Nutrients, and Food Groups	Had no Fast Food (Minimally Adjusted)†	Had Fast Food (Minimally Adjusted)†	Difference‡ (Minimally Adjusted)	Difference (Fully Adjusted)§	*P* Value (Fully Adjusted)§	95% CI (Fully Adjusted)§
Energy (kcal)	2049 ± 28	2236 ± 32	+187	+187	<.0001	109 to 265
Total fat (g)	75 ± 1.3	84 ± 1.4	+9	+9	<.0001	5.0 to 13.0
Saturated fat (g)	26.8 ± 0.5	30.3 ± 0.6	+3.5	+3.7	<.0001	2.1 to 5.3
Total carbohydrate (g)	277 ± 4	303 ± 6	+25	+24	.0001	12.6 to 35.4
Added sugars‖ (g)	94 ± 2	122 ± 4	+28	+26	<.0001	18.2 to 34.6
Dietary fiber (g)	14.3 ± 0.3	13.2 ± 0.3	−1.1	−1.1	.004	−1.8 to −0.36
Total fluid milk¶ (g)	302 ± 10	236 ± 11	−65	−62	.0005	−95 to −30
Fruits and nonstarchy vegetables# (g)	148 ± 5	103 ± 6	−45	−45	<.0001	−58.6 to −31.4
Nondiet carbonated beverages** (g)	243 ± 12	471 ± 21	+228	+228	<.0001	184 to 272
Nonbeverage energy density (kcal/g)	2.06 ± 0.02	2.36 ± 0.02	+0.30	+0.29	<.0001	0.25 to 0.33

CI indicates confidence interval.
* Means ± standard error of the mean from the regression models.
† Values from minimally adjusted regression models having fast-food status, age, and gender as independent variables
‡ Column 3 minus column 2.
§ Difference between fully adjusted means (not shown) of fast-food eaters and non-fast-food eaters from the regression model. Independent variables include fast-food intake status (had fast food or did not have fast food), age in years (a continuous variable), gender (male or female), race/ethnicity (non-Hispanic whites; non-Hispanic blacks; non-Hispanic other races such as Asians, Native Americans, Pacific Islanders, and Alaskan Natives; or Hispanics), annual household income as percentage of poverty (0%– 130%, 131%–350%, or >350%), urbanization (central city, suburban, or rural), and geographic region (Northeast, Midwest, South, or West).
‖ Includes all sugars used as ingredients in processed and prepared foods, sugars added to foods at the table, and sugars eaten separately. Does not include sugars present naturally in foods such as lactose in milk and fructose in fruits.
¶ Fluids included whole, low-fat, skim, and acidophilus milk; buttermilk; reconstituted dry milk; evaporated milk; and sweetened condensed milk. Milk drinks are not included.
# Includes citrus, dried, and other fruits; mixtures having fruit as a main ingredient; dark-green and deep-yellow vegetables; tomatoes; lettuce; other vegetables; and mixtures having vegetables as a main ingredient. Not included are citrus and other fruit juices, potatoes of all types, corn, green peas, and lima beans.
** Includes all carbonated soft drinks except unsweetened and sugar-free types.

dren who infrequently eat dinner with their families.[41] These children consume fewer fruits and vegetables, more fried food and soda, more saturated and trans fat, higher glycemic load, and less fiber and micronutrients. In a hectic society, busy family routines foster a need for quick and convenient meals[42] and may preclude preparation of healthful dinners at home. Adolescents are, in fact, obtaining an increasing proportion of their total energy intake away from home, often at fast-food establishments.[43]

Although there were some differences in fast-food consumption among socioeconomic and demographic groups, the prevalence among any of these groups was >23% on a typical day. From a sociocultural perspective, the ubiquity of fast-food establishments may account for this high level of consumption. One especially relevant trend is the increasing availability of fast food in school cafeterias.[2,6] In an ecological study of 23 middle schools in San Diego, CA, a la carte sales of brand name and school-prepared fast food exceeded 15 000 items per week.[5] Of particular interest, school socioeconomic status was directly related to the total number of a la carte sales, of which ~27% were for fast food. Despite the ubiquity of fast food, children of higher socioeconomic status may have more discretionary money and consequently greater access to fast food, and this fact may account for the independent relationship of higher income to greater consumption of fast food in our study.

The observed direct association of fast-food consumption with age is not surprising. Adolescence represents a time of increasing autonomy, and teenagers purchase more fast food with their own money than younger consumers.[2] The workforce at fast-food restaurants is largely comprised of adolescents[1] who may receive discounted or free food as part of their compensation.[9] Moreover, youth may be progressively influenced over time by pervasive advertising because of the cumulative effects of repetitious messages. The industry markets heavily to children with the goal of fostering a fast-food habit that will persist into adulthood.[44]

One methodological issue should be noted. The study relies on self-report of intake (assisted by adult household members of young children), a dietary assessment technique that may be inaccurate and imprecise. However, the 24-hour recall methodology used here arguably provides valid estimates of dietary intake on a group level in children.[45,46] When recall methodology was compared with total energy expenditure using the doubly labeled water technique, nearly 80% of children were classified as "accurate" or "over" reporters.[47] Given the escalating obesity epidemic, it is possible that some of the over reporters were accurately recalling dietary intake but eating in excess of total energy expenditure.

Our results are largely consistent with those of previous studies. French et al[9] found fast-food consumption to be associated with higher total energy

TABLE 5. Mean* Intakes of Energy and Selected Nutrients and Food Groups Among 4- to 19-Year-Old Children ($N = 2080$) Who Had Fast Food on 1 of the 2 Survey Days, Adjusted for Demographic and Socioeconomic Factors and Order Effect (Within-Subject Comparisons)

Energy, Nutrients and Food Groups	No Fast-Food Day	Fast-Food Day	Difference†	Difference (Adjusted)‡	*P* Value (Adjusted)‡	95% CI (Adjusted)‡
Energy (kcal)	2067 ± 31	2193 ± 29	+126	+126	<.0001	68 to 184
Total fat (g)	75 ± 1.3	82 ± 1.3	+7	+7	<.0001	4.2 to 9.8
Saturated fat (g)	27.2 ± 0.5	29.8 ± 0.5	+2.6	+2.6	<.0001	1.4 to 3.8
Total carbohydrate (g)	278 ± 4	295 ± 4	+17	+17	.0001	9 to 25
Added sugars§ (g)	96 ± 2	117 ± 2	+21	+21	<.0001	16 to 26
Dietary fiber (g)	13.7 ± 0.3	13.2 ± 0.3	−0.5	−0.6	.0453	−0.01 to −1.17
Total fluid milk‖ (g)	294 ± 10	250 ± 9	−44	−45	<.0001	−66 to −24
Fruits and nonstarchy vegetables¶ (g)	142 ± 7	95 ± 5	−47	−45	<.0001	−61 to −29
Nondiet carbonated beverages# (g)	264 ± 12	453 ± 16	+189	+189	<.0001	158 to 220
Nonbeverage energy density (kcal/g)	2.10 ± 0.02	2.37 ± 0.01	+0.27	+0.27	<.0001	0.23 to 0.31

CI indicates confidence interval.
* Means ± standard error of the mean for children who had fast food on one of the two days of the survey.
† Column 3 minus column 2.
‡ Difference between fully adjusted means (not in table) for fast-food day and non-fast-food day from the regression model. Independent variables include fast-food day (yes = 1 and no = 0), order of the fast-food day (day 1 or 2), age in years (a continuous variable), gender (male or female), race/ethnicity (non-Hispanic whites; non-Hispanic blacks; non-Hispanic other races such as Asians, Native Americans, Pacific Islanders, and Alaskan Natives; or Hispanics), annual household income as percentage of poverty (0%–130%, 131%–350%, or >350%), urbanization (central city, suburban, or rural), and geographic region (Northeast, Midwest, South, or West).
§ Includes all sugars used as ingredients in processed and prepared foods, sugars added to foods at the table, and sugars eaten separately. Not included are sugars present naturally in foods such as lactose in milk and fructose in fruits.
‖ Fluids include whole, low-fat, skim, and acidophilus milk; buttermilk; reconstituted dry milk; evaporated milk; and sweetened condensed milk. Milk drinks are not included.
¶ Includes citrus, dried, and other fruits; mixtures having fruit as a main ingredient; dark-green and deep-yellow vegetables; tomatoes; lettuce; other vegetables; and mixtures having vegetables as a main ingredient. Not included are citrus and other fruit juices and potatoes of all types, corn, green peas, and lima beans.
# Includes all carbonated soft drinks except unsweetened and sugar-free types.

intake and poorer diet quality among adolescents in a metropolitan area of Minnesota. McNutt et al[10] found that adolescent girls who ate fast food >4 times per week consumed more total energy than those who ate fast food less frequently. Cusatis and Shannon[11] observed that fast-food consumption was a significant predictor of dietary fat among girls but not boys.

CONCLUSIONS

This study used nationally representative household data to examine the habitual diets of children in the United States. On a typical day that fast food is eaten, children consume substantially more total energy and have worse dietary quality compared with a typical day without fast food. The associations between fast food and diet seem to be causally related, as demonstrated with between-subject comparisons controlled for confounding factors and within-subject comparisons potentially free from confounding by demographic and socioeconomic influences. In light of these findings and other recent studies,[9,20] measures to limit marketing of fast food to children may be warranted.

ACKNOWLEDGEMENTS

This work was supported by the Charles H. Hood Foundation; National Institute of Diabetes and Digestive and Kidney Diseases (grant 1R01DK59240); US Department of Agriculture Agricultural Research Service; and Centers for Disease Control and Prevention (Prevention Research Centers grant U48/CCU115807).

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MISLEADING LABEL

"The name 'chicken pox' is misleading: The word 'chicken' . . . may have been derived from the French word *chiche*, meaning chickpea, referring to the size of the lesion, or from the Old English word *gicans*, meaning itch; 'pox' refers to any rash consisting of pustules, or skin lesions filled with pus."

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Submitted by Student

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Pediatrics 2004;113;112-118
DOI: 10.1542/peds.113.1.112