

Empirical Results From the 1997-98 Data

The estimated models for the 16 food groups plus the diet-health knowledge equation allow us to evaluate the proportion of consumers purchasing the relevant item as well as the level of consumer expenditures with a specified set of household characteristics (appendix). For convenience, we present the estimated responses in per capita weekly expenditures associated with changes or differences in household demand factors. The estimated responses are evaluated at the sample means for all variables except the variable examined in the particular table. In other words, all variables in both the diet-health knowledge equation and the food expenditure equation are set to their observed mean values, except for the variable of interest. The variable of interest is set to its actual value if continuous, or to 1 if it is a binary variable.

Influence of Income

Table 9 shows the per capita effect of a 10-percent increase in weekly per capita income, as well as a 10-percent increase in diet-health knowledge. These effects represent only the so-called direct effects, or direct elasticities. The elasticity is simply the percent change in the dependent variable—in our case, the food group expenditure—divided by the percent change in income or diet-health knowledge. As such, they ignore the effects that occur in the diet-health knowledge equation, the so-called indirect effect. Hence, the direct effects in table 9 may understate or overstate the magnitude of the elasticities.

Income is an important determinant of food expenditures, and all income variables were jointly significant at acceptable statistical levels for all 16 food groups. Also, all calculated income elasticities are positive in table 9, which indicates that food expenditures increase as income rises.

Food groups most responsive to an increase in income are food away from home, miscellaneous prepared food, fruits, dairy products, and sugars and sweeteners. Given a 10-percent increase in income, expenditures rise 4.56 percent for food away from home, 1.63 percent for miscellaneous prepared foods, 1.62 percent for fruits, and 1.14 percent for both dairy products and sugars and sweeteners.

A 10-percent change in diet-health knowledge would be truly extraordinary. However, if diet-health knowledge increased 10 percent, expenditures would rise 12.50 percent for fish, 11.72 percent for fruits, and 8.79 percent for vegetables. In contrast, pork expenditures would decrease 1.12 percent and beef expenditures would decrease 7.84 percent if diet-health knowledge increased 10 percent.

As noted earlier, the market entry response comprises several components that are distinctly different but impossible to identify with our data. Correct interpretation of the market entry response requires an understanding of these components as well as the data. Three points deserve emphasis. First, the CES data are an expenditure, not a use, survey. Consequently, some households did not report any food expenditures during their survey period, but they undoubtedly consumed food from current supplies. Second, sampling units at which occupants were temporarily absent are included in the sample. These two factors will tend to cause the market entry response to be overestimated and possibly misinterpreted, especially for total food and food at home. Third, it is not possible to discern whether zero expenditures may represent nonuse of the commodity or infrequency-of-purchase behavior, as all households reported only for a 2-week period during the survey.

Table 9 also shows changes in expenditures due to market entry by consumers who did not previously purchase the good as well as changes due to the expenditure effect (the effect of those who already purchase the good increasing or decreasing expenditures). For example, if income increased by 10 percent, expenditures on vegetables would increase 1.03 percent. Of this amount, 0.48 percent would be due to households entering the market to make a vegetable purchase, and 0.55 percent would be due to increased expenditures by households that already purchase vegetables.

In terms of an income increase only, products with over 50 percent of the total income response due to market entry include beef, pork, poultry, fish, and sugars and sweeteners. In addition, both nonalcoholic beverages and miscellaneous prepared food are close to 50 percent. Hence, increases in income will benefit these food groups more than others in terms of market entry. Food companies could develop advertising strategies to attract these consumers.

To help understand the effects of income on food expenditures, we simulate average per capita expenditures on

Table 9—Per capita direct effects of 10-percent increases in income and diet knowledge on weekly food expenditures, 1997-98

Food group	Response to income increase			Response to diet-knowledge increase		
	Total increase in expenditures	Market entry effect ¹	Expenditure effect	Total increase in expenditures	Market entry effect	Expenditure effect
	<i>Percent</i>					
Total food	2.76	.69	2.07	2.07	.51	1.56
Food away from home	4.56	2.15	2.41	2.37	1.12	1.25
Food at home	1.25	.38	.87	3.60	1.09	2.51
Cereals and bakery products	1.06	.44	.62	4.85	2.01	2.84
Meats, poultry, fish, and eggs	.72	.34	.38	-2.23	-1.04	-1.19
Beef	.68	.42	.26	-7.84	-4.89	-2.95
Pork	.56	.36	.20	-1.12	-.72	-.40
Poultry	.76	.49	.27	3.05	1.95	1.10
Fish	.65	.47	.18	12.50	9.06	3.44
Dairy products	1.14	.53	.61	5.05	2.36	2.69
Fruits	1.62	.79	.83	11.72	5.73	5.99
Vegetables	1.03	.48	.55	8.79	4.12	4.67
Sugars and sweeteners	1.14	.70	.44	7.70	4.70	3.00
Nonalcoholic beverages	1.05	.52	.53	.95	.47	.48
Fats and oils	.50	.31	.19	3.52	2.16	1.36
Miscellaneous prepared food	1.63	.79	.84	6.22	3.01	3.21

¹Entry refers to how much of the total effect is due to new market entry or exit by consumers.

Source: Economic Research Service, USDA.

the 16 food groups at selected per capita income levels using the estimated Tobit equations evaluated for an average sample household (table 10). The per capita income levels we chose were the mean (\$19,721) and 25, 50, 125, and 150 percent of the mean. This exercise took into account both the diet-health knowledge equation and the expenditure equation.

Expenditures in all categories increase as income increased. Expenditures with the highest income elasticities, such as food away from home and miscellaneous prepared food, generally increase the most as income rises and, conversely, fall the most as income declines from the mean. Expenditures on food away from home fall to about 69 percent of average expenditures when income declines to 25 percent of the mean.

These responses are larger than would be predicted using the elasticities because, as noted, these results

include not only the direct effect but the indirect effect of the diet-knowledge equation. Close study indicates that the indirect effect tends to increase expenditures above what would be predicted by the direct income effect. For example, raising per capita income from \$19,721 to \$24,652 (25 percent) increases average total food expenditures about 8.2 percent, whereas the income elasticity from table 9 would increase expenditures just 6.9 percent.

The most revealing data in table 10 are the small increases in food expenditure, which are exactly in line with our calculated elasticities. If average income increased 50 percent, total food expenditures would increase just 14.8 percent while away-from-home food expenditures would increase 23.6 percent. The reason: American households are already well off and well fed. In fact, it should be noted that these expenditure simulations embody both a quantity and a quality effect. In

Table 10—Simulated weekly expenditure per capita by weekly income level, 1997-98

Food group	Base \$19,721	Expenditure change			
		25% of base \$4,930	50% of base \$9,861	125% of base \$24,652	150% of base \$29,582
	<i>Dollars</i>	<i>Percent</i>			
Total food	41.12	79.9	87.3	108.2	114.8
Food away from home	16.62	68.7	80.3	113.3	123.6
Food at home	25.34	90.3	93.8	103.9	107.1
Cereal and bakery products	4.13	92.3	95.2	103.4	106.1
Meat, poultry, fish, and eggs	6.73	95.5	96.7	100.6	102.2
Beef	1.97	97.0	97.5	100.0	100.5
Pork	1.39	100.0	100.0	100.7	100.7
Poultry	1.23	93.5	95.9	101.6	104.1
Fish	1.03	92.2	94.2	101.0	102.9
Dairy	3.12	91.7	94.9	103.8	106.7
Fruits	2.61	86.2	91.6	105.7	110.3
Vegetables	2.10	90.5	93.8	103.8	107.1
Sugars and sweeteners	1.31	91.6	95.4	103.8	106.9
Beverages	2.29	92.6	95.6	103.5	106.1
Fats and oils	.74	95.9	97.3	102.7	104.1
Miscellaneous prepared foods	3.89	87.9	92.8	105.7	109.8

Source: Economic Research Service, USDA.

other words, a 10-percent increase in expenditures does not translate to a 10-percent increase in quantities demanded. Rather, the increase in food expenditures goes in large part to increased demand for quality factors, such as convenience, packaging, and the substitution of products (for example, steak for hamburger). Because our data are an expenditure survey, separating an expenditure elasticity into its quality and quantity components is not possible. For a discussion of changes in the quantities consumed, see Lin, 2003, the companion report to this study.

Demographic and Seasonal Effects

Household characteristics and factors other than income that influence consumer demand for food include household age composition, region of residence, race, and season. Differences in per capita expenditures associated with these factors are simulated using the estimated Tobit and diet-health knowledge equations evaluated at alternative levels of the particular factor being examined, while other factors are held constant at their

respective sample averages. For example, households are grouped into four categories according to their region of residence: Northeast, North Central, South, and West. To simulate expenditures in a region, we determined the overall mean expenditure using the sample mean for all variables in the model, including the mean for all dummy variables. This mean expenditure was compared with the computed expenditure retaining all mean values but including the appropriate dummy variable for the variable of interest.

Household Age Composition

The age composition of a given household tends to have a dynamic effect on household food expenditures. In table 11, the base age group is made up of adults age 45-64. In general, as household age composition increased, expenditures on food at home increased. As household age composition decreased, expenditures on food away from home increased. Households in which the members are age 45 or older tended to spend more on food at home, while those composed mainly of

Table 11—Simulated weekly food expenditures per capita by age group, 1997-98

Food group	Base 45-64	Share of mean weekly expenditures by age (years)										Over 74
		Under 5 ¹	5-9	10-14	15-19	20-29	30-44	45-54	55-64	65-74		
	<i>Dollars</i>											
	<i>Percent</i>											
Total food	45.21	59.2	68.8	78.4	69.2	86.5	97.2	102.7	88.7			
Food away from home	15.30	77.1	83.9	108.1	113.9	134.7	128.2	105.5	75.2			
Food at home	30.82	54.5	63.5	65.2	47.2	62.8	81.2	100.5	94.3			
Cereals and bakery products	4.70	52.6	80.6	76.6	51.7	74.3	84.0	108.3	112.3			
Meats, poultry, fish, and eggs	8.64	45.7	53.6	51.6	31.7	55.7	81.0	95.8	85.5			
Beef	2.50	59.2	65.6	65.6	35.2	60.4	76.8	89.2	86.0			
Pork	1.93	46.1	44.6	37.3	27.5	37.3	72.0	92.2	94.3			
Poultry	1.48	50.0	62.8	67.6	40.5	62.1	92.6	95.3	89.2			
Fish	1.30	46.9	68.5	39.2	39.2	45.4	83.1	107.7	91.5			
Dairy	3.51	85.8	82.3	81.5	55.3	69.8	87.7	103.7	101.4			
Fruits	3.09	80.9	79.0	64.4	42.4	60.2	69.3	110.4	120.7			
Vegetables	2.74	48.5	48.5	47.4	26.6	49.3	72.6	108.0	97.1			
Sugars and sweeteners	1.46	71.9	93.2	92.5	68.5	65.8	82.2	117.8	100.7			
Nonalcoholic beverages	2.73	52.0	52.0	72.5	61.2	73.6	95.2	87.5	73.6			
Fats and oils	.98	36.7	58.2	56.1	32.7	44.9	71.4	96.9	100.0			
Miscellaneous prepared foods	4.52	70.6	71.5	79.2	56.2	70.1	89.2	93.6	92.0			

¹For example, total food expenditures for a child under age 5 would be 59.2 percent of the total food expenditures for an adult age 45-64.

Source: Economic Research Service, USDA.

members under age 45 tended to spend more on food away from home.

In the under-45 age group, households with children under age 14 as well as adults age 30-44 spent more on dairy items. The 30-44 age group also spent more on miscellaneous prepared foods than younger age groups. Households with children age 10-19 tended to spend more on food away from home, as did the 20-29 age group. Also, households with children age 9 or under spent relatively more on fruits than households with older children.

The over-45 age group spent more on food at home than the younger age groups and spent more on cereal and bakery products, meats, dairy, fruits, vegetables, and sugar and sweeteners. The over-74 age group spent the most on cereal and bakery products and fruits and spent the least on food away from home.

Each figure in table 11 approximates the per capita effect that a household member of a given age would have on total household expenditures. Hence, the weekly expenditure of a household composed of a particular combination of members may be readily calculated. For example, a household composed of a child age 7 and two adults age 25 and 32 would have weekly total food expenditures of \$114.16 (calculated as $45.21 \times (0.688 + 0.865 + 0.972)$). This approach enables us to compare expenditures for households of different sizes and/or age composition.

Region

Households in the Northeast generally spent the most on total food, including food at home and food away from home (table 12). While the South spent the least on food away from home, the North Central spent the least on food at home. Households in the Northeast spent the most on cereals and bakery products; meats, poultry, fish, and eggs; dairy; fruits; and vegetables. At the same time, the Northeast spent the least on sugars and sweeteners, nonalcoholic beverages, fats and oils, and miscellaneous prepared foods.

Households in the West spent the most on fats and oils, and miscellaneous prepared foods. Households in the South spent the most on pork, while households in the North Central spent the most on sugars and sweeteners and nonalcoholic beverages.

Race

Non-Black households outspent Black households by 6 percentage points on food at home and by about 25 percentage points on food away from home, all other factors held constant (table 13). Non-Black households had higher expenditures in every major category except meat, poultry, fish, and eggs. In this category, Black households outspent non-Black households by about 15 percentage points. Black households spent substantially more on pork, poultry, and fish and slightly more (about 3 percentage points) on fruits. Both types of households spent the same on fats and oils.

Table 12—Simulated weekly food expenditures per capita by region, 1997-98

Food group	Mean base	Share of mean weekly expenditures, by region			
		Northeast	North Central	South	West
	<i>Dollars</i>	<i>Percent</i>			
Total food	41.12	104.8	94.5	94.7	98.5
Food away from home	16.62	106.1	95.2	93.5	96.1
Food at home	25.34	102.6	94.5	96.5	101.0
Cereals and bakery products	4.13	108.7	93.7	90.6	93.5
Meats, poultry, fish, and eggs	6.73	104.9	92.9	97.0	97.3
Beef	1.97	103.6	93.9	98.0	95.9
Pork	1.39	96.4	105.0	107.9	97.1
Poultry	1.23	113.8	84.6	88.6	89.4
Fish	1.03	111.7	108.7	90.3	102.9
Dairy products	3.12	104.2	94.2	96.2	98.7
Fruits	2.61	104.6	93.1	92.3	102.7
Vegetables	2.10	104.8	89.0	95.2	102.4
Sugars and sweeteners	1.31	99.2	103.1	100.0	100.0
Nonalcoholic beverages	2.29	94.8	105.2	104.8	103.9
Fats and oils	.74	97.3	98.6	102.7	104.1
Miscellaneous prepared foods	3.89	88.9	110.0	105.7	115.2

Source: Economic Research Service, USDA.

Table 13—Simulated weekly food expenditures per capita by race, 1997-98

Food group	Mean	Share of mean expenditures	
		Black	Non-Black
	<i>Dollars</i>	<i>Percent</i>	
Total food	41.12	88.7	101.2
Food away from home	16.62	77.6	102.5
Food at home	25.34	94.6	100.6
Cereals and bakery products	4.13	88.9	101.2
Meats, poultry, fish, and eggs	6.73	113.8	98.5
Beef	1.97	99.0	100.0
Pork	1.39	120.9	97.8
Poultry	1.23	129.3	96.7
Fish	1.03	130.1	96.1
Dairy	3.12	76.9	102.6
Fruits	2.61	103.1	99.6
Vegetables	2.10	95.2	100.5
Sugars and sweeteners	1.31	89.3	101.5
Nonalcoholic beverages	2.29	87.3	101.3
Fats and oils	.74	100.0	100.0
Miscellaneous prepared food	3.89	80.5	102.3

Source: Economic Research Service, USDA.