Journal of Agricultural and Resource Economics 30(2):302–314

Household Fast Food Expenditures and Children's Television Viewing: Can They Really Significantly Influence Children's Dietary Quality?

Wen You and Rodolfo M. Nayga, Jr.

Previous studies have found a strong relationship between food-away-from-home expenditures and television viewing, and children's diet. This study revisits this issue by examining the impact of household fast food expenditures and children's television viewing on children's dietary quality. Results indicate that both factors have statistically significant and negative effects. However, the elasticities of children's diet quality with respect to both factors are quite inelastic. Results also suggest that the effects of these two factors differ between children younger than 11 years old and children at least 11 years old. Relevant policy implications are discussed.

Key words: children's diet and health, fast food expenditures, healthy eating index, obesity, television viewing

Introduction

The U.S. population now leads the world in obesity rates. The prevalence of obesity in the U.S. population has nearly doubled in the last 10 years, and today an estimated 64% of Americans are classified as overweight or obese. Even more troubling is the increase in the number of overweight and obese children. Based on data from the American Obesity Association (2004), about 15.5% of adolescents (ages 12 to 19) and 15.3% of children (ages 6 to 11) were classified as obese in 1999–2000, compared to only 7% and 5%, respectively, in 1976–1980 (see table 1). This increasing prevalence of childhood obesity is of concern because it will affect children's quality of life as they grow older and is also likely to increase future health care costs.

These recent increases in childhood obesity have received a great deal of attention in the scientific and popular press, and have been attributed partly to foods eaten by children away from home (mainly fast food consumption) and television viewing. For example, Bowman et al. (2004) found that children who ate fast food, compared with those who did not, consumed more total energy, fat, added sugars, and sugar-sweetened beverages, and less milk, fruits, and vegetables. They concluded that consumption of fast food among children in the United States appears to have an adverse effect on the quality of children's diet in ways which plausibly could increase risk of obesity. Their study, however, did not directly estimate the effect of fast food expenditures on the overall diet quality of children.

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Review coordinated by DeeVon Bailey.

Table 1. Childhood Obesity: 95th Percentile of Body Mass Index (BMI)

Time Period	Ages 6–11	Ages 12–19
1999–2000	15.3%	15.5%
1988–1994	11%	11%
1976–1980	7%	5%

Source: American Obesity Association (2004).

A number of studies (e.g., Crespo et al., 2001; Dietz and Gortmaker, 1985; Gortmaker et al., 1996; Boynton-Jarrett et al., 2003; Giammattei et al., 2003; Halford et al., 2004) have also suggested a positive correlation between television viewing and children's poor eating behavior. Several investigations (e.g., Kaur et al., 2003; Proctor et al., 2003; Utter et al., 2003; Wake, Hesketh, and Waters, 2003) found that television viewing leads to a subsequent increase in Body Mass Index (BMI)[1] percentiles and overweight in adolescents and concluded that efforts to decrease overweight should consider interventions to reduce television time. Biddle et al. (2004) examined TV viewing as a marker of inactivity, while Phillips et al. (2004) found a significant, positive relationship between energy-dense snack (EDS) food consumption and television viewing among 8- to 12-year-old girls. None of these studies, however, have jointly examined the effect of both continuous measures of fast food expenditures and television viewing on the overall diet quality of children.

Accordingly, the central questions to be evaluated in this paper are: (*a*) Can household fast food expenditures (denoted here as *FAST*) and amount of television viewing (denoted as *TV*) really significantly influence children's diet quality? and (*b*) How do these two factors influence the diet quality of younger versus older children? If the answer to the first question is yes, then policy makers can indeed use these two factors as instruments to help improve our children's diets and plausibly help reduce the risk and the prevalence of obesity. It is also important to determine if the effects of these two variables are different on younger versus older children.

This paper addresses the effect of household weekly expenditures on fast food, and number of hours per day of television/video time by children on the quality of children's diet. Our goal is not only to quantitatively estimate the marginal effects of these two factors on an overall measure of children's diet quality (not just on individual nutrient intake), but also to assess how elastic diet quality is to changes in weekly fast food expenditures and daily television viewing hours. The findings suggest both factors have a statistically significant and negative effect on children's diet quality. However, children's diet quality is found to be quite inelastic to changes in either of these two factors. Moreover, the effects of either of these two factors differ depending on whether the child is younger than 11 years of age (generally pre-puberty stage) or at least 11 years old (generally post-puberty stage). The next section presents the theoretical framework used in the analysis, followed by a description of the data and a discussion of the econometric model specifications. Empirical results are then presented. The final section highlights the implications of our findings and offers concluding remarks.

[1] Body Mass Index is an index calculated by the following formula: $BMI = weight/(height^2)$.

Theoretical Framework

Children's health is one of the household outputs which provides utility to the entire household. This analysis places the issue of children's health within the context of Becker's (1965) household production theory and adapts the approaches suggested by Grossman (1972); Becker (1965); and Lancaster (1966). The basic concept in household production theory is that households are producers as well as consumers. The household utility function is maximized by consuming commodities the households produce by combining purchased market goods, income, time, and human capital. For example, a household may get satisfaction from a meal, but this meal may be prepared at home with a variety of ingredients bought from markets and combined with preparation time, cooking skills, and nutrition knowledge; or the meal can be prepared elsewhere and eaten inside or outside the home, which will save more time for work or for leisure.

One of the outputs produced by a household is children's health. Grossman (1972) used the household production model to study the determinants of health, health behaviors, and health inputs. In this paper, we derive the reduced form (children's) health demand function using information on one important health indicator, the Healthy Eating Index (HEI). Based on the discussion above, weekly household fast food expenditure (*FAST*) and children's average daily television viewing time (*TV*) can reflect a household's eating habits, which are quasi-fixed in the short run and in the conditional optimization process, assuming interior solutions. This will allow *FAST* and *TV* to be arguments in the *HEI* demand function in a theoretically consistent fashion (Basmann, 1956).

Following Park and Davis (2001), we assume a quasi-concave direct utility function:

$$U = U(H, \mathbf{x}, \mathbf{t}), \tag{1}$$

where H is children's health outcome, $\mathbf{x}$ is a vector of market goods which includes the health production inputs (x_H) (with prices p_H) and the other goods (x_o) (with prices p_o), and $\mathbf{t}$ is a vector of household head's time allocation, subject to the following constraints:

- *Income* constraint: $Y + wt_w = \mathbf{p}'\mathbf{x}$, where Y is the household unearned income, w is the market wage rate, t_w is the market working time, and $\mathbf{p}$ is a vector of market prices ($\mathbf{p} = (p_H, p_o)$).

- *Children's Health Production* constraint: $H = H(\mathbf{N}, x_H, t_H; FAST, TV, \boldsymbol{\mu})$, where $\mathbf{N}$ is a vector of nutrient intakes, t_H is the time allocated to produce health including parental time spent in food preparation, and $\boldsymbol{\mu}$ is a vector of demographic or environmental variables (such as parents' health knowledge).

- *Time* constraint: $T = t_H + t_W + t_O$, where t_O is the other residual time which includes pure leisure time and time spent in other activities.

A conditional children's health demand function is derived from the above optimization process. We use the children's *HEI* as the indicator for the children's health outcome H:

$$HEI = f(\mathbf{P}, T, Y; FAST, TV, \boldsymbol{\mu}), \tag{2}$$

where $\mathbf{P} = (\mathbf{p}, w)$. According to the theory, at the optimum point, the unconditional demand for *HEI* is equal to the conditional demand function evaluated at the optimal level of *FAST* and *TV* inputs. And because we are using cross-sectional data, it is assumed the market prices, **p**, are held constant. In our model specification, it is also assumed that the demand for health is weakly separable from other household output demands, such as accommodation, etc. Under this assumption, we can explore only those factors affecting healthy eating behavior, without considering all the other factors affecting other household output demands. Since we do not have data on the household head's market wage rate, w, the household head's average weekly hours of market work is used as an indicator for the opportunity cost of time. Also due to the data limitation, the household annual total income is used instead of the unearned income Y. The reduced form conditional demand for children's *HEI* is:

$$HEI = f(t_w, Y; FAST, TV, \boldsymbol{\mu}). \quad (3)$$

Due to data limitations, we do not directly examine children's fast food consumption. However, household fast food expenditures could be an indicator of the nutritional environment (e.g., parental nutrition preference) the children face in the household. Specifically, even if the expenditures are not borne by the child, this measure may be negatively correlated with diet quality if higher levels are telling us about unobserved parental concern for following nutritional guidelines. The other factor, average daily TV/video time, can also provide an indication of the child's lifestyle, since TV time is a substitute for the child's active/exercise time. Moreover, this factor might also be linked to parental attentiveness.

Data and Econometric Model

The data sets used are the 1994–1996 Continuing Survey of Food Intake by Individuals (CSFII) and its companion Diet and Health Knowledge Survey (DHKS), conducted by the U.S. Department of Agriculture (USDA). The CSFII provides information at the household level, including usual food expenditures, participation in the Food Stamp Program and other food assistance programs, and the level of food sufficiency within the household, for approximately 8,000 households. These data have been collected by the USDA as part of its ongoing national nutrition-monitoring activities.

The Healthy Eating Index (HEI), originally designed and developed by the USDA's Center for Nutrition Policy and Promotion (CNPP), is estimated based on data from the CSFII and provides an overall picture of the type and quantity of foods people eat, their compliance with specific dietary recommendations, and the variety in their diet. The USDA developed this index to provide a measure of diet quality of individuals. Prior to the HEI, most dietary assessment instruments focused on specific components, such as fat and cholesterol, but few assessed overall diet quality. The HEI data used in this paper were computed for individuals who are at least two years of age, and whose complete food intake records are available commencing with the first day of the CSFII 1994–96 survey period (USDA, 1994–96; Bowman et al., 1998; Basiotis et al., 2002).

The HEI is comprised of 10 components, each representing different aspects of a healthful diet. Components 1–5 measure the degree to which a person's diet conforms to USDA's Food Guide Pyramid serving recommendations for the five major food groups—grains, vegetables, fruits, milk, and meat. Components 6 and 7 measure total fat and saturated fat consumption as a percentage of total food energy intakes. Components 8 and 9 measure total cholesterol and sodium intake, and component 10 examines variety in a person's diet. Each component has a possible scoring range of 0 to 10. Thus, the maximum overall score is 100. High component scores indicate intakes close to recommended ranges or amounts; low component scores indicate less compliance with recommended ranges or amounts.

The range of children's age is from 2 to 18. Demographic variables include urbanization, region, race, gender, household size, age, number of children aged 1 to 5, and household income. In addition to household fast food expenditure (*FAST*) and children's average daily TV viewing time (*TV*), other variables in the models include indicators about any household member on a special diet, participation in supplementary government programs such as the Food Stamp Program and WIC (women, infants, and children), data on household head indicating household time constraints (e.g., household head's average time in front of TV per day, usual working hours per week) and household head's health knowledge index created from the DHKS data set. After accounting for nonresponses or missing data, our sample data consist of 1,622 observations.

Following Variyam et al. (1999), the health knowledge index is based on responses to fifteen questions about nutrient content in different foods,[2] and seven questions on the relationship between diet and health problems.[3] Each correct answer is given a score of 1. The health knowledge index is the sum of all the correct answers, and therefore ranges from 0 to 22.

To test for nonlinearity, squared terms were added for *FAST* and *TV*, but they were found to be statistically insignificant.[4] In addition, given that the *HEI* scores are always positive, we explored whether the nonlinearities inherent in using the logarithm of *HEI* would provide a better fit. This specification, however, did not yield better results. Hence, a linear econometric model was employed—with *HEI* as the dependent variable, and *FAST* and *TV*, in combination with other demographic variables, as independent variables.

Empirical Results

Table 2 provides the data description and summary statistics of the variables used in the analysis.[5] The average *HEI* of children in the sample is 65.60, which is significantly lower than the minimum *HEI* of 80 that is considered healthy, according to the USDA. The mean weekly household expenditure on fast food (*FAST*) is \$13.40, and the average number of hours of children's television viewing (*TV*) is roughly three hours per day.

Table 3 presents the parameter estimates of the empirical models using generalized method of moments (GMM) estimation to correct for heteroskedasticity in the error term.

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[2] For example, the sample respondent is asked: "Based on your knowledge, which has more saturated fat: Liver? T-bone steak? The same? Don't know?"

[3] For example, the sample respondent is asked: "Have you heard about any health problems caused by eating too much fat?"

[4] Neither *FAST* nor *TV* are statistically significant at the 10% level in each of the three individual-year models or in the pooled three-year model.

[5] As reported in table 2, the maximum of children's daily TV viewing time (*TV*) is 16 hours/day, but this maximum occurs only in one household. Similarly, the maximum average household head's weekly working time (*Pworkhr*) is 140 hours/week, also occurring only in one household. These two observations do not affect our parameter estimates in terms of signs, magnitude, and statistical significance.

Table 2. Data Description and Summary Statistics for Three-Year Polled Data (1994–96)

Variable	Description	Mean	Minimum	Maximum
HEI	Children's Healthy Eating Index (dependent variable)	65.60	26.78	94.47
REGION (base group is *South*):				
NE	1 if individual resides in the Northeast; 0 otherwise	0.15	0	1
Midwest	1 if individual resides in the Midwest; 0 otherwise	0.27	0	1
West	1 if individual resides in the West; 0 otherwise	0.21	0	1
CITY (base group is *Non-MSA*):				
Central	1 if individual resides in MSA, central city; 0 otherwise	0.27	0	1
Noncent	1 if individual resides in MSA, noncentral city; 0 otherwise	0.51	0	1
RACE (base group is *White*):				
Black	1 if individual is Black; 0 otherwise	0.12	0	1
Asian	1 if individual is Asian or Pacific Islander; 0 otherwise	0.02	0	1
Other	1 if individual is some other race than White; 0 otherwise	0.05	0	1
HOUSEHOLD CHARACTERISTICS:				
HHsize	Household size (number of individuals)	4.33	2	16
Income	Annual household income (actual reported $ amount)	45,637	1,200	100,000
Age	Age of the individual child in years	9.55	2	18
TV	Children's average hours spent watching TV/video/day	2.97	0	16
Gender	1 if individual is male; 0 if individual is female	0.50	0	1
Parent-TV	Parents' average hours spent watching TV/video/day	2.29	0	12
WIC	1 if household participates in WIC Program; 0 otherwise	0.07	0	1
Diet	1 if any household member is on a diet; 0 otherwise	0.23	0	1
Fstamp	1 if household is receiving food stamps; 0 otherwise	0.10	0	1
Child1-5	Number of children in household aged 1 to 5 years old	0.61	0	3
Knowledge	Household head's nutrition knowledge index	15.27	0	22
Pworkhr	Household head's average weekly hours spent at work	42.33	3	140
FAST	Household's weekly fast food expenditure amount ($)	13.40	0	100

Columns 1–3 in table 3 report the parameter estimates for each individual year (1994, 1995, and 1996) of the survey data, while columns 4–8 present the parameter estimates using all three years of the data in aggregate. Column 5 gives the estimates without the *TV* variable, and column 6 presents the estimates without the *FAST* variable to assess the robustness of the effects of these two factors on children's HEI.

Consistent with prior expectations, the parameter estimates for the *FAST* and *TV* variables are negative and statistically significant for the three-year data. While *FAST* is significant across both the individual-year estimations and the three-year estimation, *TV* is not significant for year 1994 and year 1995 (table 3, columns 1 and 2).[6] This finding implies that household fast food expenditures and children's television viewing are negatively related to children's diet quality, as measured by the HEI. For the 1994–96 combined estimation, the effect of *FAST* is robust even with the exclusion of the *TV* variable in the model (column 5). Similarly, the effect of *TV* is robust even with the

[6] The parameter estimates for *TV* in the 1994 and 1995 models are not statistically significant at the 10% level.

Table 3. Parameter Estimates of Empirical Models Using Generalized Method of Moments (GMM) [dependent variable = *Healthy Eating Index* (*HEI*)]

Variable	Individual-Year Estimation 1994 $N = 531$ [1]	1995 $N = 475$ [2]	1996 $N = 616$ [3]
1 Household weekly fast food expenditure (*FAST*)	-0.064*	-0.063*	-0.059**
	(0.03)	(0.04)	(0.03)
2 Child's average TV viewing, hours/day (*TV*)	-0.264	0.035	-0.470**
	(0.27)	(0.24)	(0.198)
3 Household size	0.616	-0.953**	-0.421
	(0.43)	(0.36)	(0.38)
4 Annual household income ($1,000s)	0.050**	0.006	0.055**
	(0.02)	(0.02)	(0.02)
5 Age of child in years	-0.747**	-0.913**	-0.479**
	(0.11)	(0.12)	(0.11)
6 Gender	0.062	1.147	0.392
	(0.81)	(0.85)	(0.75)
7 Household head's average weekly work hours	-0.070	0.004	0.065*
	(0.05)	(0.04)	(0.04)
8 Household head's health knowledge index	0.165	0.271*	0.128
	(0.18)	(0.15)	(0.14)
9 Parents' average TV viewing, hours/day	-0.376	-0.130	-0.162
	(0.35)	(0.31)	(0.27)
10 Household participation in Food Stamp Program	0.342	-0.864	1.759
	(1.40)	(1.98)	(1.75)
11 Household member on diet	-0.180	-0.547	-1.023
	(1.02)	(1.07)	(0.97)
12 Household participation in WIC Program	0.895	0.571	0.203
	(2.11)	(1.97)	(1.70)
13 Number of children 1–5 years old	-1.210	-1.898*	1.342*
	(0.78)	(1.00)	(0.71)
14 Black race	-3.488**	-4.151**	-2.681**
	(1.34)	(1.75)	(1.35)
15 Asian or Pacific Islander	1.691	4.259	0.488
	(2.91)	(2.69)	(1.98)
16 Other remaining races, other than White	0.550	1.654	-1.110
	(3.20)	(2.05)	(2.03)
17 Northeast region	3.097*	2.950**	2.879**
	(1.64)	(1.18)	(1.16)
18 Midwest region	1.679	2.251*	1.648
	(1.14)	(1.18)	(1.03)
19 West region	1.985	0.230	1.742
	(1.51)	(1.16)	(1.20)
20 MSA central city residence	6.093**	2.912**	2.256*
	(1.44)	(1.32)	(1.30)
21 MSA non-central city residence	3.123**	3.170**	0.923
	(1.40)	(1.03)	(1.22)
Intercept	66.838**	72.651**	64.331**
	(4.22)	(3.89)	(3.93)
R^2	0.226	0.243	0.213

Note: Single and double asterisks (*) denote coefficients that are statistically different from zero at the 10% and 5% significance levels, respectively.

Table 3. Extended

	1994–96 Combined Estimation				
		No *TV*	No *FAST*	Age 0–10	Age > 10
	N = 1,622	*N* = 1,622	*N* = 1,948	*N* = 903	*N* = 869
Variable	[4]	[5]	[6]	[7]	[8]
1	-0.052**	-0.057**	—	-0.078**	-0.029
	(0.02)	(0.02)		(0.03)	(0.02)
2	-0.230*	—	-0.282**	-0.085	-0.313*
	(0.14)		(0.14)	(0.22)	(0.19)
3	-0.366*	-0.371*	-0.374*	-0.642**	0.121
	(0.23)	(0.23)	(0.23)	(0.28)	(0.34)
4	0.037**	0.039**	0.031**	0.042**	0.027*
	(0.01)	(0.01)	(0.01)	(0.02)	(0.016)
5	-0.677**	-0.677**	-0.681**	-0.689**	-0.593**
	(0.07)	(0.07)	(0.07)	(0.15)	(0.16)
6	0.538	0.497	0.495	1.383**	-0.605
	(0.46)	(0.46)	(0.46)	(0.63)	(0.71)
7	0.006	-0.008	-0.012	0.011	-0.028
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
8	0.210**	0.213**	0.230**	0.227**	0.232**
	(0.08)	(0.08)	(0.08)	(0.12)	(0.12)
9	-0.187	-0.283*	-0.193	-0.298	-0.211
	(0.18)	(0.18)	(0.18)	(0.25)	(0.25)
10	0.214	0.227	0.171	1.517	-1.983
	(0.99)	(0.98)	(0.99)	(1.15)	(1.65)
11	-0.548	-0.516	-0.640	-1.240	0.040
	(0.60)	(0.61)	(0.60)	(0.81)	(0.83)
12	0.350	0.387	0.222	0.062	0.124
	(1.10)	(1.10)	(1.09)	(1.20)	(2.42)
13	-0.225	-0.208	-0.168	-0.164	-0.694
	(0.48)	(0.49)	(0.49)	(0.58)	(0.88)
14	-3.096**	-3.256**	-3.128**	-1.989*	-4.265**
	(0.85)	(0.87)	(0.86)	(1.17)	(1.23)
15	1.853	1.877	1.588	3.810*	-0.431
	(1.59)	(1.58)	(1.61)	(2.01)	(2.19)
16	0.442	0.243	0.609	-1.152	1.964
	(1.38)	(1.38)	(1.39)	(1.91)	(1.72)
17	3.022**	3.056**	3.032**	3.242**	2.866**
	(0.80)	(0.81)	(0.80)	(1.04)	(1.07)
18	1.979**	1.956**	1.999**	2.207**	1.691*
	(0.66)	(0.66)	(0.67)	(0.86)	(0.92)
19	1.520**	1.515**	1.644**	1.376	1.534
	(0.76)	(0.76)	(0.76)	(1.01)	(1.11)
20	3.779**	3.801**	3.809**	2.972**	4.912**
	(0.79)	(0.79)	(0.79)	(1.07)	(1.09)
21	2.517**	2.563**	2.456**	2.236**	2.941**
	(0.72)	(0.72)	(0.73)	(0.99)	(0.94)
Intercept	67.458**	67.016**	67.272**	67.486**	65.603**
	(2.34)	(2.30)	(2.36)	(3.00)	(3.86)
R^2	0.197	0.195	0.192	0.134	0.148

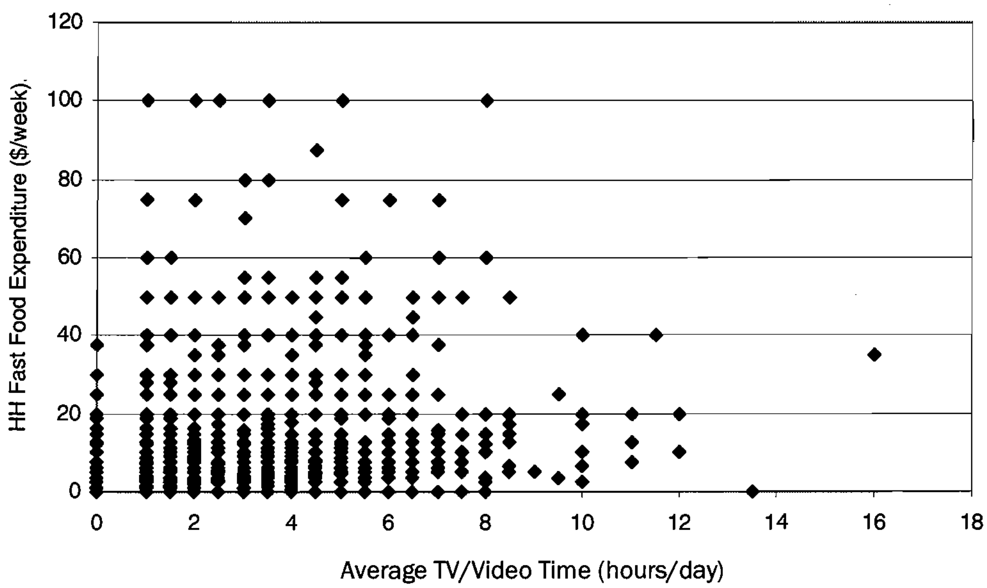


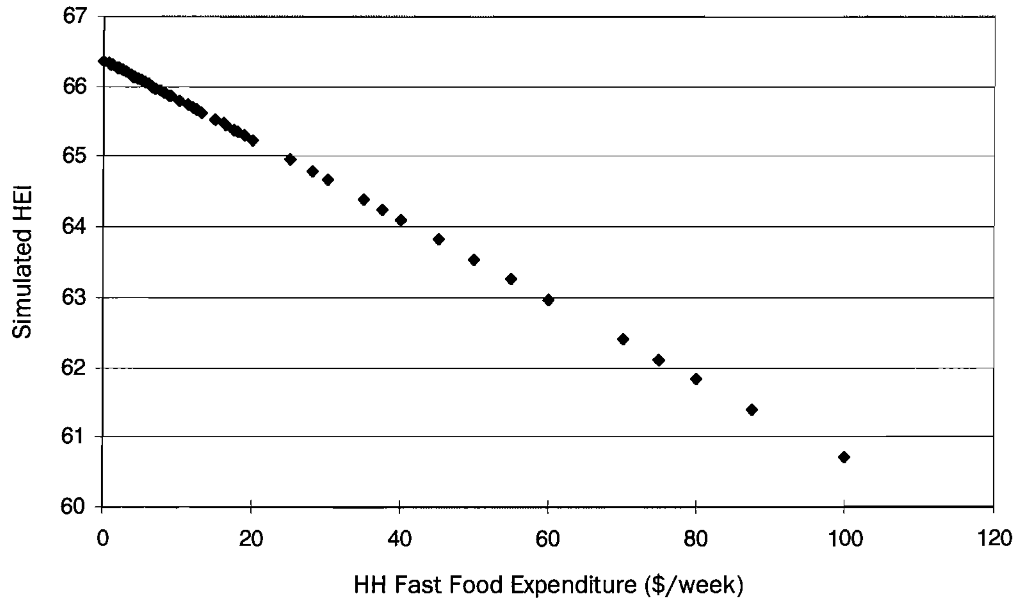
Figure 1. Scatter plot of weekly fast food expenditures and child's TV viewing hours

exclusion of the *FAST* variable in the model (column 6). This finding also signifies there is no collinearity between *FAST* and *TV* (as can be visually observed from the scatter plot in figure 1 and from their correlation of 0.112).

The calculated elasticities of *HEI* with respect to *FAST* and *TV* are −0.0106 and −0.0104, respectively. Thus, they are quite inelastic, signifying that even though the marginal effects of *FAST* and *TV* are negative and statistically significant, they are not very sensitive to changes in household weekly fast food expenditures and children's daily TV/video time. Figures 2 and 3, respectively, show the simulated effects of *FAST* and *TV* on *HEI*. These figures reflect the relative inelasticity of *HEI* on changes in the *FAST* and *TV* variables. They also imply that substantial reductions in *FAST* and *TV* are needed to increase *HEI*. This is an important finding, considering the amount of attention these two factors have received recently in the literature and in the press as they relate to children's obesity.

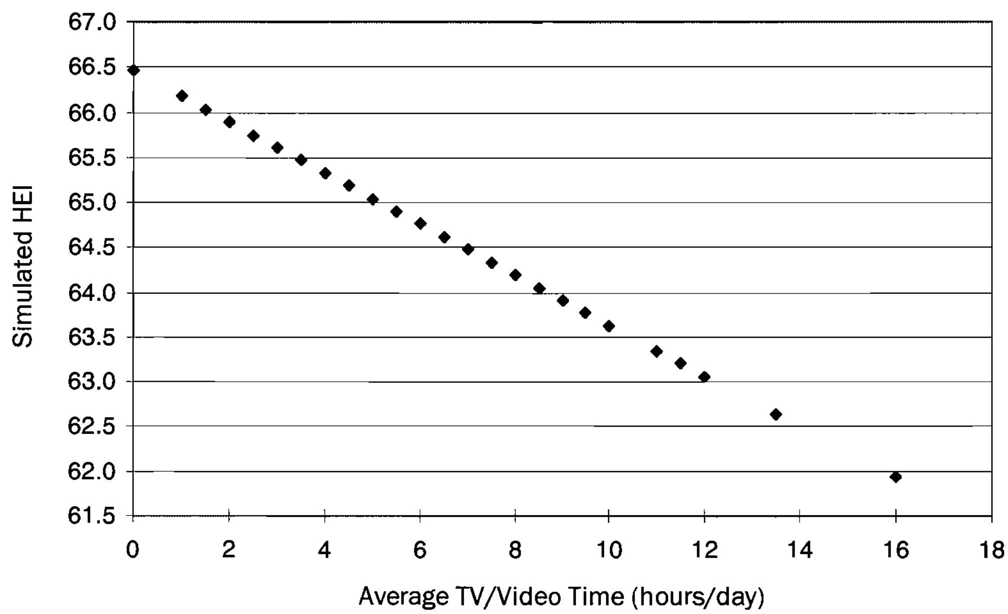
We also estimated our model for children under the age of 11 and for children 11 years old and over (table 3, columns 7 and 8). Results indicate *FAST* has a significantly negative effect on the diet quality of children under age 11. *TV*, however, has an insignificant negative effect on the diet quality of children under the age of 11 (column 7). Interestingly, the results for children 11 years of age and over are the opposite (column 8); *TV* now plays a significant negative role in influencing their diet quality, while *FAST* has an insignificant negative effect.

Turning to a discussion of the effects of the other independent variables in the 1994–96 model, the results reveal that household size is significantly negatively related to children's *HEI*, suggesting larger households tend to have a negative effect on children's diet quality. Household income plays a positive role in association with children's *HEI*. Children in higher income households tend to have higher diet quality.



Note: These estimates were derived by shifting *FAST* from each level and holding all variables other than *FAST* at their means.

Figure 2. Simulated impact of weekly fast food expenditures on Healthy Eating Index



Note: These estimates were derived by shifting *TV* from each level and holding all variables other than *TV* at their means.

Figure 3. Simulated impact of television viewing on Healthy Eating Index

Child's age has a negative effect on *HEI*. Interestingly, the household head's health knowledge is positively related to children's *HEI*. African-American children have lower *HEI* than Caucasian children, while children from the South have lower *HEI* than children from other parts of the country. In addition, children from a non-metropolitan statistical area (non-MSA) have lower *HEI* than others. These results are also quite evident even when the sample is divided between younger and older children (table 3, columns 7 and 8).

Implications and Concluding Remarks

Our findings do not refute past studies' assertion about the negative influence of fast food and television viewing on children's diets and obesity. However, our analysis shows children's diet quality as measured by *HEI* is quite inelastic to changes in weekly household fast food expenditures and number of hours of television viewing. For instance, a $10 reduction in weekly household expenditure on fast food only increases *HEI* by 0.52 point, and a one-hour per day reduction in television viewing only improves *HEI* by about 0.23 point.

Our analysis suggests that a significant reduction in fast food expenditures and/or television viewing is needed to significantly improve the diet quality of children. This study contributes to the literature because it not only assesses the direction of the effect, but also the magnitude of the elasticity of diet quality with respect to these two instruments. The ability to assess the magnitude of the sensitivity of diet quality to changes in either fast food expenditures or television viewing is important, as it could be used as a guide in identifying the types of policy instruments that should or should not be used to improve the diet quality of children. By confirming the need for large reductions in fast food expenditures and television viewing to improve children's diet quality, our findings contribute to the continuing debate on this important topic. The findings of this study may also imply the need for additional instruments to help bring about a significant increase in the diet quality of children. These instruments could include improving the dietary quality of foods served at home and in schools, providing formal nutrition education to children, teaching them how to read nutrition labels, etc. With increased data availability, these factors should be considered in future studies.

The contrasting results between the two children's age groups also have interesting implications. For children under age 11, *FAST*, not *TV*, is found to have a significant negative effect on the diet quality; but for children 11 years of age and over, *TV*, not *FAST*, plays a significant negative role in influencing their diet quality. Based on these results, substantial reductions in fast food expenditures is a more effective strategy than substantial reductions in television viewing to increase diet quality of children under age 11. However, the reverse is true for children age 11 and over. The reason for these results is unclear and should be examined in future studies.

While not the focus of the study, the implications of the findings for childhood obesity are also important. This investigation focused only on one aspect of the obesity issue: dietary quality. Other issues, such as the effect of television viewing on physical activity, need to be examined in future studies. For example, since the amounts of time used for television viewing and physical activity are generally substitutes (i.e., as television viewing time rises, time available for other activities like exercise declines), it is possible that reductions in television viewing could also have a positive effect on physical activity, which in turn could possibly increase the likelihood of decreasing childhood obesity. Moreover, the effect of television viewing perhaps could be greater on physical activity than on diet quality. Finally, given that fast food expenditures and children's television time are potentially endogenous variables which can be explained by various other factors (e.g., mother's employment status), it might be appropriate to use simultaneous equation or structural equation models in future studies, given data availability.

[Received August 2004; final revision received June 2005.]

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