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The Effect of Demographic, Economic, and Nutrition Factors on the Frequency of Food Away from Home

Food away from home, especially fast food, is often cited as contributing to obesity and other nutritional problems. This negative publicity can affect demand. Models explaining visits to table service and fast food restaurants are estimated, with nutrition variables added to standard demographic measures. Demographic effects are similar to those in past studies. Nutrition factors have little impact on table service, but nutrition-orientated consumers tend to have lower fast food consumption.

One of the largest changes in American eating habits in recent decades has been the increasing reliance on food eaten away from home (FAFH). FAFH has increased from 33% of total food expenditures in 1970 to 47% by 2003.[1] Most of this is at table service and fast food restaurants. Much of the growth is attributed to the rising value of household time, especially as induced by more female labor force participation and rising household incomes. The importance of these factors has been shown in numerous studies (Byrne, Capps, and Saha 1998; Kinsey 1983; McCracken and Brandt 1987; Prochaska and Schrimper 1973; Redman 1980; Yen 1993). In addition, studies have consistently found that FAFH declines with household size, reflecting the scale economies associated with household meal preparation, and that women and older individuals of either sex are less likely to dine out. Separate analysis by type of facility has found different effects for some factors. For example, income is generally more important for table service, while convenience and accessibility have relatively greater influence for fast food (Jekanowski, Binkley, and Eales 2001; McCracken and Brandt 1987).

Recently, the growth in FAFH has generated concern about its possible effect on dietary quality. Analysis of food consumption surveys has indicated that meals eaten in restaurants are generally of lower nutritional quality than meals eaten at home, mainly due to higher fat and calorie content (Lin and Frazao 1997). Furthermore, obesity is now one of the nation's leading health problems, and because its growth has paralleled the trend

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in dining out, FAFH is often suggested as contributing to the energy imbalance that brings it about. Although this has not been scientifically established, the nature of restaurant food has become a policy issue. For example, proposals mandating that chain restaurants provide nutritional information on their menus have been introduced in both houses of Congress (Burton and Creyer 2004). On another front, lawsuits have been filed by diners alleging that their obesity resulted from restaurant meals.

This public scrutiny has caused some restaurant chains to adopt proactive measures. New products geared to the nutrition-orientated consumer have been introduced, particularly by fast food chains. The success of these initiatives ultimately depends on acceptability by consumers. Although initial sales appear promising (Warner 2005), previous introductions of healthy menu options have not been highly successful (Consumer Reports 1996, 2004). One possible reason for this is that individuals concerned with nutrition are less inclined to dine out, perhaps due to the bad publicity—effectively negative advertising—directed at restaurant food.

Because of these considerations, a potentially important question is the extent to which nutrition concerns and attitudes affect the decision to have an FAFH meal. Although there have been several studies of the impact of nutrition factors on the demand for particular foods or nutrients (Brown and Schrader 1990; Chern, Loehman, and Yen 1995; Ippolito and Mathios 1990), most have focused on nutrition information, and none has considered restaurant dining. In this paper, we do so using an econometric model containing not only demographic measures and measures of convenience but also measures of nutrition attitudes, concerns, and knowledge. The issue addressed is the decision to dine out: we do not consider the subsequent issue of what is eaten when dining out occurs.

Separate equations are estimated for fast food and table service restaurants. This is not only because of the differing effects of economic and demographic factors identified in previous work but also to permit differences for nutrition variables. Although FAFH is one of the most frequently cited factors behind the obesity epidemic, it is fast food that receives most of the criticism, especially in the popular media. Recent examples of this are Eric Schlosser's Fast Food Nation (2001) and in the well-received documentary Supersize Me. In a 2004 ABC News–Time Magazine poll, 43% of respondents thought that fast food bears a "great deal" of responsibility for the obesity crisis. The attitude that fast food is particularly bad is also present in the academic literature. Many studies of the dietary impacts of FAFH are confined to fast food (e.g., Bowman et al. 2004; Paeratakul et al. 2003). A likely reason for the different treatment is that most popular fast food items tend to be relatively high in fat and calories. Although the same items

are available from table service restaurants, better-nutrition alternatives are also likely to be on the menu. In any case, this emphasis on fast food in the obesity and nutrition debate may have caused some consumers to avoid fast food when making dining choices.

MODEL AND DATA

Most studies involving FAFH are grounded on household production theory, and this study is no exception. As developed by Becker (1965), household production theory views the household as both a consumer and producer of final goods, so that both household time and market-produced goods enter the utility maximization process. This view is clearly relevant for food consumption since meals can either be produced in the household using purchased inputs and household time or be purchased ready-made at a restaurant. In addition, we recognize that health is an important final good to most consumers and that they thus view food and good nutrition as inputs into health. This interdependency between food and health makes food choice dependent not only on prices, income, and household time, but potentially also on measures of nutrition knowledge and concern.

These considerations lead to a model of the following general form:

$$Y_i = f(P, I, T, H, D) \tag{1}$$

in which Y_i is a measure of household or individual food choice, P is a set of relevant prices, I represents household income, T involves measures of time cost, H is measures of nutrition concerns and knowledge, and D represents demographic and other factors. The latter can be viewed as proxies for taste and perhaps factors not captured by the variables in H.

This study uses the individual consumer as the observational unit. The data are from the 1994–1996 Continuing Survey of Food Intakes by Individuals (CSFII) and the accompanying Diet and Health Knowledge Survey (DHKS) (United States Department of Agriculture 2000). This is a nationally representative sample of noninstutionalized persons living in the United States. The CSFII involves 16,103 individuals, most of whom supplied two nonconsecutive days of detailed dietary intake collected by trained in-person interviewers using 24-hour recalls. The nutrient intake lists the name of each food eaten, a detailed breakdown of its nutritional content, and where it was obtained. The data also includes demographic measures for the individuals surveyed and for their households. The DHKS

is a follow-up telephone survey of 5,765 individuals at least 20 years old who participated in the CSFII. Its purpose is to assess their knowledge of and attitudes toward nutrition and health.

The sample was limited to those participating in the DHKS. Beginning with the 5,765 participants, we eliminated those who did not provide intake data for both days. Additional observations were lost because some respondents failed to provide values for all variables. This left a sample of 4,361 individuals, 2,147 of whom had at least one FAFH visit during the sample period.[2]

Given the interest in the decision to dine out, Y_i in equation (1) is the number of FAFH visits during the two days. This is a short period, and a question might arise regarding how well it captures typical behavior. For example, someone temporarily absent from home is more likely to dine out, irrespective of demographics or attitudes concerning nutrition; conversely, during an illness dining out is less likely. This problem applies in some degree to any analysis using the CSFII data. The survey design attempts to lessen its impact by requiring that the survey days be nonconsecutive, with at least three days between them. The possibility of being away on both survey days is further reduced because interviews were conducted in the respondent's home on the day after the day of intake. Additionally, the large number of observations reduces the impact of any one of them and generally helps to overcome the high degree of error associated with individual behavior in a two-day period.

To reduce this error further, we limited the definition of a FAFH visit. The CSFII data is based on "occasions," defined as breakfast, brunch, lunch, dinner, supper, or snack. We wished to confine attention to complete meals. Therefore, snacks were excluded. A further requirement was that the restaurant meal have at least two items, with no items obtained elsewhere. The dependent variable in each equation is the total number of visits to the restaurant type in question by each individual. The sample averages are .371 for table service and .326 for fast food.

Because of the special nature of the dependent variable, ordinary least squares is not an appropriate estimation procedure. A common way to address this problem is to view the process as Poisson,

$$f(Y_i) = \frac{e^{-\lambda_i}\lambda_i^{Y_i}}{Y_i!} \text{ for } Y_i = 1, 2, \ldots$$

The parameter λ_i is usually modeled as $\ln(\lambda_i) = X_i\beta$, where X is a set of explanatory variables affecting the probabilities for Y (Greene 2003, 880).

These models are easily estimated by maximum likelihood, based on the log-likelihood function

$$\ln L = \sum_{i=1}^{n} [-\lambda_i + Y_i \beta' X_i - \ln Y_i!]$$

However, a disadvantage of the Poisson is that the variance and the mean are equal. This restriction is likely to be unrealistic for many economic processes for the variance often exceeds the mean, the "overdispersion" problem. Empirically, it generally appears in the form of more zeros and more large values of Y than would be predicted by the Poisson process.

A popular alternative to the Poisson, which is not subject to overdispersion, is the negative binomial model. The negative binomial can be viewed as a Poisson model with specification error, i.e.

$$\lambda_i = \exp(X_i \beta + \eta_i)$$

The error accounts for individual variation, and high individual variation is the main consequence of having only two days of observation on the survey respondents. Greene (2003, 886) illustrates that the distribution of Y conditional on η_i is again Poisson, and it can be straightforwardly estimated by maximum likelihood. It is the method employed in this study.[3]

In Table 1 appear the sample frequencies of table service and fast food visits, along with the expected Poisson frequencies with means equal to the respective sample means. The expected and sample proportions are quite similar, but the overdispersion in the sample is quite evident: there are too many zeros and larger values.[4]

Independent Variables

In Table 2 are presented the independent variables used in the models, along with summary statistics. The independent variables can be broadly classed into two groups. One contains economic and demographic variables similar to those used in prior studies. The second involves measures related to nutrition and health. As can be seen, there is a large number of variables, 39 in total. While some might view this as excessive, we chose to err on the side of overparameterization. The analysis is somewhat exploratory since there is no exact theoretically correct model, at least with respect to the role of nutrition. Furthermore, there is little multicollinearity in this data: the largest variance inflation factor was 2.1. A larger number of included variables also has the advantage of reducing the possibility of endogeneity

TABLE 1
Poisson-Predicted Frequencies and Sample Frequencies of Restaurant Visits

	Table Service		Fast Food	
Visits	Poisson	Actual	Poisson	Actual
0	.690	.732	.722	.755
1	.256	.192	.235	.181
2	.047	.055	.038	.049
3	.006	.014	.004	.011
4	.000	.005	.000	.003
5	.000	.001	.000	.000
6	.000	.000	.000	.000

induced by neglected heterogeneity, i.e., omitted variable bias. This is elaborated below.

Among the group of economic variables are several related to money and time costs. Income is measured as per-person household income, expected to positively affect the number of FAFH occasions. Because table service provides more amenities and greater variety, it should be more responsive to income, as found in previous work (e.g. Byrne, Capps and Saha 1998; Nayga and Capps 1994). The CSFII database has no direct measures of prices. We follow the usual practice of assuming that all respondents faced the same relative prices and to include regional variables to capture any remaining cross-section differences. A dummy variable measuring whether the household is receiving food stamps is included. Although food stamps could conceivably increase FAFH due to an income effect, they effectively lower the food at home price. The resulting substitution effect is likely to be more important, reducing demand for FAFH. Higher time cost is always found to increase the demand for FAFH; our measure of this is the number of hours per week usually worked by the respondent. An additional aspect of time cost is the availability and closeness of restaurants (Jekanowski, Binkley, and Eales 2001). We include urban-suburban-rural indicators to capture this. Those living in urban and suburban areas have lower accessibility costs than do rural residents, so FAFH usage should be higher. A variable also related to time cost is the size of household. Because of scale economies in household food preparation, the time cost per person by the meal preparer falls as household size increases, reducing FAFH usage. This has also been found in most studies.

The DHKS provided two price and cost measures. PRICEIMP is a binary variable measuring whether the respondent considers price "very important" when buying food. Consumers particularly concerned with price, the money cost, would be expected to make less use of the FAFH meal option since it is usually more expensive than dining at home. The opposite applies to CONVENIENCE, an indicator measuring the importance of

TABLE 2
Variables Used in the Analysis and Summary Statistics

Variable	Description	Mean	Standard Deviation	Minimum	Maximum
OCC2	Table service visits	.371	.718	0	6
OCC3	Fast food visits	.326	.651	0	4
INCOME	Per capita household income (1000 dollars)	16.86	13.85	0	100
HOURS	Usual hours worked/week	24.89	22.45	0	91
HHSIZE	Household size	2.59	1.40	1	16
FOODSTAMPS	1 = food stamp participant	0.07	.25	0	1
PRICEIMP	1 = price very important when food shopping	.45	.50	0	1
CONVENIENCE	1 = convenience very important when food shopping	.38	.49	0	1
AGE	Age in years	49.76	16.79	20	90
GENDER	1 = female	.51	.50	0	1
EDUCATION	Years of education	12.96	2.86	0	17
AFRICAMER	1 = African American	.12	.32	0	1
HISPANIC	1 = Hispanic	.07	.25	0	1
TV	Hours per day	2.61	2.10	0	19.5
FRIDAY	Number of Fridays in the two interview days	.28	.46	0	2
SATURDAY	Number of Saturdays in the two interview days	.20	.41	0	2
SUNDAY	Number of Sundays in the two interview days	.34	.48	0	2
RURAL	1 = lives in rural area[a]	.26	.44	0	1
URBAN	1 = lives in urban area[a]	.30	.46	0	1
EAST	1 = East region	.19	.39	0	1
SOUTH	1 = South region	.35	.48	0	1
MIDWEST	1 = Midwest region	.26	.44	0	1
BMI	Body mass index	26.36	4.96	15.19	45.91
DIET	1 = on any kind of diet	.19	.39	0	1
VEGETARIAN	1 = vegetarian	.03	.17	0	1
PRODUCE	Number of 23 types of fruits and vegetables eaten in last year	12.50	4.58	0	23
DISFAT	Larger values imply avoids discretionary fat	2.19	.71	1	4
SUBFAT	Larger values imply substitutes low fat for regular foods	2.61	.74	1	4
TASTE	1 = taste is very important when food shopping	.84	.36	0	1
NUTRITION	1 = nutrition is very important when food shopping	.65	.48	0	1
HLTHYWT	1 = very important to maintain a healthy weight	.75	.44	0	1
LOWFAT	1 = very important for diet to be low in fat	.60	.49	0	1
FRTVEG	1 = very important to eat lots of fruit and vegetables	.69	.46	0	1
NUTSCORE	Number correct of 14 nutrition questions	8.85	2.33	0	14
LABEL	1 = frequently uses nutrition labels	.32	.47	0	1
USEWELL	1 = knows how to use labels for nutritious diet	.23	.42	0	1
SENSE	1 = healthy diet just requires knowing what is good and bad	.40	.49	0	1
NOCHANGE	1 = my diet is healthy and requires no changes	.18	.38	0	1

[a]Suburban is reference.

preparation time. Individuals who regard ease of preparation as very important have high time costs and thus are expected to dine out more frequently.

The model includes several demographic measures that can be broadly classified as related to taste and preferences. These involve race and

ethnicity (African American and Hispanic), years of education, gender, and age. We regard the effect of ethnicity somewhat as an empirical question, although the balance of the evidence is that minorities make less use of FAFH. It is reasonable that more highly educated individuals make greater use of table service restaurants, due to food variety, but perhaps not fast food. It has been found that FAFH declines after middle age (Dong et al. 2000; Nayga and Capps 1994), so a negative sign is expected for age. Regarding gender, a survey by the National Restaurant Association found that men consume an average of 4.6 commercially prepared meals per week, while for women the figure is 3.8 (Ebbin 2000).[5]

As a measure of lifestyle, TV, the hours per day spent watching TV, is included in the model. People who watch a large amount of television are likely to spend a lot of time at home, reducing demand for FAFH. So a negative sign is expected. It is reasonable to expect that people are more likely to dine out on weekends than during the week (Dong et al. 2000). We allow for this with three additional dummies: FRIDAY, SATURDAY, and SUNDAY. This allows separate effects for each of these, with a common effect for the remaining four days.

A final variable included in this group is the body mass index (BMI) of the respondent. If the main reason people become overweight is that they obtain above normal enjoyment from eating, particularly energy dense foods, we might expect overweight people to have a greater demand for FAFH. Then being overweight can be regarded as a "cause" for dining out. On the other hand, many people believe that one reason for the obesity epidemic is the nation's increased reliance on FAFH. To the extent this view is valid, BMI is partly an endogenous variable. In spite of this, BMI is included in the model, mainly because we found that results for other variables were insensitive to whether it was present.[6]

Most of the nutrition variables are binary in nature. Variable choice was based on factors deemed likely to affect the dining out decision and measures potentially related to policy issues. In many cases, the direction of effect is not necessarily obvious *a priori*. Some ambiguity is inevitable, given the exploratory nature of the study and the fact that these variables are survey responses, not observational measures. Nevertheless, under a maintained hypothesis that, relative to food at home, restaurant meals are high in fat and calories, it is reasonable to expect that variables associated with "good" dietary practice and a higher regard for nutrition and health would have negative signs in our models.

That said, however, an additional complexity is the possibility of endogeneity due to joint relations between the error, the decision to dine out, and nutrition measures. This has been a concern in studies specifically

examining the role of nutrition knowledge on diet. Presumably, the problem is that consumers with high nutrition concerns—an omitted variable—have better diets and greater levels of knowledge, leading to an overestimate of the latter's effect. However, the model herein allows for this by including measures of nutrition concern, reducing the likelihood of endogeneity problems from that source. Of course it could arise for other, less apparent reasons (a possibility with any study), with indeterminate consequences. They are likely to be small relative to the high levels of statistical noise inevitably present in nonexperimental data on individuals. Park and Davis (2001) have an illuminating discussion of the difficulty of dealing with endogeneity in household survey data, where instrumental variables are particularly difficult to obtain.

Of the nutrition variables, six describe current dietary behavior. DIET indicates whether the respondent is on any kind of diet. Because dining away from home reduces the individual's control of food ingredients, a negative sign is expected. The same is true of VEGETARIAN, since meatless FAFH options, while certainly available, are usually somewhat limited, especially for fast food. PRODUCE, taken from the CSFII, is a measure of fruit and vegetable consumption. Respondents were asked 23 questions of the form "In the last twelve months, did you eat ___?", where the blank contained a fruit or vegetable.[7] PRODUCE is the number of affirmatives. It is a measure of taste for fruits and vegetables, variety, and preference for nutritious foods, so a negative sign is expected.

DISFAT and SUBFAT indicate whether respondents avoid adding discretionary fat and whether they substitute low-fat versions of foods, respectively. Each of these is the average of questions coded from 1 to 4, with larger values indicating an inclination to avoid fat and substitute low-fat items.[8] Low-fat substitution possibilities in restaurants may be limited, and the discretionary fat may be added before the food is served. Thus, individuals who normally restrict discretionary fat and/or make low-fat food substitutions may be less inclined to dine out. Hence, negative signs are expected.

The model includes five variables measuring whether certain aspects of diet/health are "very important." These are NUTRITION (nutrition when food shopping), HLTHYWT (maintaining a healthy weight), LOWFAT (maintaining a diet low in fat), FRTVEG (getting adequate amounts of fruit and vegetables), and TASTE (taste when food shopping). The first four are positively related to nutrition and thus are expected to have negative signs; TASTE is expected to be positive.

The remaining variables are measures associated with nutrition knowledge. LABEL measures whether the respondent currently uses food labels with frequency. If this is found to be related to FAFH demand, it can help

assess the potential value of menu labels. Perhaps the most reasonable expectation is a negative effect. Presumably, label users desire a healthy diet, and with the general belief that FAFH is substandard in nutrition, they might avoid restaurants. The same applies to a related variable, USEWELL, which indicates the respondent has high confidence in her/his ability to use labels to choose a healthy diet.

NUTSCORE is the number of correct answers to 14 specific questions about nutritional characteristics of foods (a typical question: "Which has more saturated fat: butter or margarine?"). A consumer with high nutrition knowledge (and who desires a nutritious diet) may avoid FAFH because it tends to be less healthy, thus generating a negative effect. But such an individual may have greater ability to navigate the menu and avoid nutrition pitfalls, reducing concern that FAFH will lower diet quality. Then, dining out may be more likely.

SENSE is an indicator variable equaling 1 when the individual strongly agrees with the statement "Choosing a healthy diet is just a matter of knowing what is good and what is bad." Although this is essentially a truism, we interpret it as expressing the sentiment that what is needed to have a healthy diet are common sense rules, such as "avoid fat" and "eat lots of fruit and vegetables," not detailed nutrition knowledge, such as that measured by NUTSCORE.[9] Given the negative publicity about the nutrition of FAFH, one might expect a negative effect. On the other hand, such a viewpoint may simply be a rationalization for not making the effort to obtain specific information.

A similar variable is NOCHANGE, which has value 1 if the individual strongly believes that their current diet is healthy and requires no change. We interpret this as indicating the respondent believes they make no serious nutritional missteps, not that their current diet has achieved perfection. If this self-assessment is accurate, then an expectation of reduced likelihood of dining out is reasonable. However, Variyam, Shim, and Blaylock (2001) found that people believing their diet needed no improvement were often mistaken.

RESULTS

The results for the two estimated models appear in Table 3. The effect of the six variables associated with the money or time cost of FAFH relative to home meals—INCOME, HHSIZE, HOURS, FOODSTAMPS, PRICEIMP, and CONVENIENCE—differs in the two cases. All except HHSIZE are significant at 10% or better in the table service model, with expected signs; estimates for fast food are similar in direction, but INCOME and

TABLE 3
Poisson Regression Results

	Table Service		Fast Food	
	Estimate	Chi-Square	Estimate	Chi-Square
INTERCEPT	−2.264	35.22***	0.455	1.49
INCOME	0.292	33.93***	0.054	1.25
HOURS	0.004	5.44**	0.005	10.03***
HHSIZE	−0.041	2.45	−0.024	0.98
FOODSTAMPS	−0.379	3.77*	−0.131	0.82
PRICEIMP	−0.152	5.58**	−0.139	4.54**
CONVENIENCE	0.119	3.76*	0.134	4.60**
AGE	−0.001	0.08	−0.022	88.62***
GENDER	−0.192	9.57***	−0.225	12.19***
EDUCATION	0.011	0.69	−0.008	0.32
AFRIAMER	−0.339	7.92***	0.140	1.96
HISPANIC	−0.068	0.26	0.169	2.06
TV	−0.102	32.31***	−0.057	11.48***
FRIDAY	0.209	11.10***	0.083	1.61
SATURDAY	−0.009	0.02	0.091	1.64
SUNDAY	0.030	0.21	−0.036	0.29
RURAL	0.015	0.04	−0.142	3.35*
URBAN	0.102	2.09	−0.037	0.26
EAST	−0.035	0.15	−0.101	0.95
SOUTH	−0.092	1.27	0.238	7.73***
MIDWEST	−0.050	0.34	0.078	0.70
BMI	0.019	9.47***	0.015	6.16**
DIET	−0.040	0.26	−0.081	0.83
VEGETARIAN	0.034	0.04	−0.549	5.26**
PRODUCE	0.015	4.35**	−0.025	12.64***
DISFAT	−0.041	0.83	−0.149	9.93***
SUBFAT	0.003	0.00	0.048	0.86
TASTE	0.095	1.41	0.031	0.14
NUTRITION	−0.034	0.26	−0.034	0.25
HLTHYWT	0.055	0.53	0.064	0.70
LOWFAT	−0.013	0.03	−0.007	0.01
FRTVEG	−0.034	0.23	−0.132	3.43*
NUTSCORE	0.027	3.78*	−0.005	0.13
LABELUSE	0.067	0.87	−0.014	0.04
USEWELL	0.016	0.05	−0.162	4.17**
SENSE	−0.108	2.98*	−0.101	2.49
NOCHANGE	−0.088	1.04	−0.192	3.92**
R^2	.076		.094	

Note: R^2 is calculated as the squared correlation between the actual and predicted value of the dependent variable.
"*Significant at 10% level; **significant at 5% level; ***significant at 1% level.

FOODSTAMPS are insignificant, while HOURS and CONVENIENCE are somewhat more important. Generally, financial cost seems more important for table service, while time cost is the driver of fast food. This is not surprising.

Gender has a similar negative and highly significant effect for both restaurant types, indicating that women dine out less than men. Age also has a negative effect for both, but it is not significant for table service but very highly significant for fast food. Years of education affects neither. The only strong racial effect in these models is that blacks are estimated to be less likely to dine at table service facilities. Our view that the TV variable is a measure of a stay-at-home lifestyle is borne out by the results: the coefficient is negative and highly significant in both models.

Like earlier studies, we find a weekend effect but of a very limited type. According to the results, a table service meal is much more likely to occur on a Friday than on any other day. Fast food usage displays no such effect, evidently more or less evenly distributed through the week. We find that rural consumers are significantly less likely to use fast food than are those in suburban areas (the omitted class), while there is a vague indication that urban consumers make greater use of table service (the probability value is .15). These likely reflect the importance of facility availability. The only significant regional effect is the clear preference for fast food in the South.

In each case, the coefficient on BMI is positive and significant, which is evidence that overweight individuals are more likely to dine out than are others. Based on coefficient size and level of significance, they are estimated to be more likely to choose table service. Assuming that one reason people become overweight is an above average liking for eating, this could reflect the greater variety and perhaps palatability found at table service restaurants relative to fast food. It could also be that, fast food supersizing notwithstanding, buffet style and frequent all-you-can-eat offers at table service outlets provide a better value for anyone interested in eating large meals. To the extent there is reverse causality, the result also suggests that dining in table service restaurants is a greater source of excess weight. In any case, it is evident that fast food is not the only factor in the FAFH–obesity question.

Nutrition Variables

We now consider the nutrition-related variables, beginning with those describing the current diet of the respondent. DIET, measuring whether the respondent reports being on any kind of diet, is not significant in either equation. Although this is somewhat surprising, Nayga and Capps (1994) obtained the same result in their study. However, VEGETARIAN, which is certainly a type of "diet," is significantly negative in the fast food model. Most fast food menus are built around a small number of meat-based items, making them of limited interest to vegetarians. Table service, which often

provides vegetarian entrees, is not affected. For fast food, PRODUCE, the measure of fruit and vegetable consumption, also has a negative effect, yet more significant. But the coefficient for table service is significantly positive. A possible reason for this somewhat unexpected sign is that PRODUCE is measuring not only a desire for fruits and vegetables but a preference for variety as well, which we would expect to be positively associated with dining in table service restaurants.

DISFAT and SUBFAT measure the degree to which the respondent makes an effort to avoid fat, by either not adding discretionary fat in the first place and/or by substituting low-fat foods for standard counterparts. Neither is significant for table service. For fast food, SUBFAT is not significant, while DISFAT has a very highly significant negative effect, indicating that those who avoid discretionary fat tend to also avoid fast food. This difference for these apparently related variables suggests they are distinguishing between two consumer types. One is those who avoid discretionary fat not only for nutrition considerations but also because they simply do not care for foods higher in fat. Since this seems to characterize fast food, they would dine out less. The second is the group who enjoys high-fat foods—and thus FAFH—but also worries about nutrition and so is willing to make substitutions when the sacrifice is not too onerous.

Results for the group of variables measuring the importance respondents claimed for aspects of nutrition were generally disappointing. NUTRITION and TASTE indicate whether the characteristics in question are deemed "very important." We expected consumers ranking food taste as very important to be more inclined to dine out, with the opposite effect for nutrition. However, these expectations failed to materialize, for both variables are estimated to have no effect whatsoever in either equation. Similarly, neither LOWFAT nor HLTHYWT, measuring the importance of a low-fat diet and maintaining a healthy weight, is significant in either model. Of course, actual behavior does not always accord with what consumers say they regard as important. Note from Table 2 that 75% of the sample strongly agreed with the statement that healthy weight is very important. Nevertheless, according to the Centers for Disease Control, in 1999–2000, 65% of adults older than 20 were overweight (Hedley et al. 2004). Furthermore, some people may become more aware of the importance of a healthy weight when they themselves become overweight.

FRTVEG, measuring the importance of fruits and vegetables, is the only member of this group whose effect is as expected. It is negative in both equations, and modestly significant for fast food. Given similar results for PRODUCE and VEGETARIAN, we conclude that the unavailability of fruit and vegetable items restricts the customer base of fast food outlets. This agrees

with other evidence. A recent survey found that more than twice as many fast food than table service customers said they would eat out more often if more fruits and vegetables were offered (Odesser-Torpe 2005).

Of the information variables, NUTSCORE is the most direct measure, being the score on a nutrition test. With an insignificant effect for fast food and a modestly significant positive effect for table service, we conclude that more knowledgeable consumers are likely to choose table service over fast food. Accepting that higher knowledge implies a desire for a healthy diet, this makes sense. Someone alert to the nutritional properties of various foods will be able to find reasonably healthy items among the variety of table service dishes available, certainly more so than with the limited selections at a fast food outlet.

LABELUSE is insignificant in both models, meaning that food label users are neither more nor less likely to dine out than nonusers. However, those who believe they know how to use labels to choose healthy foods, measured by USEWELL, are significantly less likely to eat fast food. This is additional evidence of a negative correlation between nutrition concern and fast food use.

We regard SENSE as indicating that nutrition choices are based on broad rules of thumb rather than punctilious attention to details. In view of the negative publicity regarding FAFH nutrition, one such rule is likely to be "other things the same, avoid discretionary dining out." The results somewhat support this: the coefficient on SENSE is negative for both FAFH types and significant at $p = .10$ for table service, slightly less so for fast food. Much the same argument applies to NOCHANGE, the indicator that the respondent believes his/her current diet is healthy, which also has a negative effect in both cases, but only significantly so for fast food. Although our interpretation of these variables can be questioned, less dining out would probably be viewed as evidence of good nutrition behavior.

Practical Effects

The coefficients in Table 3 are not direct effects because they refer to the nonlinear equation for the expected number of FAFH visits in equation (1). The ith marginal effect is $\beta_i e^{X\beta}$, which depends on the values of all the variables. A typical point of evaluation is the point $\bar{X}$. However, rather than marginal effects, it is more interesting to consider selected discrete changes in each of the k variables, using the difference formula

$$\Delta_i = e^{X_c\beta} - e^{X_b\beta}, \; i = 1 \text{ to } k$$

For continuous variables, X_b is the vector of sample means (including sample means of binary variables) and X_c is X_b with the ith position increased by 1 standard deviation of x_i. That is, we predicted the effect of a 1 standard deviation increase in x_i on predicted visits taken at the mean of other variables. For binary variables, X_b was again the vector of means except that the ith position was replaced with a zero. For X_c, the same vector was used, except the ith position was 1. This is the predicted difference in visits when the characteristic is present versus when it is not, again taken at the means. Since these effects refer to a period of two days, they were multiplied by 15, making them monthly differences.

These appear in Table 4. From this we see, for example, that being on food stamps is associated with two fewer FAFH visits per month, 1.5 table service and .5 fast food, while price-conscious food shoppers make at least one less. Increasing age by 1 standard deviation from the mean (i.e., from about 50 to over 66 years [Table 2]) has a similar effect, mostly due to less fast food. Given our somewhat stringent definition of a restaurant meal, the predicted male–female difference of 2.2 per month compares reasonably well with the .8 weekly difference found by the National Restaurant Association Survey noted previously.

Fast Food versus Table Service

A purpose of the study was to test whether nutrition factors have a greater impact for fast food than for table service. Based on the number of significant coefficients, they do. On balance, the pattern suggests that consumers with better dietary practices are less likely to dine at fast food outlets. There is little evidence of any similar effect for table service demand.

To address this more formally, the variables were classified into two sets: 14 nutrition and diet variables, and the remaining 22 variables. ONDIET and VEGETARIAN were included in the latter group, the first because it is often not a choice variable and the second because of its low prevalence in the sample. We then conducted a likelihood ratio test of the significance of each group in each equation. These appear in Table 5, which shows that the likelihood ratio statistics for the "other" group do not greatly differ for the two restaurant types, with fast food slightly larger. Both are highly significant. In either case, it is considerably larger than the statistic for the nutrition group, indicating that economic and demographic factors are more important than nutrition measures in explaining differences in FAFH demand. However, it is evident that the difference in the fast food equation is much smaller, suggesting a larger role for nutrition factors in the fast food

TABLE 4
Effect of a 1-Standard Deviation Change in Indicated Variable on Monthly FAFH Visits

	Table Service	Fast Food
INCOME	**1.40**	0.20
HOURS	**0.42**	**0.51**
HHSIZE	−0.26	−0.14
FOODSTAMPS	**−1.53**	−0.50
PRICEIMP	**−0.72**	**−0.55**
CONVENIENCE	**0.57**	**0.55**
AGE	−0.05	**−1.25**
FEMALE	**−1.11**	**−1.13**
EDUCATION	0.15	−0.09
AFRICAMER	**−1.41**	0.59
HISPANIC	−0.31	0.73
TV	**−0.91**	**−0.45**
FRIDAY	**1.03**	0.34
SATURDAY	−0.04	0.38
SUNDAY	0.14	−0.14
RURAL	0.07	**−0.55**
URBAN	0.49	−0.15
EAST	−0.17	−0.39
SOUTH	−0.43	**0.99**
MIDWEST	−0.24	0.32
BMI	**0.48**	**0.32**
DIET	−0.19	−0.32
VEGETARIAN	0.16	**−1.72**
PRODUCE	**0.34**	**−0.44**
DISFAT	−0.14	**−0.41**
SUBFAT	0.01	0.15
TASTE	0.44	0.12
NUTRITION	−0.16	−0.14
HLTHYWT	0.26	0.25
LOWFAT	−0.06	−0.03
FRTVEG	−0.16	**−0.54**
NUTSCORE	**0.31**	−0.05
LABELUSE	0.32	−0.06
USEWELL	0.08	**−0.62**
SENSE	**−0.51**	−0.40
NOCHANGE	−0.41	**−0.73**

Note: Bold indicates coefficient significant at 10% level or better.

decision. For table service, the nutrition variables as a group are not significant at even .10; for fast food, they are highly significant.

To illustrate the potential consequences of this difference, we used the estimated equation to compare the predicted mean outcomes for two hypothetical consumers, one with high and one with low nutrition concerns/interest/behavior, where these are defined by values of the 14 nutrition-related variables. In the case of the "high" consumer, all binaries are

TABLE 5
Results of Chi-Square Tests (Probability Values in Parentheses)

	Table Service	Fast Food
Economic and demographic	258.26 (.000)	284.13 (.000)
Nutrition	18.60 (.136)	51.07 (.000)

set at 1, except TASTE and PORTION set at 0; nonbinary nutrition variables are set at their 75th percentile value. For the "low" consumer, all binaries are reversed, and the continuous measures set at the 25th percentile. In both cases, the remaining variables are at their sample means. Based on equation (1), a 2–standard deviation confidence interval was constructed for mean visits by each consumer type to each type of restaurant in a 30-day period.

These appear in Table 6. For table service, there is virtually no difference between the consumer types, with the high-nutrition interval entirely contained with the low-nutrition interval. It is quite the contrary for fast food: the intervals have no overlap, with much smaller values for high nutrition. The means indicate that the typical low-nutrition consumer makes at least two more fast food visits per month than does the high-nutrition consumer. For table service, there is virtually no difference. Clearly, those with higher nutrition concerns are more likely to choose a table service restaurant when they dine out, while those without these concerns are somewhat more inclined to fast food.

Concluding Remarks

In this paper, we have examined a question that has been studied several times over the past three decades: the factors behind the decision to dine away from home. The study differs from previous work by including variables measuring nutrition attitudes, behavior, and knowledge as well as demographic and economic factors. Some people believe that restaurant meals have lower nutritional value than meals prepared at home, and restaurant food is often linked to the growing obesity problem, especially fast

TABLE 6
Two-Standard Deviation Confidence Intervals for Mean 30-Day Visits by "Low-Nutrition" and "High-Nutrition" Consumers

	Table Service			Fast Food		
Consumer type	Lower	Mean	Upper	Lower	Mean	Upper
Low nutrition	3.99	4.77	5.69	4.59	5.47	6.53
High nutrition	3.62	4.57	5.78	2.57	3.28	4.18

food. Thus, the hypothesis examined is that consumers concerned with nutrition are less likely to dine out, with fast food particularly affected.

We found support for this. Although the variables that have been found most important in prior studies, such as income, time value, age, and gender, continue to play the primary role in FAFH demand, our results show it is influenced by nutrition concerns as well. The effect is much more pronounced for fast food, and more consistent in direction. Nutrition-focused consumers make fewer visits to fast food outlets. In the case of table service, nutrition is less of a factor, and the direction of effect is ambiguous: if anything it appears to be more positive than negative.

Our conclusion is that negative publicity regarding the nutritional effects of FAFH has adversely affected the demand for fast food, but the effect on table service has been inconsequential. This is not a surprising result, because fast food has become a symbol of high-fat, low-nutrition dining. While this may be justified, that consumers obtain better nutrition at table service restaurants has not been demonstrated. Indeed, the limited information available suggests little difference, with table service possibly worse (Binkley 2003; Lin and Frazao 1997). Certainly, the issue needs clarification. If table service is no better, consumers may mistakenly believe that as long as they avoid fast food, they need not be greatly concerned with their diet when dining out.

The last point is important because, according to a recent United States Department of Agriculture study, demographic trends favor the table service sector. Because of the aging of the population, rising incomes, and the continuing decline in household size, demand for table service meals will grow faster than fast food demand (Stewart et al. 2004). Our results for these variables support this. In addition, if nutritional concerns continue to grow, which they seem likely to do, the results of this study suggest the shift to table service may be even stronger. However, our results also suggest that the recent addition of fruit and salad items to fast food menus is likely to counteract these trends. Fast food firms may serve themselves and consumers by continuing in this direction.

ENDNOTES

1. http://www.ers.usda.gov/briefing/CPIFoodAndExpenditures/.

2. The CSFII often surveyed more than one person in a household. However, the DHKS was limited to one person in any household. Thus, our sample did not include any individuals from the same household.

3. For more details on the method, see Dong et al. (2000).

4. We tested for overdispersion using the regression-based test presented in Greene and rejected the null of no overdispersion (Greene 2003, 884–885).

5. This is more than implied by the sample means presented in Table 2. Reasons for this include our exclusion of snacks and meals from other sources, such as cafeterias.

6. Also, all individuals who dine out frequently do not become overweight. This implies that anyone who does gain weight due to dining out is doing something different from others, e.g., choosing fattier foods or eating more. That is, ultimately it is due to diners' choice. We also note that BMI has been used in similar studies (e.g., Variyam, Blaylock, and Smallwood 1996; Wilde, McNamara, and Ranney 1999).

7. The 23 are artichokes, asparagus, broccoli, brussels sprouts, cauliflower, eggplant, kale, swiss chard, okra, spinach, summer squash, winter squash, yams, turnips, avocado, grapefruit, cantaloupe, honeydew, watermelon, nectarines, pears, plums, and rhubarb.

8. DISFAT is the average of three questions asking how often fat (e.g., butter, sour cream) is added to baked potatoes, cooked vegetables, and breads. 1 is "never" and 4 is "almost always." SUBFAT is the average of six questions, asking how often the respondent substitutes low fat for regular versions of lunch meat, milk, cheese, ice cream, and salad dressing, and whether fruit is substituted for regular versions.

9. This attitude is exemplified by a respondent in a recent New York Times survey on food label usage. "I don't need to read nutrition labels closely to know doughnuts are bad for me …. I just sort of know what would be good and what wouldn't" (Burros 2004).

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