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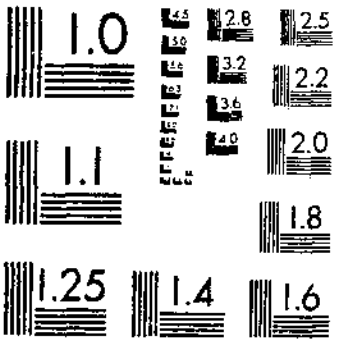

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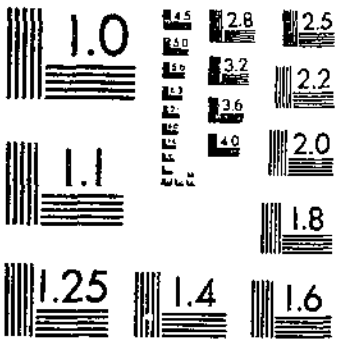

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United States Department of Agriculture

Economics and Statistics Service

Technical Bulletin Number 1650

Impact of Household Size and Income on Food Spending Patterns

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James Blaylock

IMPACT OF HOUSEHOLD SIZE AND INCOME ON FOOD SPENDING PATTERNS. David Smallwood and James Blaylock, National Economics Division, Economics and Statistics Service, U.S. Department of Agriculture. Technical Bulletin No. 1650.

ABSTRACT

Statistical relationships called expenditure elasticities are detailed for 24 major food groups and 77 subgroups. They allow researchers and policymakers to anticipate what can happen to family expenditures for these foods when income and household size change. The elasticities generally confirm that spending for food away from home increases significantly as income rises while spending for food prepared at home increases more modestly. The reverse relationship is true for increases in household size. The elasticitiy coefficients established here are based on the U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey.

Keywords: Food expenditures, elasticity, household income, household size

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Washington, D.C. 20250 May 1981

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INTRODUCTION

Statistical values outlined in this report allow researchers and government policymakers to anticipate the impact of such government programs as those involving welfare payments on various food purchases. The behavioral patterns suggested by these statistical values, describing 24 major food groups and 77 subgroups, indicate what can happen to family expenditures for each of those foods when income and household size change.

A 10-percent increase in income generates an increase of over 8 percent in spending for food away from home--such as restaurant fare--but only a 1.5-percent increase in the value of food purchased for preparation at home, according to this report. But, the reverse relationship is true for increases in household size: at-home food purchases climb at a much greater rate than away-from-home food spending.

Such statistical relationships are derived from "expenditure elasticities" which measure changes in food spending arising from a 1-percent change in income or household size. For example, the expenditure elasticity for increases in household size is 0.73 for at-home food and 0.11 for food away from home. This means that a household 10 percent larger than another would likely spend 7.3 percent more eating in and only 1.1 percent more eating out. It also means that the larger household would spend less per person. These elasticities are based on the most recent and comprehensive data currently available on family eating patterns--the U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey (NFCS).

As income increases, the amount spent on such products as pork, eggs, and cereals declines. But households with higher incomes spend more on such items as beef, beverages, bakery products, and vegetables.

Expenditures for food at home account for about 74 percent of the average food budget. Dairy products account for about 14 percent of all at-home food expenditures, beef accounts for 13 percent, pork 8 percent, cereal and bakery products about 12 percent, sugar 3 percent, fruits and vegetables about 14 percent, juices 2.5 percent, and fats and oils about 3 percent. Beverages, including alcoholic beverages, account for 12 percent of at-home food purchases.

The elasticities obtained in this study are comparable to those reported by Salathe. 1/ Methods and procedures used to calculate the elasticities are the same in this study and the one by Salathe. The major differences between the two studies are in the timeliness of the data and the type of survey in which the data were collected. Salathe used data from the Bureau of Labor Statistics' 1972-74 Consumer Expenditure Diary Survey. Those data relate to actual expenditures over a 2-week period (averaged to 1 week). Data on which this report is based refer to the money value of purchased food that was used during the week preceding the 1977-78 NFCS survey interview.

THE MODEL

The classical theory of consumer demand provides the economic framework for this analysis. According to the classical theory, the consumer unit seeks to allocate its income among many alternative goods in an effort to maximize its utility or wellbeing. The solution to the consumer budget allocation problem can be expressed as a set of expenditure functions, one for each good, and a restriction equating the sum of expenditures to consumer income. Expenditures for each item are expressed as a function of consumer income, prices of all items, and consumer tastes and preferences.

Use of cross-section survey data allows the researcher to control for the effects of price changes on expenditures. It is usually assumed that price variation is negligible in cross-section data collected over a reasonably short time interval. Consequently, if all consumers face the same prices, observed differences in expenditures are attributed to differences in income level, household size, and tastes and preferences. Household size is included in the expenditure function to control for expenditure variations associated with changes in the size of the consumer unit, the household. Tastes and preferences also vary across consumer units. These variations are empirically modeled as deviations from the average relationship.

1/ Larry E. Salathe, Household Expenditure Patterns in the United States. TB-1603. U.S. Dept. Agr., Econ. Stat. Coop. Serv., Apr. 1979.

Various functional forms have been suggested to describe household expenditure behavior, with no single form having found general acceptance. The choice of functional form used to estimate the expenditure functions should take into consideration the following interrelated factors: (1) theoretical plausibility; (2) cost, simplicity,and convenience of estimation and interpretation; (3) ability to test alternative hypotheses; and (4) validity and fit of the function over the range of the data. This analysis assumes a quadratic function as the hypothesized form of the expenditure function. When comparing the quadratic form to other commonly used functional forms, researchers have found that it more accurately describes expenditure behavior. 2/ The quadratic form possesses properties suggested by demand theory and may be thought of as a second order Taylor series expansion in income and household size to a general expenditure function. 3/ In particular, the quadratic form possesses the adding up property suggested from demand theory, allows for zero expenditure values in the data, and allows for testing of alternative hypotheses concerning the impact of household size and income on expenditures.

This study focuses on the relationship of household size and income to household food expenditures. The impacts of other socioeconomic and demographic factors such as race, location of residence, and educational level of the household head on household expenditures are assumed to be independent of income and household size and are not examined. Consequently, the parameters and elasticities presented in this report should be interpreted as national averages and, hence, they may not represent individual population subgroups.

The mathematical form of the quadratic function used is:

$$(1)\quad E_{ih} = A_{0i} + A_{1i}Y_h + A_{2i}Y_h^2 + A_{3i}N_h + A_{4i}N_h^2 + A_{5i}Y_hN_h$$

...where E_{ih} is expenditure on the ith commodity by the hth household, Y_h is income of the hth household, N_h is the size of the hth household, and A_{0i}, A_{1i}, A_{2i}, A_{3i}, A_{4i}, and A_{5i} are coefficients that measure the response of household expenditures to changes in household size and income. Elas-

2/ Larry E. Salathe, "A Comparison of Alternative Functional Forms for Estimating Household Engel Curves." Contributed paper, 1978 Amer. Agr. Econ. Assoc. annual meeting, Blacksburg, Va., Aug. 6-8, 1978.

3/ Howard Howe, "Estimation of the Linear and Quadratic Expenditure System: A Cross-Section Case for Columbia." Ph.D. thesis, Univ. Penn., 1974.

ticities can be computed from equation (1) to summarize the influence of household size and income on household food expenditures.

Income Elasticity

The income elasticity measures the percentage change in expenditure (E_{ih}) due to a 1-percent change in income (Y_h). The income elasticity implied by equation (1) is given by:

$$(2) \qquad n_{ih} = (\partial E_{ih}/\partial Y_h)(Y_h/E_{ih})$$

$$= (A_{1i} + 2A_{2i}Y_h + A_{5i}N_h)(Y_h/E_{ih})$$

...where ($\partial E_{ih}/\partial Y_h$) is the partial derivative of E_{ih} with respect to Y_h. Equation (2) implies that the value of the income elasticity depends upon the expenditure level, income, and household size. The sample means are used in this study as the level of these variables for calculating income and household size elasticities.

A negative income elasticity indicates that expenditures on a particular item decline as income increases. A positive income elasticity indicates that an increase in household income causes an increase in household expenditures for the item in question. The larger the magnitude of the income elasticity the more responsive household expenditures are to a change in household income.

Household Size Elasticity

The household size elasticity measures the percentage change in household expenditures due to a 1-percent change in household size. The household size elasticity associated with equation (1) is given by:

$$(3) \qquad S_{ih} = (\partial E_{ih}/\partial N_h)(N_h/E_{ih})$$

$$= (A_{3i} + 2A_{4i}N_h + A_{5i}Y_h)(N_h/E_{ih})$$

A positive household size elasticity indicates that an increase in household size is associated with higher household expenditures on the item in question. A negative household size elasticity indicates that purchases decline as household size increases and a household size elasticity value of 1.00 indicates that expenditures are proportional to household size. The larger the magnitude of the household size elasticity, the more responsive household expenditures are to changes in household size.

THE DATA

The 1977-78 NFCS data were collected over a 1-year period: April 1, 1977, to March 31, 1978. They result from interviews with approximately 15,000 households from the 48 contiguous States. Households were selected using a stratified self-

weighting area probability sampling technique to ensure national representation. Information on household characteristics and food use was obtained during personal interviews with the household members(s) most responsible for food planning and preparation. The interviewer used a detailed food list to assist the homemaker to recall the kinds, quantities, and costs of food used during the 7 days immediately preceding the interview. The recall data on the dollar value of purchased food used provides the basis for this analysis. The money value of nonpurchased food--food received as gift or pay, home-produced food, and food provided through charitable donations--was excluded.

The data were obtained from the public use tapes and had been edited for major errors before release by the U.S. Department of Agriculture. 4/ However, since many households did not report a dollar figure for pretax household income, an attempt was made to increase the usable sample by using income reported in other questions. If pretax income was not reported then the midpoint of the reported income class was used. 5/ If this was also unavailable, after tax income was inflated by the average tax rate paid by reporting households. After these procedures were used to measure income, 10,784 out of a total 14,937 observations were found to be usable for the regression analysis. Table 1 contains average weekly household food expenditures and the proportion of total at-home food expenditures accounted for by each at-home category. Data presented in table 1 relate to an average of 2.95 people in the household and average household before-tax income was $273.05 per week. Principal findings are:

(1) At-home food expenditures account for 74.1 percent of total food expenditures.

(2) Meals away from home account for 80.8 percent of food away from home expenditures and snacks away from home account for the remaining 19.2 percent.

(3) Dairy products average 13.0 percent of weekly at-home food expenditures; fresh fluid milk accounts for 51.8 percent of dairy expenditures.

(4) Beef and veal account for 13.6 percent of at-home food expenditures; pork expenditures average 8.1 percent of at-home food expenditures; and total meat expenditures (including fish and poultry) account for 33.4 percent of at-home food expenditures.

4/ These tapes are available through NTIS (National Technical Information Service, U.S. Department of Commerce).

5/ Income classes were defined in thousand dollar intervals.

(5) Sugars and sweets average 3.1 percent of at-home food expenditures.

(6) Fresh fruits and vegetables average 8.0 percent of at-home expenditures; fresh vegetables account for 52.0 percent of the weekly expenditures on fresh fruit and vegetables.

(7) Beverages account for about 12.0 percent of at-home food expenditures; coffee accounts for 30.3 percent, soft drink 23.5 percent, and alcoholic beverages 30.8 percent of beverage expenditures.

RESULTS

Estimated expenditure functions and household size and income elasticities for aggregate and disaggregate food groups are presented in table 2. Expenditure functions which are quadratic in income and household size are estimated by ordinary least squares regressions. The regressions include observations with zero values for expenditures on individual food items. Parameter estimates and elasticities obtained for food items consumed by small proportions of the sample households should be interpreted cautiously because the concentration of values at zero violates the assumptions of the statistical model. The percentage in the sample reporting non-zero values for expenditures on each commodity and commodity group is reported in table 1.

The estimated income elasticity for total food is about 0.32. This means that a 10-percent increase in household income is associated with a 3.2-percent increase in food expenditures. Similarly, a 10-percent increase in income is associated with a 1.5-percent (0.15 elasticity) increase in at-home food expenditures and an 8.1-percent (0.81 elasticity) increase in spending for food away from home. Because the increase in food expenditure is less than proportionate to the increase in income, the percent of income spent on food declines as household income increases.

The estimated household size elasticities for food at home and food away from home are 0.73 and .11, respectively. This indicates that, given the same income, larger households spend more per household but less per person for both at-home food and food away from home than smaller households. They also spend a smaller share of their food dollar on food away from home.

Dairy Products

Household expenditures on fresh whole milk are only slightly responsive to changes in income, but very responsive to changes in household size. Other dairy products, with the the exception of processed milk, are more responsive to income changes but less responsive to changes in household size.

Fats and Oils	Commodity expenditures in this group are fairly responsive to changes in household size but generally unresponsive to changes in income. Household expenditures on cooking oil and shortening decline as household incomes increase, as indicated by its negative income elasticity.
Cereal Products	The income elasticity for cereal products is negative, indicating that low-income households spend more on these products than higher income households. Of the four products in this group, only prepared flour mixes have a positive income elasticity. All commodities in this group are very responsive to increases in household size with expenditures being approximately proportional to the number of individuals in the household.
Bakery Products	Household expenditures on bread increase slightly with income, but are relatively more responsive to changes in household size. Other bakery products are more responsive to changes in income than is bread. The income elasticity for other bakery products is about 0.22 which indicates that a 10-percent increase in income is associated with a 2.2-percent increase in household expenditures on these products.
Meats, Poultry, Eggs, and Fish	Estimated income elasticities for various meats differ substantially. The income elasticity for beef is about 0.22 which indicates that a 10-percent increase in income is associated with a 2.2-percent increase in expenditure on beef. Pork has a small negative income elasticity which means low-income households spend slightly more on pork than their higher income counterparts. Veal and lamb are more responsive to changes in income than either beef or pork. Pork, however, is more responsive than beef to increases in household size. Poultry expenditures are generally unresponsive to changes in income, but quite responsive to increases in household size. Fish and shellfish have an income elasticity of about 0.33. This indicates that a 10-percent increase in income is associated with a 3.3-percent increase in expenditures on these products. This group has a higher income elasticity than either beef or poultry. Expenditures on fresh eggs decline as income increases as indicated by its negative income elasticity. This means that lower income households spend more on fresh eggs than higher income households. The response of fresh egg expenditures to increases in household size is large but was less than proportional to household size.
Fruits and Vegetables	Vitamin C-rich fruit has the highest income elasticity of the three fresh fruit groups considered. The income elasticity is

about 0.53, which indicates that a 10-percent increase in income is associated with a 5.3-percent increase in expenditures on vitamin C-rich fruit. Frozen fruits are also very responsive to changes in income, but unresponsive to increases in household size.

Deep yellow vegetables have the largest income elasticity of all fresh vegetables. Canned vegetables and fresh potatoes have negative income elasticities, indicating that expenditures on these commodity groups decline as income increases. Frozen vegetables are quite responsive to income changes.

Juices

The income elasticities for canned and fresh fruit juices are negative. This indicates that lower income households spend more on these products than higher income households. The income elasticity for frozen fruit juices is about 0.43. This indicates that a 10-percent increase in income is associated with a 4.3-percent increase in expenditures on frozen fruit juices. In general, a 10-percent increase in household size has a much larger impact on juice expenditures than does a similiar increase in income.

Sugar and Sweets

The income elasticity for sugar is -0.15. This means a 10-percent increase in income is associated with a 1.5-percent decline in expenditures. All four subgroups in this category are very responsive to an increase in household size. Expenditures are approximately proportional to the number of individuals in the household.

Beverages

The income elasticity and household size elasticities for alcoholic beverages are about 0.90 and -0.18, respectively. This indicates that a 10-percent increase in income is associated with a 9-percent increase in expenditures on alcoholic beverages. Conversely, a 10-percent increase in household size is associated with a 1.8-percent decline in expenditures on alcoholic beverages.

Cocoa and soft drinks appear to be much more responsive to changes in household size than to changes in income. The same is also true for coffee and tea.

Miscellaneous

The remaining food categories--soups, nuts, mixtures--are more responsive to changes in household size than to changes in income. For example, a 10-percent increase in income is associated with a 3.5-percent decrease in expenditures on baby mixtures. But a 10-percent increase in household size is associated with a 17.9-percent increase in expenditures for baby food.

Food Away From Home

A 10-percent increase in income is associated with an 8.1-percent increase on expenditures for food away from home. Expenditures on snacks are more responsive to changes in household size than are meals away from home. The opposite relationship holds for changes in income.

Table 1--Weekly household food expenditures

Product category	Average expenditures	Allocation of at-home food dollar	Households reporting item
	Dollars	----Percent----	
Total food	56.26	N/A	100.0
Food away from home	14.57	N/A	76.1
Meals	11.78	N/A	65.0
Snacks	2.80	N/A	49.3
Food at home	41.68	100.00	99.8
Dairy products	5.43	13.04	98.7
Fresh milk	2.82	6.75	92.7
Processed milk	.32	.78	26.9
Cream	.16	.39	27.2
Frozen desserts	.62	1.48	49.2
Cheese	1.50	3.61	81.1
Dips	.01	.03	1.7
Fats and Oils	1.36	3.25	95.5
Table fat	.61	1.46	91.6
Shortening	.16	.37	30.8
Salad, cooking oil	.23	.55	44.9
Salad dressing	.36	.86	70.3
Cereal products	1.81	4.34	93.3
Flour, other than mixes	.16	.37	53.7
Prepared flour mixes	.22	.53	27.6
Breakfast cereals	.92	2.21	79.1
Other cereals	.51	1.23	70.3
Bakery products	3.14	7.54	98.5
Bread	1.15	2.77	95.0
Other baked goods	1.99	4.77	88.5
Meat	10.91	26.17	96.8
Beef	5.68	13.63	87.4
Pork	3.36	8.05	77.4
Veal	.16	.38	5.2
Lamb, mutton, goat	.13	.31	3.7
Variety meat, game	.13	.31	10.2
Lunch meat	1.44	3.46	68.5
Meat substitutes	.01	.03	0.9

Continued--

Table 1--Weekly household food expenditures--Continued

Product category	Average expenditures	Allocation of at-home food dollar	Households reporting item
	Dollars	----Percent----	
Poultry and fish	3.00	7.19	78.3
Poultry	1.83	4.38	65.8
Fish, shellfish	1.17	2.80	46.8
Eggs	.84	2.01	89.4
Fresh eggs	.83	1.99	89.0
Processed eggs	.01	.02	1.2
Sugar products	1.28	3.08	92.0
Sugars	.35	.85	83.0
Sirups, honey, molasses	.16	.39	32.6
Jellies, jams, preserves	.16	.39	39.9
Candies, nonfruit toppings	.43	1.03	35.6
Misc. sweets	.18	.43	28.2
Potatoes	.78	1.86	79.2
Fresh potatoes	.41	.98	67.0
Canned potatoes	.02	.05	4.2
Frozen potatoes	.06	.16	9.9
Deyhydrated potatoes	.02	.05	4.8
Chips, sticks	.26	.62	30.9
Vegetables, fresh	1.74	4.17	87.8
Dark green	.19	.45	25.9
Deep yellow	.12	.29	34.1
Light green	.58	1.39	37.5
Tomatoes	.29	.69	72.7
Other vegetables	.56	1.35	69.1
Fresh fruits	1.60	3.85	78.8
Citrus	.35	.85	37.6
Vitamin C-rich	.12	.29	11.6
Other fruits	1.13	2.70	72.4
Canned fruits and vegetables	1.30	3.12	77.5
Vegetables	.98	2.36	72.4
Fruits	.32	.76	32.5
Frozen fruits and vegetables	.36	.86	34.3
Vegetables	.34	.82	33.4
Fruits	.017	.04	1.9

Continued--

Table 1--Weekly household food expenditures--Continued

Product category	Average expenditures	Allocation of at-home food dollar	Households reporting item
	Dollars	----Percent----	
Juices	1.05	2.52	72.9
Canned vegetables	.09	.23	14.1
Canned fruit	.34	.81	32.0
Frozen vegetables	*	*	.1
Frozen fruit	.42	1.01	37.2
Fresh fruit	.19	.47	14.7
Fresh vegetables	*	*	.2
Dried fruits and vegetables	.18	.43	27.9
Vegetables	.11	.27	20.3
Fruits	.07	.16	9.9
Beverages	4.99	11.97	97.1
Coffee	1.51	3.63	76.4
Tea	.30	.71	52.4
Cocoa	.06	.15	14.6
Soft drinks	1.17	2.82	62.8
Fruit ades	.41	.98	37.1
Alcoholic	1.54	3.68	32.6
Soups	.41	.99	51.4
Ready to serve	.08	.20	9.9
Semi-condensed	.26	.62	38.4
Frozen, condensed	*	*	0
Frozen, ready to serve	*	*	0
Dehydrated	.07	.16	14.7
Nuts, condiments	.76	1.81	71.4
Nuts and peanut butter	.43	1.02	51.6
Catsup, chili sauce, etc.	.18	.43	39.6
Pickles and relishes	.13	.32	24.1
Leavening agents	.02	.04	12.3
Seasonings	*	*	.1
Mixtures, baby food	.76	1.81	37.8
Fresh	.20	.47	6.5
Canned and frozen	.42	1.02	23.7
Dry	.08	.19	12.6
Baby food	.06	.14	3.3

Notes: Totals may not sum due to rounding. N/A = Not applicable.
* = Expenditures are less than 1 cent per week.

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times housenold size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Total food	6.386597	1.241134	-0.006952	11.939973	-0.370213	0.075804	0.444	0.3199	0.5681
	3/(6.75)	(21.84)	(14.60)	(23.61)	(6.13)	(5.45)			
Food away from home	.812863	.955656	- .004433	.511796	.004034	.001921	.168	.8139	.1140
	(1.25)	(24.42)	(13.52)	(1.47)	(0.10)	(0.20)			
Meals	.572950	.872624	- .003899	- .143290	.031070	.003349	.167	.9306	.0220
	(0.98)	(24.77)	(13.20)	(0.46)	(0.83)	(0.39)			
Snacks	.239914	.083032	- .000534	.655086	- .027035	- .001428	.042	.3229	.5010
	(1.33)	(7.68)	(5.90)	(6.81)	(2.35)	(0.54)			
Food at home	7.336089	.238338	- .002419	11.911626	- .379383	.090668	.477	.1471	.7268
	(10.38)	(5.62)	(6.80)	(31.54)	(8.41)	(8.73)			
Dairy products	.638930	.005619	- .000532	1.401673	- .028641	.023112	.392	.1534	.8474
	(5.22)	(0.76)	(8.64)	(21.43)	(3.67)	(12.85)			
Fresh milk	.121085	- .024668	- .000147	.914179	- .018611	.012992	.338	.0479	1.0363
	(1.49)	(5.04)	(3.59)	(21.00)	(3.58)	(10.85)			
Processed milk	.024360	.004320	.000022	.075861	.010054	- .002328	.027	- .0844	.9326
	(0.57)	(1.67)	(1.02)	(3.30)	(3.66)	(3.68)			
Cream	.054066	.004172	- .000054	.010507	- .001643	.001129	.034	.5274	.3093
	(4.04)	(5.20)	(8.03)	(1.47)	(1.92)	(5.74)			
Frozen desserts	.042286	.002309	- .000093	.157013	- .005373	.003682	.109	.2414	.8470
	(1.25)	(1.14)	(5.50)	(8.70)	(2.49)	(7.42)			
Cheese	.398329	.018953	- .000253	.241829	- .012788	.007521	.146	.3207	.5359
	(7.45)	(5.90)	(9.38)	(8.46)	(3.75)	(9.57)			
Dips	-.001197	.000533	- .000007	.002284	- .000282	.000117	.003	.7353	.5180
	(0.24)	(1.81)	(2.93)	(0.87)	(0.90)	(1.62)			
Fats and oils	.214943	- .000108	- .000040	.413247	- .016317	.002619	.246	.0681	.7711
	(6.07)	(0.05)	(2.22)	(21.85)	(7.22)	(5.03)			

See footnotes at end of table.

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Table fat	0.174694	0.000706	-0.000048	0.129441	-0.005377	0.002555	0.166	0.1603	0.6493
	3/ (9.03)	(0.61)	(4.95)	(12.52)	(4.35)	(8.98)			
Shortening	.012160	- .003319	.000044	.076483	.000463	- .001168	.085	- .5028	1.1870
	(0.99)	(4.52)	(7.16)	(11.71)	(0.59)	(6.50)			
Cooking oil, salad	.029116	- .001450	.000017	.096998	- .007016	.000230	.034	- .0185	.7540
	(1.85)	(1.54)	(2.10)	(11.55)	(6.99)	(0.99)			
Salad dressing	- .001027	.003955	- .000052	.110324	- .004387	.001002	.138	.2142	.8083
	(0.07)	(4.23)	(6.65)	(13.26)	(4.41)	(4.38)			
Cereal products	.119715	- .025368	.000092	.652384	- .002715	.002637	.365	- .1177	1.1002
	(2.37)	(8.36)	(3.61)	(24.16)	(0.84)	(3.55)			
Flour, other than mixes	.064831	- .003205	.000040	.034191	.005028	- .000760	.075	- .3948	1.0078
	(5.06)	(4.16)	(6.16)	(4.99)	(6.14)	(4.04)			
Prepared flour mixes	- .020191	- .000544	- .000028	.087009	- .004767	.001175	.059	.1376	1.0134
	(1.16)	(0.52)	(3.17)	(9.32)	(4.27)	(4.58)			
Breakfast cereals	.027753	- .014128	.000001	.324805	- .000914	.003069	.261	- .0780	1.161
	(0.79)	(6.67)	(0.05)	(17.24)	(0.41)	(5.92)			
Other cereals	.047322	- .007492	.000079	.206379	- .002062	- .000847	.161	- .2145	1.0490
	(2.06)	(5.44)	(6.86)	(16.83)	(1.41)	(2.51)			
Bakery products	.220577	- .001446	- .000234	.997644	- .050272	.013927	.299	.1491	.8438
	(2.67)	(0.29)	(5.62)	(22.60)	(9.53)	(11.47)			
Bread	.291722	- .010810	- .000028	.278258	- .000484	.004486	.255	.0201	.8663
	(8.37)	(5.16)	(1.58)	(14.93)	(0.22)	(8.75)			
Other baked goods	- .071145	.009364	- .000206	.719386	- .049788	.009440	.195	.2241	.8308
	(1.01)	(2.23)	(5.84)	(19.21)	(11.13)	(9.17)			
Meat	.629618	.082919	- .000477	3.453620	- .113986	.008038	.284	.1212	.7831
	(2.30)	(5.04)	(3.46)	(23.59)	(6.52)	(2.00)			
Beef	.256079	.090166	- .000623	1.603410	- .059308	.006400	.198	.2283	.6981
	(1.44)	(8.47)	(6.98)	(16.93)	(5.24)	(2.46)			

See footnotes at end of table.

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Pork	.235188	-0.008967	0.000140	1.239323	-0.044625	0.001258	0.143	-0.0054	0.8736
	(1.76)	(1.12)	(2.09)	(17.39)	(5.24)	(0.64)			
Veal	.049222	.003785	- .000033	.013311	- .002430	.001161	.007	.5642	.2885
	(1.54)	(1.98)	(2.04)	(0.78)	(1.19)	(2.48)			
Lamb, mutton, goat	.044603	.008280	- .000038	- .008502	.002503	- .000547	.003	.6215	- .0346
	(1.43)	(4.43)	(2.41)	(0.51)	(1.26)	(1.19)			
Variety meat, game	.065450	- .000695	.000033	.033817	.000627	- .000941	.007	- .2768	.5507
	(3.38)	(0.60)	(3.44)	(3.27)	(0.51)	(3.31)			
Lunch meat	-.027124	- .010229	.000047	.573547	- .010922	.000699	.187	- .0672	1.0615
	(0.45)	(2.83)	(1.56)	(17.83)	(2.84)	(0.79)			
Meat substitutes	.006200	.000579	- .000005	- .001286	.000169	.000010	.001	.5862	- .0365
	(0.85)	(1.32)	(1.29)	(0.33)	(0.36)	(0.10)			
Poultry and fish	.691298	.036545	- .000085	.632518	- .006486	.000456	.094	.1682	.5917
	(5.50)	(4.84)	(1.34)	(9.41)	(0.81)	(0.25)			
Poultry	.397145	.006281	.000008	.481395	.009956	.000682	.094	.0661	.6983
	(4.99)	(1.31)	(0.19)	(11.31)	(1.96)	(0.58)			
Fish, shellfish	.294153	.030264	- .000092	.151123	.003470	- .000226	.034	.3278	.4251
	(3.48)	(5.96)	(2.17)	(3.35)	(0.64)	(0.18)			
Eggs	.245278	- .001788	.000055	.207876	.003599	- .001169	.199	- .0625	.7485
	(9.68)	(1.18)	(4.28)	(15.35)	(2.22)	(3.14)			
Fresh eggs	.239139	- .002139	.000051	.206205	.003755	- .001051	.203	- .0653	.7609
	(9.51)	(1.42)	(3.99)	(15.34)	(2.34)	(2.84)			
Processed eggs	-.006139	.000351	.000004	.001671	- .000157	- .000118	.001	.1694	- .2716
	(1.42)	(1.35)	(1.89)	(0.72)	(0.57)	(1.86)			
Sugar products	.019672	- .004028	- .000060	.465045	- .016598	.003382	.164	.0469	.9548
	(0.37)	(1.27)	(2.26)	(16.43)	(4.91)	(4.34)			
Sugars	.041592	- .005072	.000015	.140252	- .003927	.000239	.085	- .1574	1.0026
	(1.98)	(4.01)	(1.46)	(12.47)	(2.92)	(0.77)			

See footnotes at end of table.

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Sirups, honey, molasses	0.008507	0.000716	-0.000005	0.051432	-0.000892	0.000047	0.043	0.0624	0.8601
	(0.66)	(0.92)	(0.81)	(7.46)	(1.08)	(0.25)			
Jellies, jams preserves	.031379	- .001498	.000004	.040975	.001127	.000357	.080	- .0297	.9601
	(2.87)	(2.28)	(0.68)	(7.01)	(1.61)	(2.22)			
Candies, nonfruit, toppings	- .034920	.002616	- .000065	.145060	- .007851	.002317	.046	.2529	.9086
	(0.91)	(1.14)	(3.36)	(7.10)	(3.21)	(4.12)			
Misc. sweets	- .026886	- .000790	- .000009	.087326	- .005056	.000422	.047	.0149	1.0514
	(1.80)	(0.88)	(1.26)	(10.96)	(5.31)	(1.93)			
Potatoes	.000672	- .001634	- .000037	.291650	- .010053	.001399	.210	.0263	.9591
	(0.02)	(1.00)	(2.72)	(20.03)	(5.78)	(3.49)			
Fresh potatoes	.096156	- .004455	.000035	.135022	- .001639	- .000293	.131	- .1502	.8719
	(5.59)	(4.31)	(4.00)	(14.68)	(1.49)	(1.16)			
Canned potatoes	.001387	.000124	.000001	.006682	.000359	- .000096	.010	- .0876	.9665
	(0.30)	(0.44)	(0.30)	(2.70)	(1.22)	(1.41)			
Frozen potatoes	- .026432	.000092	- .000015	.032799	- .002231	.000507	.033	.2538	1.2212
	(3.08)	(0.18)	(3.50)	(7.15)	(4.07)	(4.02)			
Dehydrated potatoes	.000835	.000210	- .000002	.006798	- .000091	- .000006	.007	.0837	.8347
	(0.19)	(0.78)	(0.97)	(2.84)	(0.32)	(0.10)			
Chips, sticks	- .071274	.002396	- .000055	.110349	- .006451	.001288	.093	.2560	1.0421
	(4.16)	(2.33)	(6.42)	(12.05)	(5.90)	(5.11)			
Vegetables, fresh	.605300	.021224	.000038	.306047	- .007158	- .000020	.085	.1816	.4471
	(9.46)	(5.52)	(1.18)	(8.95)	(1.75)	(0.02)			
Dark green	.091000	.000901	.000039	.029285	.002402	- .000904	.018	- .0498	.4801
	(5.57)	(0.92)	(4.73)	(3.35)	(2.30)	(3.76)			
Deep yellow	.067433	.001236	- .000012	.003215	.000635	.000487	.024	.2740	.3395
	(7.42)	(2.26)	(2.67)	(0.66)	(1.09)	(3.65)			
Light green	.211153	.006121	.000033	.095336	- .000630	- .000032	.059	.1698	.4627
	(7.71)	(3.72)	(2.36)	(6.51)	(0.36)	(0.08)			

See footnotes at end of table.

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Tomatoes	0.098385	0.001571	-0.000001	0.063809	-0.002402	0.000130	0.026	0.0961	0.5287
	(5.13)	(1.36)	(0.04)	(6.22)	(1.96)	(0.46)			
Other vegetables	.137328	.011395	- .000021	.114402	- .007162	.000298	.049	.2953	.4013
	(4.65)	(6.42)	(1.41)	(7.24)	(3.80)	(0.69)			
Fresh fruits	.437830	.016712	- .000152	.318165	- .016945	.005009	.102	.2405	.5320
	(7.07)	(4.49)	(4.87)	(9.61)	(4.28)	(5.50)			
Citrus	.117695	.004624	- .000025	.052875	- .001504	.000868	.036	.2591	.4688
	(5.06)	(3.31)	(2.15)	(4.25)	(1.01)	(2.54)			
Vitamin C-rich	.072968	.002098	- .000011	- .006138	- .000284	.000946	.017	.5328	.1357
	(4.74)	(2.27)	(1.37)	(0.75)	(0.29)	(4.19)			
Other fruits	.247166	.009990	- .000116	.271429	- .015157	.003194	.088	.2030	.5949
	(5.14)	(3.46)	(4.80)	(10.57)	(4.94)	(4.52)			
Canned fruits and vegetables	.134433	- .003661	.000027	.492465	- .020510	- .000172	.126	- .0372	.8372
	(2.62)	(1.19)	(1.03)	(17.95)	(6.26)	(0.23)			
Vegetables	.075283	- .004708	.000077	.400432	- .014105	- .001482	.124	- .0994	.8883
	(1.82)	(1.89)	(3.71)	(18.10)	(5.34)	(2.44)			
Fruits	.059150	.001048	- .000051	.092033	- .006405	.001310	.030	.1558	.6784
	(2.39)	(0.70)	(4.06)	(6.95)	(4.05)	(3.60)			
Frozen fruits and vegetables	.056498	.011874	- .000072	.068936	- .005879	.000480	.031	.4439	.3366
	(2.08)	(7.27)	(5.24)	(4.74)	(3.39)	(1.20)			
Vegetables	.053148	.010951	- .000067	.067059	- .005639	.000492	.030	.4345	.3511
	(2.02)	(6.95)	(5.11)	(4.78)	(3.36)	(1.28)			
Fruits	.003350	.000923	- .000004	.001877	- .000240	- .000012	.002	.6303	.0500
	(0.55)	(2.53)	(1.39)	(0.58)	(0.62)	(0.13)			
Juices	.336297	.006841	- .000048	.216273	- .011433	.002664	.081	.1806	.5241
	(7.96)	(2.70)	(2.26)	(9.57)	(4.26)	(4.29)			
Canned vegetables	.039786	.002201	- .000012	.010818	- .001325	.000223	.010	.3783	.1932
	(3.90)	(3.60)	(2.41)	(1.99)	(2.04)	(1.49)			

See footnotes at end of table.

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Canned fruit	0.133144	-0.000058	0.000016	0.086384	-0.004003	-0.000184	0.015	-0.0056	0.5251
	(5.17)	(0.04)	(1.27)	(6.27)	(2.43)	(0.49)			
Frozen vegetables	.000103	- .000035	- .000001	.000415	- .000070	.000016	.001	.2151	.8887
	(0.10)	(0.56)	(0.13)	(0.76)	(1.07)	(1.09)			
Frozen fruit	.058418	.005458	- .000113	.077417	- .006471	.003562	.073	.4315	.6308
	(2.13)	(3.32)	(8.18)	(5.29)	(3.70)	(8.86)			
Fresh fruit	.104860	- .000701	.000061	.040623	.000471	- .000979	.007	- .1355	.4479
	(4.42)	(0.49)	(5.12)	(3.20)	(0.31)	(2.81)			
Fresh vegetables	-.000014	- .000024	.000001	.000617	- .000095	.000026	.001	.3667	.8874
	(0.01)	(0.24)	(0.67)	(0.71)	(0.91)	(1.06)			
Dried fruits and vegetables	.045133	- .002236	.000049	.067166	.000593	- .001186	.039	- .3459	.8887
	(2.81)	(2.32)	(6.03)	(7.84)	(0.58)	(5.03)			
Vegetables	.016174	- .002296	.000060	.057177	.001649	.001694	.059	- .7126	1.1347
	(1.35)	(3.19)	(9.94)	(8.93)	(2.16)	(9.62)			
Fruits	.028959	.000059	- .000011	.009988	- .001056	.000508	.007	.2613	.4813
	(2.74)	(0.09)	(2.12)	(1.77)	(1.57)	(3.28)			
Beverages	1.021277	.129818	- .000881	.889738	- .051360	.008107	.109	.3662	.4149
	(5.49)	(11.62)	(9.41)	(8.95)	(4.32)	(2.96)			
Coffee	.731845	.010807	- .000122	.233028	- .012854	.002707	.037	.1439	.3817
	(10.90)	(2.68)	(3.62)	(6.49)	(3.00)	(2.74)			
Tea	.013234	.003264	- .000040	.104737	- .006874	.000424	.016	.1620	.6988
	(0.42)	(1.72)	(2.51)	(6.20)	(3.41)	(0.91)			
Cocoa	-.014176	- .000651	- .000011	.023705	- .000448	.000568	.041	.1544	1.3376
	(1.62)	(1.24)	(2.61)	(5.08)	(0.80)	(4.42)			
Soft drinks	-.028688	.010441	- .000108	.410085	.021785	.002788	.097	.1887	.8066
	(0.48)	(2.93)	(3.60)	(12.92)	(5.75)	(3.19)			
Fruit ades	-.124941	- .004974	.000032	.246244	- .012041	.000110	.042	- .1301	1.2773
	(2.90)	(1.92)	(1.48)	(10.70)	(4.38)	(0.17)			
Alcoholic	.444004	.110930	- .000632	- .128063	.002642	.001510	.047	.9013	- .1750
	(3.17)	(13.21)	(8.98)	(1.71)	(0.30)	(0.73)			
Soups	.054638	.001729	- .000007	.137360	- .005683	- .000115	.059	.0414	.7326
	(2.43)	(1.28)	(0.59)	(11.43)	(3.96)	(0.35)			

See footnotes at end of table

Continued--

Table 2--Estimated coefficients and elasticities obtained from NFCS, 1977-78--Continued 1/

Product category	Independent variable								
	Constant term	Income	Income squared	Household size	Household size squared	Income times household size	Coefficient of determination 2/	Income elasticity	Household size elasticity
Ready to serve	0.028868	0.001080	-0.000005	0.020492	-0.001024	-0.000139	0.004	0.0880	0.4345
	(2.33)	(1.45)	(0.82)	(3.10)	(1.30)	(0.77)			
Semi-condensed	.015370	- .000669	.000013	.101517	- .003465	- .000208	.061	- .0503	.8864
	(0.93)	(0.67)	(1.54)	(11.51)	(3.29)	(0.86)			
Frozen, condensed	-0.000013	.000004	- .000001	.000279	- .000036	- .000001	.001	.0128	.4121
	(0.02)	(0.10)	(0.21)	(0.76)	(0.83)	(0.06)			
Frozen, ready to serve	.000736	.000008	- .000001	- .000275	.000022	- .000001	.001	.2984	-1.8961
	(1.31)	(0.25)	(0.17)	(0.92)	(0.60)	(0.08)			
Dehydrated	.009676	.001305	- .000014	.015347	- .001179	.000234	.010	.3409	.5215
	(1.07)	(2.41)	(3.14)	(3.18)	(2.05)	(1.76)			
Nuts, condiments	.043870	.007422	- .000075	.174506	- .002124	.003007	.143	.2660	.7985
	(1.25)	(3.52)	(4.23)	(9.30)	(0.95)	(5.82)			
Nuts, and peanut butter	.071264	.008136	- .000086	.051485	.002598	.001820	.081	.3691	.6421
	(2.71)	(5.16)	(6.49)	(3.67)	(1.55)	(4.71)			
Catsup, chili sauce, etc.	- .045957	- .000101	- .000010	.083483	- .002770	.000292	.085	.0371	1.1858
	(3.51)	(0.13)	(1.59)	(11.95)	(3.32)	(1.52)			
Pickles and relishes	.010071	- .000811	.000021	.039159	- .002878	- .000992	.041	.2854	.7967
	(0.74)	(0.99)	(3.00)	(5.37)	(3.31)	(4.95)			
Leavening agents	.008631	.000202	.000001	.000263	.000935	- .000099	.011	- .0480	.6906
	(2.39)	(0.93)	(0.52)	(0.14)	(4.06)	(1.87)			
Seasonings	- .000140	- .000004	- .000001	.000117	- .000009	.000001	.001	- .0735	2.3775
	(1.00)	(0.45)	(0.34)	(1.56)	(1.01)	(0.64)			
Mixtures, baby food	.057756	.005045	- .000080	.241864	- .012220	.001710	.036	.1467	.7567
	(0.98)	(1.42)	(2.69)	(7.66)	(3.24)	(1.97)			
Fresh	- .019050	.008293	- .000085	.044810	- .005227	.001169	.009	.6699	.4557
	(0.48)	(3.46)	(4.21)	(2.10)	(2.05)	(1.99)			
Canned and frozen	.144187	- .001850	- .000010	.097012	- .002305	.001061	.022	.0336	.6849
	(3.80)	(0.81)	(0.51)	(4.78)	(0.95)	(1.90)			
Dry	- .012209	- .000803	.000007	.042655	- .001616	- .000169	.023	- .2008	1.1616
	(1.17)	(1.28)	(1.32)	(7.63)	(2.42)	(1.10)			
Baby food	- .055172	- .000596	.000008	.057387	- .003072	- .000352	.013	- .3581	1.7940
	(3.70)	(0.66)	(1.01)	(7.19)	(3.22)	(1.61)			

1/ Food expenditures are measured in dollars per week and income is measured in thousands of dollars per year. Income and family size elasticities are calculated at the independent variable means using equations (2) and (3), respectively. Sample means for the independent variables are: income, 14.198; income squared, 328.051; household size, 2.95; household size squared, 11.489; and income times household size, 46.90[illegible] 2/ Unadjusted R^2. 3/ Numbers in parentheses denote t-values.

*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-340-933/ES8-101

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C. 20250

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