United States Department of Agriculture

Economic Research Service

Technical Bulletin Number 1806

Food Spending by Female-Headed Households

Elizabeth Frazao

It's Easy To Order Another Copy!

Just dial 1-800-999-6779. Toll free in the United States and Canada. Other areas, please call 1-301-725-7937.

Ask for *Food Spending by Female-Headed Households (TB-1806).*

The cost is $11.00 per copy. For non-U.S. addresses (includes Canada), add 25 percent. Charge your purchase to your VISA or MasterCard, or we can bill you. Or send a check or purchase order (made payable to ERS-NASS) to:

ERS-NASS
P.O. Box 1608
Rockville, MD 20849-1608.

We'll fill your order by first-class mail.

Food Spending by Female-Headed Households. By Elizabeth Frazao. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin No. 1806.

Abstract

The results of this study suggest that, on a per person basis, female-headed households spend less for food than do similar two-parent households. The presence of a male head influences food expenditures less than household income and education level of the female head. Low income and low education levels are two characteristics associated with female-headed households. Female-headed households constitute a growing proportion of the total population, particularly of the population receiving food assistance. Identifying the causes for lower food expenditures among female-headed households should help programs aimed at increasing food expenditures among female-headed households. Analysis of expenditure patterns among 15 food categories reveals that the factors that influence a household's decision to purchase a particular food category differ from the factors that influence the decision of how much to spend for that food category. For this reason, the tobit model is rejected, and a two-step decision model is recommended.

Keywords: Female-headed households, food expenditures, tobit model, two-step decision model, Cragg model

Acknowledgments

The author acknowledges Noel Blisard for suggesting the topic and joining the initial research; Dave Smallwood for helping with the econometrics and final review; Kyra Toland and Mary Byrd for preparing the manuscript for publication; Jane Allshouse for support in revising and typing; and Teri Thrash for editing the report.

Washington, DC 20005-4788 July 1992

Contents

Tables

Table

Summary

This study suggests that, on a per person basis, female-headed households spend less for food than do similar two-parent households, after controlling for differences in household income and in education and work force status of female heads. This difference is reflected primarily in the lower expenditures for food at home by female-headed households, with little observable difference in expenditures for food away from home for the two types of households. Female-headed households may allocate their income differently than two-parent households because (1) there is no male head to influence food consumption patterns and food spending decisions, and (2) women may exhibit different preferences than men about allocating income to food.

The presence of a male head influences food expenditures less than do household income and education level of the female head. Low income and low education levels are two characteristics associated with female-headed households. Female-headed households constitute a growing proportion of the total population, particularly of the population receiving food assistance. Identifying the causes for lower food expenditures among female-headed households should help programs aimed at increasing food expenditures among female-headed households.

A tobit analysis was compared with a two-step decision process for analyzing differences in spending for 15 disaggregated food categories. The tobit model is the method traditionally used to correct for a large proportion of households reporting zero expenditures for a particular food category during the sample period. However, the tobit model constrains the factors that influence both the decision to purchase and the decision of how much to spend to be equal. The two-step decision process consists of a probit regression to model the decision to purchase, and a truncated regression to model the independent--albeit positive--expenditure level. In this study, the tobit model is overwhelmingly rejected. Using the two-step decision model, female-headed households are found less likely to purchase fats and oils, fruits, and some meats, and to spend less for some meats compared with similar two-parent households.

The finding that female-headed households spend less for food than do similar two-parent households in no way implies that female-headed households have lower nutrition. Although lower food expenditures may result from purchasing less food, or food of lower nutritional value, they may also result from buying less of costlier foods (such as convenience or fast foods), paying lower prices, or a combination of the above. Additional research is needed to investigate how differences in food expenditures translate into actual intake of food and nutrients for the two types of households.

Female-headed households represented 24 percent of all family groups with children in 1988, but they made up nearly half of all households receiving food stamps. Approximately a third of the participants in the Women, Infants, and Children Program (WIC), one of several food assistance programs, lived in households with no adult male present.

Food Spending by Female-Headed Households

Elizabeth Frazao

Introduction

Households headed by single women constitute a growing proportion of the total population. In 1970, female-headed households[1] made up 12 percent of all family groups[2] with children under age 18. By 1988, female-headed households had grown to represent 24 percent of all family groups with children under age 18 (Rawlings, 1989).

In addition to their dramatic growth in numbers, female-headed households are becoming of interest to policymakers because of:

- Their high poverty rates: Nearly 50 percent of all households in poverty in 1986 were headed by women (Boyle, 1989).

- The increasing proportion of children raised in these households: An estimated 60 percent of all children born today will spend some of their childhood in a single-parent household, mostly a female-headed household (U.S. Department of Commerce, 1989a).

- The over-representation of blacks in this group: Whereas blacks represented 15 percent of all family groups with children in 1988, they accounted for 35 percent of all female-headed households (Rawlings, 1989).

- The over-representation of female-headed households among the welfare and food assistance population: In 1988, female-headed households formed an estimated 50 percent of all households receiving food stamps[3] (U.S. Department of Agriculture, 1988), and an estimated 33 percent of participants of the Women, Infants, and Children Program (WIC) lived in households with no adult male present (Williams and others, 1990).

Because female-headed households constitute a large and increasing proportion of the population, particularly of the population receiving food assistance, Federal food program administrators and policymakers need to understand the patterns and determinants of food expenditures of female-headed households. Cross-tabular studies of food expenditures reveal that households headed by single women spend less for food compared with other households. Female-headed households also allocate a larger share of their food budget to food at home than do other households.

The extent to which one can attribute differences in food expenditures and food budget allocations between female-headed and other households to differences in purchasing power and other household characteristics has

---

[1]Female-headed households, for this paper, are consumer units with a female reference person, no spouse present, and at least one child under age 18 living in the unit. A two-parent household is a consumer unit with both husband and wife present, and at least one child under age 18 living in the unit.

[2]Family groups, as defined in Rawlings (1989), are (1) family households in which the family owns or rents their living quarters, or (2) single parents who are not householders (that is, the single parent and children reside in a home owned or rented by a relative, or in a household belonging to an unrelated person).

[3]Published data on food stamps participants' characteristics allow for the possibility that a household identified as a female-headed household may have a male spouse present.

not yet received much research attention. Demand studies have analyzed the influences of income, race, household size, and the age distribution of household members on the demand for food at home and food away from home (Blaylock and Smallwood, 1986). And increasing rates of female labor force participation are hypothesized to influence the demand for food at home and food away from home, as working women search for substitutes for some of their food preparation time (Horton and Campbell, 1991). However, few studies have controlled for type of household, to determine whether or how household type might play a role in a household's food expenditure decisions, or might influence how the household allocates its income to food purchases.

Household type is hypothesized to influence food expenditures in two ways (Andrews and others, 1990). First, in a dual-head, or two-parent, household, decisionmaking is likely to involve a weighing of individual preferences. In a single-headed household, however, there is no joint decisionmaking between marital partners, and spending decisions more likely reflect the preferences of the household head, in this case, the female head. Second, to the extent that women have traditionally been responsible for the purchase and preparation of food, women may have different preferences than men in how much income they allocate to food. Food spending in female-headed households may reflect this preference. Studies in developing countries suggest that women allocate a larger share of the income directly under their control to food and basic needs, compared with the income earned by men (Holmboe-Ottesen and others, 1988).

This study analyzes the influence of household type on food expenditure patterns, after controlling for household income and other socioeconomic characteristics. First, this report provides some general characteristics of female-headed households. Then it describes the sample used for the analysis, and presents the empirical results for expenditures for total food, food at home, and food away from home. Theoretical considerations for the analysis of expenditures for 15 disaggregated food categories are followed by empirical results for that analysis, and estimates of income elasticities.

Female-Headed Households

The number of female-headed family groups rose moderately in the 1950's and has increased dramatically in the last two decades. The number of female-headed family groups more than doubled between 1970 and 1988, rising from 3.4 million to 8.1 million (table 1). Although there has been much interest in learning more about the characteristics of female-headed households, comparisons among studies are not always feasible, due to multiple definitions of the term "female-headed household." In addition to its use in referring to households headed by a single woman with no spouse present and at least one child under age 18, the term has also been applied to households of single females without children, or to households with two adults, with or without children, in which the female is the reference person.[4] Many studies have also focused on all single-parent households, which include single fathers and their children. There is some similar confusion regarding the comparison group, sometimes classified as "married parents," which does not make clear whether or not this category includes households with unmarried couples and their children. Despite these difficulties, some general characteristics of female-headed households are presented below.

Race

Although nearly 63 percent of all female-headed family groups were white in 1988, female-headed family groups were more prevalent among blacks than among whites (table 1). In 1988, single women headed more than half of all black family groups with children under age 18, but only 18 percent of white family groups with children, and 29 percent among Hispanics (who may be of any race). In 1970, single women headed a third of black families with children under age 18 and less than a tenth of such white families. No data are available for Hispanics in 1970.

---

[4]The reference person is the first household member that the respondent mentions, when asked in a survey to "start with the name of the person or one of the persons who owns or rents the home." Thus, either the husband or wife can be the reference person in a married-parent household (Boyle, 1989).

Table 1--Family groups with children under age 18, by race and Hispanic origin of reference person, 1970 and 1988

Item	1970		1988		Change, 1970-88
	Number	Share	Number	Share	
	Thousands	Percent	Thousands	------Percent------	
All races:					
All family groups	29,631	100.0	34,345	100.0	15.91
Two parents	25,823	87.1	24,977	72.7	-3.28
Single mother	3,415	11.5	8,146	23.7	138.54
White:					
All family groups	26,115	100.0	28,104	100.0	7.62
Two parents	23,477	89.9	22,013	78.3	-6.24
Single mother	2,330	8.9	5,100	18.1	118.88
Black:					
All family groups	3,219	100.0	5,057	100.0	57.10
Two parents	2,071	64.3	2,055	40.6	-.77
Single mother	1,063	33.0	2,812	55.6	164.53
Hispanic:[1]					
All family groups	N/A	N/A	3,321	100.0	N/A
Two parents	N/A	N/A	2,205	66.4	N/A
Single mother	N/A	N/A	977	29.4	N/A

N/A = Not available.

[1] May be of any race.

Source: S. W. Rawlings, "Single Parents and Their Children," Studies in Marriage and The Family, Current Population Reports, Special Studies, Series P-23, No. 162, U.S. Dept. Comm., Bur. Cen., 1989.

Marital Status

Much of the rise in the number of female-headed households stems from the large increases in the number of never-married mothers (table 2). Never-married women headed 248,000 family groups in 1970, representing slightly more than 7 percent of all female-headed family groups. By 1988, never-married mothers headed 2.7 million family groups, more than a tenfold increase, representing a third of all family groups headed by single women. The increase in relative importance of never-married mothers among female-headed family groups is particularly evident among blacks. In 1970, 16.3 percent of all black female-headed family groups were headed by never-married black women. By 1988, their proportion had grown to more than 57 percent.

Divorce significantly contributed to the increase in female-headed family groups. Divorced women headed 1.1 million family groups in 1970, nearly a third of all female-headed family groups. By 1988, the number of families headed by divorced women had increased to 3.1 million, or 38.3 percent of all female-headed family groups. Divorce appeared to be the more frequent manner in which white women became female heads of households. The proportion of white female-headed families headed by a white divorced woman increased from 39.9 percent in 1970 to more than 50 percent in 1988.

Among black female-headed families, there was no significant change in the proportion headed by divorced women between 1970 and 1988 (Rawlings, 1989), even though black women reportedly have much higher separation and divorce rates than white women and low remarriage rates (Klein and Rones, 1989).

Table 2--Marital status of reference person in female-headed family groups, by race and Hispanic origin, 1970 and 1988

Item	1970		1988		Change, 1970-88
	Number	Share	Number	Share	
	Thousands	Percent	Thousands	-----Percent-----	
All races:	3,416	100.0	8,147	100.0	138.54
Never married	248	7.3	2,707	33.2	991.53
Spouse absent[1]	1,377	40.3	1,776	21.8	-28.98
Divorced	1,109	32.5	3,120	38.3	181.33
Widowed	682	20.0	544	6.7	-20.23
White:	2,330	100.0	5,100	100.0	118.88
Never married	73	3.1	1,049	20.6	1,336.99
Spouse absent	796	34.2	1,127	22.1	-41.58
Divorced	930	39.9	2,568	50.4	266.13
Widowed	531	22.8	356	7.0	-32.96
Black:	1,063	100.0	2,809	100.0	164.53
Never married	173	16.3	1,605	57.1	827.75
Spouse absent	570	53.6	584	20.8	-2.46
Divorced	172	16.2	471	16.7	173.84
Widowed	148	13.9	149	5.3	.68
Hispanic:[2]	N/A	N/A	978	100.0	N/A
Never married	N/A	N/A	351	35.9	N/A
Spouse absent	N/A	N/A	282	28.9	N/A
Divorced	N/A	N/A	287	29.4	N/A
Widowed	N/A	N/A	58	5.9	N/A

N/A = Not available.

[1] Includes women who are separated.

[2] May be of any race.

Source: S. W. Rawlings, "Single Parents and Their Children," Studies in Marriage and The Family, Current Population Reports, Special Studies, Series P-23, No. 162, U.S. Dept. Comm., Bur. Cen., 1989.

Age and Education

A number of studies suggest that women who are heads of households tend to be younger and less educated than their counterparts in two-parent households. As Rawlings (1989) points out, the age at which a woman becomes a single parent, her educational level, and the path through which she becomes a single parent have enormous implications for both the stability of her living arrangements and the economic welfare of her household. An unmarried teenage mother who has not completed high school may require considerably more assistance from public resources than a 35-year-old divorced mother with a college degree, child support, a well-paying job, and perhaps her own home. In a recent study of the Aid to Families with Dependent Children (AFDC) program, an estimated 30 percent of entrants were unmarried women without children becoming female-heads with children, and 45 percent were wives becoming female heads of households (Allin and others, 1990).

Poverty

The incidence of poverty among female-headed households is estimated to be greater than that among other types of households, with about one of every three female-headed households being poor (Beller and Graham, 1988; Novak, 1989). While poverty is common among female-headed households, such households are also increasingly more prevalent among those in poverty. The share of families in poverty headed by women increased from 23 percent in 1959 to 51 percent in 1986 (Bassi, 1988; U.S. Department of Commerce, 1989b). The term "feminization of poverty" refers to the disproportionate percentage of poverty borne by women living alone or with their children.

Whereas studies suggest that poverty is rarely a permanent state for a family, the persistently poor tend to be concentrated in two overlapping groups: blacks and female-headed households (Klein and Rones, 1989). Reasons for this concentration include the following:

- Female heads of households are hypothesized to have low employment rates, perhaps due to their lower education and employment experience, or to problems finding adequate child care.
- For any given educational level, women earn less than men.
- Female heads of households are more likely to be black and, for any given educational level, black women earn even less than other female heads of households.
- Female heads of households, on average, have lower educational levels, which further affects their earnings potential (Rawlings, 1989).
- Female-headed households are less likely to have other income earners in the household, and thus depend to a large extent on the income earned by only the female head, when she works.

Employment

Rawlings (1989) compared the employment status of parents of children living in female-headed and two-parent households (table 3). However, the unit of analysis was the child, not the household, so that a parent with three children is counted three times. Thus, the numbers do not translate directly into households. This may not be much of a problem if the number of children is similar between female-headed and two-parent households, and between households with working and nonworking parents. Also, among two-parent households, information is provided for only one of the two parents, and nothing is known about the labor force status of the second parent. Therefore, the table does not permit any inferences about the proportion of children in two-parent households with no working parent, nor does it allow a direct comparison of labor force participation rates between women who are single heads of households and the female heads in two-parent households.

Overall, close to 88 percent of the children in two-parent households had at least one working parent, compared with 52 percent of the children in female-headed households. Twice as many children in two-parent households (84 percent) had at least one parent who worked full-time, compared with children in female-headed households (42 percent). From a different perspective, nearly 50 percent of the children in female-headed households lived in a household in which the mother did not work. For children in two-parent households, no information was available about whether or not the second parent worked when the reference person did not, or about whether or not the mother worked.

Racial and ethnic differences were evident in the rates of parental labor force participation, full-time and part-time work, and unemployment: black and Hispanic children appeared less likely to have a working parent. Among children in two-parent households, 89 percent of white children had at least one working parent, compared with 79 percent of black children and 81 percent of Hispanic children. Among children in female-headed households, the proportions of children with a working mother were 59 percent for white children, 42 percent for black children, and 38 percent for Hispanic children.

Table 3--Labor force status of parents with children under age 18, 1988[1]

Item	Children under age 18		Parent[2] works full-time		Parent[2] works part-time		Unemployed		Not in labor force	
	Number	Share	Number	Share	Number	Share	Number	Share	Number	Share
	Thousands	Percent	Thousands	Percent	Thousands	Percent	Thousands	Percent	Thousands	Percent
All races:										
Two parents	45,942	100.0	38,454	83.7	1,932	4.2	1,760	3.8	3,796	8.3
Single mother	13,521	100.0	5,737	42.4	1,337	9.9	1,083	8.0	5,364	39.7
White:										
Two parents	40,287	100.0	34,388	85.4	1,617	4.0	1,448	3.6	2,834	7.0
Single mother	8,160	100.0	3,881	47.6	923	11.3	444	5.4	2,913	35.7
Black:										
Two parents	3,739	100.0	2,737	73.2	200	5.3	219	5.9	583	15.6
Single mother	4,959	100.0	1,702	34.3	402	8.1	625	12.6	2,231	45.0
Hispanic:[3]										
Two parents	4,497	100.0	3,298	73.3	317	7.0	367	8.2	514	11.4
Single mother	1,845	100.0	535	29.0	164	8.9	73	4.0	1,073	58.2

[1]Data should be read across rows.

[2]Householder or reference person in two-parent situations may be husband or wife.

[3]May be of any race.

Source: S. W. Rawlings, "Single Parents and Their Children," Studies in Marriage and The Family, Current Population Reports, Special Studies, Series P-23, No. 162, U.S. Dept. Comm., Bur. Cen., 1989.

Income

Recent studies suggest that although female-headed households suffer from low employment rates, the most important reason for the high poverty levels associated with female-headed households is the missing male spouse. The absent male spouse is associated with the loss of additional income earners, and, consequently, the reduced income found among female-headed households. For example, Klein and Rones (1989) found that poverty was rare in husband-and-wife families where both were employed. Furthermore, they found that the most dramatic difference between poor and nonpoor working families related to the proportion with only one income earner: 76 percent of poor families had only one working member, whereas the majority of nonpoor families had two or more earners. Among two-parent households, when there was only one worker, it was usually the male head who worked. A male was likely to earn more than a female and, if working full-time, to earn wages that placed him above the poverty level. However, as wives increasingly enter the labor market to supplement the household income, we increasingly find two income earners in two-parent households. Thus, female-headed households are believed to be at an economic disadvantage in that they usually have only one income earner who typically does not earn much when she works.

Using the interview portion of the Bureau of Labor Statistics' (BLS) Continuing Consumer Expenditure Survey (CCES) for 1984-86, Boyle (1989) compared the levels and sources of income for single-parent and married-parent households.[5] With an average before-tax income of $33,153 and an average after-tax income of $30,305, married-parent households had more than twice the income of single-parent households, who reported average incomes of $14,671 before taxes and $14,633 after taxes (a finding similar to that reported by Klein and Rones, 1989). Furthermore, the sources of income differed significantly between the two types of households (table 4). Ninety-four percent of married parents reported income from wages and salaries, compared with 71 percent of single parents.[6] Conversely, 66 percent of single parents reported receiving income from other sources, such as public assistance, alimony, child support, or food stamps, compared with 24 percent of married parents. Boyle (1989) notes that these nonsalary sources of income may not be received on a regular basis, especially income from child support and alimony which, for single parents, often represent more than a third of their nonsalary income. Yet the regularity with which income is received may be almost as important as the overall level of income when planning expenditures. Little is known, however, about the effects of different sources of income on food spending and marginal propensities to spend for food.

Spending Patterns

Based on the interview portion of the CCES for 1984-86, Boyle (1989) reports differences in spending levels for a number of expenditure categories between single-parent and married-parent households. Single-parent households spent an average of $237.17 per month for food, approximately 63 percent of the $376.75 that married-parent households spent (table 5). Monthly expenditures by single-parent households for food at home were $183.33, or 67 percent of what married-parent households spent, while expenditures for food away from home were $53.92 for single-parent households, or 53 percent of what married-parent households spent for that category. These differences become smaller after controlling for differences in household size. Single-parent households spent an average of $85.25 per person per month for total food, including $64.58 for food at home, and $20.58 for food away from home. These expenditures represent approximately 90 percent of what married-parent households spent for total food, 94 percent of their expenditures for food at home, and 79 percent of what married parents spent for food away from home.

Smallwood and others (1991) used the diary portion of the CCES to compare food spending patterns in American households between 1980 and 1988, and found similar differences (but larger in magnitude) in per person food expenditures between female-headed and married-parent households (table 5).[7] For example,

---

[5]A single-parent household is a consumer unit with a male or a female reference person, no spouse present, and at least one child under age 18 living in the unit. A married-parent household is a consumer unit with both husband and wife present, and at least one child under age 18.

[6]Differences between these numbers and those in table 3 are most likely due to differences in the unit of analysis. Table 3 uses the child as the unit of analysis, but table 4 uses the household as the unit of analysis.

[7] These differences are likely due to the different samples and different time periods. For example, Boyle's sample includes single fathers, whereas the analysis by Smallwood and others focuses on single mothers.

Table 4--Sources of income for single-parent and married-parent households

Sources of income	Single parents[1]	Married parents
	Percent reporting	
Money income before taxes	100	100
Wages and salaries	71	94
Self-employment income	5	15
Social Security, railroad retirement, and other pensions	8	4
Dividends and other property income	17	36
Income from other sources	66	24
Public assistance	29	2
Alimony and child support	28	4
Food stamps	36	4

[1] Includes single males with children.
Source: B. W. Klein and P. L. Rones, "A Profile of The Working Poor," Monthly Labor Review, pp. 3-13, Oct. 1989.

the average monthly per person food expenditures in female-headed households was $76.48 in 1988, representing 76 percent of the $100.79 spent by married couples with children. Female-headed households spent $53.13 per month per person for food at home, and $23.36 for food away from home, approximately 82 percent and 65 percent of the expenditures by married couples with children. However, Smallwood and others (1991) also found that while all urban households increased their per person average food expenditures by 36 percent between 1980 and 1988, female-headed households increased their per person food expenditures by 42 percent. This contrasts with the results obtained for 1986, when all urban households increased their per person average food expenditures by 26 percent, but female-headed households increased their per person food expenditures by only 20 percent.

A number of sociodemographic characteristics, such as the large incidence of poverty among female-headed households (approximately 50 percent of all single-parent households had incomes below the poverty level in 1986) may confound these differences in spending levels between female-headed and married-parent households. To control for the effect of poverty, Boyle (1989) separated single-parent households into poor and nonpoor households, and noted that families in poverty spend less for food than do nonpoor single-parent households. Furthermore, table 5 reveals that once single-parent households were separated into poor and nonpoor, the observed differences in per person food expenditures between married-parent households and single-parent households were clearly attributed to differences between poor single-parent households and other households. Nonpoor single-parent households actually spent more for food, on a per person basis, than married-parent households. Thus, it is important that analyses of spending differences between female-headed and other households attempt to control for possible effects of other intervening factors on expenditures.

The Sample

The data for this study were derived from the diary portion of the 1988 Continuing Consumer Expenditure Survey (CCES) of the Bureau of Labor Statistics (BLS), U.S. Department of Labor. The CCES grew out of consumer expenditure surveys of American households that the BLS had been conducting at about 10-year intervals since 1888. A major objective of the first surveys was to collect the expenditure information necessary to construct consumer price indexes (CPI's). However, the decennial surveys were found to be inadequate and, in late 1979, the BLS initiated a continuing survey of consumer expenditures. The BLS also expanded the

objectives of the survey to include a continuous flow of information about the buying habits of Americans, not only for use in revising the CPI's, but also for use in research by government, business, labor, and academics.

The CCES consists of two separate components, each with its own questionnaire and independent sample:

- A quarterly interview panel survey, in which each of approximately 5,000 consumer units in the sample are interviewed once per quarter for five consecutive quarters.

Table 5--Research comparison of average monthly food expenditures between single-parent and married-parent households, by poverty level

Expenditures	Married parents	Single parents[1]		
		All	In poverty[2,3]	Not in poverty
		Dollars		
Boyle's 1984-86 average:[4]				
Per household--				
Total food	376.75	237.17	196.83	271.33
Food at home	274.58	183.33	176.75	188.83
Food away from home	102.17	53.92	20.08	82.50
Per capita--				
Total food	94.50	85.25	63.58	103.50
Food at home	68.42	64.58	56.58	71.42
Food away from home	26.00	20.58	7.00	32.08
Smallwood's 1988 data:[5]				
Per capita--				
Total food	100.79	76.48	N/A	N/A
Food at home	64.61	53.13	N/A	N/A
Food away from home	36.18	23.36	N/A	N/A
This study's 1988 data:				
Per household--				
Total food	411.78	253.07	169.74	325.71
Food at home	266.04	171.10	142.44	196.07
Food away from home	145.73	81.98	27.30	129.64
Per capita--				
Total food	105.31	89.37	55.89	118.55
Food at home	67.28	59.41	46.37	70.78
Food away from home	38.03	29.95	9.51	47.77

N/A = Not available.

[1]For the Smallwood data, and this study, single parents include only single mothers.

[2]For this study, households in poverty are defined as having income less than the 1988 Federal Poverty Income Guidelines for a household of the same size (U.S. Department of Commerce, Bureau of the Census, Money Income and Poverty Status in the United States: 1988, Current Population Reports, Series P-60, No. 166, 1989b).

[3]In Boyle's study, the 1986 poverty threshold for a three-person household with two children under age 18 was $8,829, and for a four-person household with two children under age 18, it was $11,113.

[4]Adapted from M. Boyle, "Spending Patterns and Income of Single and Married Parents," Monthly Labor Review 112 (3): 37-41, March 1989; obtained by dividing Boyle's annual estimates by 12 months.

[5]Adapted from D.M. Smallwood, N. Blisard, and J. R. Blaylock, Food Spending in American Households, 1980-1988, U.S. Dept. Agr., Econ. Res. Serv., SB-824, 1991. Obtained by multiplying Smallwood's weekly average by 52, then dividing that total by 12.

- A diary or recordkeeping survey of approximately the same sample size, in which each consumer unit is asked to complete a diary of expenses for two consecutive 1-week periods, with the sample spread across a 12-month period.

The diary survey is intended to collect data on small, frequently purchased items, such as those purchased on a daily or weekly basis, that are normally difficult to recall, such as food and beverages, tobacco, gasoline, housekeeping supplies, nonprescription drugs, and personal care products and services. Expenses incurred while away from home on overnight or extended trips are excluded from the diary. Information on household characteristics, such as age, sex, race, marital status, consumer-unit relationships, work experience, and income of each consumer-unit member, is also collected at the end of the 2-week period.

For this study, only nonrural households living in noncollege housing, with at least one child under age 18 were included. Because of their small numbers, households headed by single males, and other households were excluded. Households with missing expenditure data for one of the 2-week periods, or missing data on independent variables, were also eliminated. The final study sample consists of 1,140 households, of which 204 (18 percent) are headed by single women (and referred to as "female-headed households"). The remaining 936 households are husband-and-wife households (referred to as "two-parent households"). The data on food expenditures, collected over a 2-week period, were subsequently converted into monthly values by multiplying the biweekly value by 26 and then dividing by 12. Total food expenditures are broken down into food at home and food away from home. Expenditures for food at home are further disaggregated into 14 food categories: bakery and cereal products, beef, beverages, dairy products, eggs, fats and oils, fish and seafood, fruits, other meats, miscellaneous prepared foods (which includes frozen dinners, chips, and condiments), pork, poultry, sugars and sweets, and vegetables. (See appendix 1 for a complete definition of the food categories.) Also note that the CCES is a survey of expenditures, not of consumption. The data include only the value of items purchased during the 2-week period, but not necessarily the value of all items used (that is, items used out of the household's own inventories are not included in the data).

Model Specification and Variables

The analysis begins with a simple ordinary least-squares (OLS) regression, using the household's monthly food expenditures per person as the dependent variable. Because all households report some expenditures for food, OLS is the appropriate model for our purposes. Engel functions are also estimated for the subcategories of food at home and food away from home. Again, because more than 90 percent of all households report expenditures for these two subcategories, OLS regressions are also used for this analysis.

Food expenditure equations have usually been estimated using variations of a linear, semilog, quadratic, or double-log functional form (Fraker, 1990). For this study, a semilog functional form is specified,

$$EXP_i = \alpha + \beta \ln(INC), \text{ where}$$

EXP_i = monthly per person expenditures for food i, and
INC = monthly per person income (which includes the value of food stamps).

This specification allows the marginal propensity to spend for food out of income to vary monotonically with income level. This is particularly important in this study, because difficulties with the food stamp variable (see below) led to the decision to include the value of food stamps in the income variable, thereby restricting the marginal propensity to spend for food to be the same for both money income and food stamp income. Yet, empirical studies have consistently found that the marginal propensity to spend for food out of food stamps is greater than the marginal propensity to spend for food out of money income. Because lower income households are more likely to receive food stamps, allowing the marginal propensity to spend for food out of total household income to vary with income level is important. A dummy variable representing whether or not the household received food stamps in the past month controls for participation in the Food Stamp Program. The analysis does not address sample selection bias on the part of households that choose to participate in the Food Stamp Program, because previous studies have found no self-selection bias between food-stamp recipients and nonrecipients in food expenditures (Devaney and Fraker, 1989).

Problems with the food stamp variable became evident when the value of food stamps was entered as a separate variable from money income. Contrary to other empirical findings, the marginal propensity to spend for food out of food stamps was not greater than the marginal propensity to spend for food out of money income. Further review of the data revealed that 40 percent of the households receiving food stamps reported expenditures for food that were lower than the reported monthly value of food stamps, compared with 8-12 percent in other surveys. Possible explanations for this (explained in more detail in appendix 2) include:

- Some respondents were incorrectly classified as being current recipients of food stamps.
- Some respondents did not understand the question, and reported only food expenditures out of cash income.
- Some respondents have uneven food expenditure patterns, and the 2 weeks of expenditures reported in the survey are much lower than expenditures in the other 2 weeks (for example, some households may not have much cash or food stamps left at the end of the month, and their expenditures then might be very low and not representative of their monthly expenditures).

Since the data did not allow us to investigate the issue further, the value of food stamps was included in the income variable.

A number of other household sociodemographic characteristics are also included in the regression. For example, food expenditures are clearly related to both the size and age composition of the household. Salathe and Buse (1979) used adult equivalent scales to standardize household size, taking into account sex and age composition of the household. In their analysis, weights were estimated for each household member, representative of that member's needs compared with the needs of the adult male. However, since the weight may vary from one commodity to the other, the use of adult equivalent scales is not very practical. Thus, we follow Blaylock and Smallwood (1986) by using per person expenditures as the dependent variable, and including as independent variables the proportion of household members in selected age groups as well as the inverse of household size. The proportion of members in selected age groups captures the effects of household age composition on food expenditures. Since the sample consists mainly of nuclear households, only three age groups are included, detailing the age composition of the children in the household (preschoolers, elementary grade, and older children). The inverse of household size captures the effects of economies of scale. Because the variable increases as household size decreases (or, conversely, it decreases as household size increases), a positive coefficient indicates that economies of scale are present. In other words, after controlling for age composition differences, larger households tend to spend less per person than smaller households. A negative coefficient would indicate diseconomies of scale, with larger households spending more per person than smaller households. Although use of household size could provide the information on economies of scale, use of the inverse of household size (which decreases as household size increases) forces the magnitude of the scale effect to diminish as household size increases, which seems more reasonable than a constant scale effect.

Food shopping and, by consequence, food expenditures remain largely the woman's responsibility. Although men are participating more in food shopping, the New York Times (February 24, 1988) reports that, among the married couples questioned, more than 90 percent of the women said they did the primary food shopping for the household. Therefore, the woman's human capital may be an important determinant of food expenditures. Two commonly used proxies for human capital levels are the individual's age (usually entered as a quadratic, to allow for diminishing marginal returns and perhaps even negative effects, such as those associated with old age and senility), and education level (herein proxied by whether the female head has completed at least high school). Time availability (or the lack thereof) may also be an important determinant of shopping and expenditures, particularly with respect to food away from home and other foods that reduce at-home preparation time. Rather than use labor force participation of the female head as a proxy for time availability or value of time, we used a variable indicating that the female head worked full-time (more than 35 hours per week).

Other important influences on a household's food expenditures include the household's racial/ethnic background (proxied by the race/ethnicity of the female head), the region of the country in which the household is located (which partly controls for differences in prices and food habits), and the time (or season) of year. Guest meals could not be controlled for, due to lack of information.

Descriptive Characteristics

Table 6 lists definitions and sample means for the sociodemographic variables used to explain the observed expenditure patterns and some other variables of interest. As noted above, single women headed 18 percent of the sample households, and 9 percent of the sample households participated in the Food Stamp Program. Average monthly household income exceeded $3,000, or $821 per capita per month. Monthly expenditures for food averaged $383.38, approximately $102 per capita per month. Of this, 64 percent goes toward food at home, and the remaining 36 percent goes toward food away from home. Ten percent of the female heads are black, nearly 90 percent have at least a high school education, and nearly 20 percent have a college degree. Seventy-five percent of the female heads work, and close to 50 percent work full-time (more than 35 hours per week).

A comparison of the two types of households (table 7) reveals some similarities, although differences predominate. Similarities are present in the age of the female head and, interestingly, labor force participation of the female head. However, women in female-headed households tend to work longer hours, and thus are more likely than their married counterparts to work full-time.[8] Women in female-headed households are more likely to be black and less likely to have completed either high school or college.

The data from table 7 also show that households headed by single women average one less member in the household than two-parent households. Although this difference may seem inconsequential, recent studies suggest that this missing member probably represents the missing male spouse, and may be the main reason for the low income and high poverty rates among female-headed households. In nearly all two-parent households in this sample, there is at least one person (excluding the woman) who is an income earner, most likely, the male spouse. Compare this with the 22 percent of female-headed households that reported having another income earner present in the household. The presence of an adult male income earner among two-parent households may be responsible for their larger household cash income (that is, not including the value of food stamps), which was more than 2.5 times greater than the mean cash income of female-headed households. Even controlling for the larger household size, we find that average per person cash income in two-parent households was nearly 175 percent of the average per person cash income among female-headed households. Thus, it is not surprising to find that 36 percent of the female-headed households receive food stamps compared with only 3 percent of male-present households. Or, from a different perspective, although female-headed households made up 18 percent of the households in the sample, they represented more than 70 percent of the sample households receiving food stamps. Inclusion of the value of food stamps into the income variable did not, however, significantly reduce the income differential between the two types of households.

Female-headed households spent more than 17 percent of their income for food, compared with the slightly less than 12 percent that two-parent households spent. Food expenditures by female-headed households ($253.07) represented nearly 61 percent of what two-parent households spent for food per month ($411.78). Controlling for differences in household size considerably reduced the difference, and the per person monthly food expenditures of $89.37 by female-headed households now represent nearly 85 percent of the per person monthly food expenditures of $105.31 by two-parent households.[9] Considering the large income differences between female-headed households and two-parent households, we find it surprising that this difference in per person food spending is so small.

As mentioned earlier, other sociodemographic characteristics may have confounded some of the differences in food expenditures by female-headed and two-parent households. As an illustration, table 8 shows how average per person food expenditures differed according to season, region, race, and poverty level. For this sample, per person monthly food expenditures tended to be higher during the summer and in the Northeast. The most noticeable differences in per person food expenditures occurred between black and nonblack households, and between poor and nonpoor households. Black households, on average, spent less than 70 percent of what nonblack households spent for food. This difference was slightly greater among female-headed households than

---

[8] Although this may seem to differ from the findings by Rawlings (1989), note that Rawlings compared the characteristics of the reference person in a two-parent household (who could be either the husband or the wife), whereas this study compares the characteristics of the female head in both types of households.

[9] These differences are much smaller than those estimated by Smallwood and others (1991), but the sample used in this study is smaller.

Table 6--Variable means and definitions

Variable	Mean (Number = 1,140)	Definition
Characteristics of the household:		
DFEMALEHEAD	0.18	Dummy = 1 if household headed by single female
MINCOME	3,055.28	Monthly household income (including value of food stamps)
PC INCOME	821.50	Monthly per capita income (including value of food stamps)
LN (INCOME)	6.43	Log of per capita income
DFOOD STAMPS	.09	Dummy = 1 if household receives food stamps
MFOOD STAMPS	16.55	Monthly value of food stamps
PC FOODSTAMPS	4.62	Monthly per capita value of food stamps
DOTHER EARNER	.84	Dummy = 1 if other income earner present
% POVERTY	3.19	Percentage of poverty level
DPOVERTY	.16	Dummy = 1 if household income is below poverty level
HHESIZE	3.86	Household size
1/HHESIZE	.28	Inverse of household size
PROP04	.15	Proportion of household members younger than age 5
PROP511	.20	Proportion of household members between ages 5 and 11
PROP1218	.14	Proportion of household members between ages 12 and 18
DNORTHEAST	.19	Dummy = 1 if region is the Northeast[1]
DMIDWEST	.26	Dummy = 1 if region is the Midwest[2]
DSOUTH	.29	Dummy = 1 if region is the South[3]
DWEST	.26	Dummy = 1 if region is the West[4]
DWINTER	.22	Dummy = 1 if survey done in winter (January-March)
DSPRING	.22	Dummy = 1 if survey done in spring (April-June)
DSUMMER	.22	Dummy = 1 if survey done in summer (July-September)
DFALL	.34	Dummy = 1 if survey done in fall (October-December)
MFOOD	383.38	Monthly household expenditures for food
PC FOOD	102.46	Monthly per capita expenditures for food
PC FAH	65.87	Monthly per capita expenditures for food at home
PC FAFH	36.59	Monthly per capita expenditures for food away from home
Characteristics of the female head:		
AGE	34.66	Age of female head
AGESQ	1,254.48	Age, squared
DBLACK	.10	Dummy = 1 if black
DHIGH SCHOOL	.87	Dummy = 1 if completed high school
DCOLLEGE	.19	Dummy = 1 if completed college
DWORK	.75	Dummy = 1 if works
DFULLTIME	.48	Dummy = 1 if works at least 35 hours per week

[1]The Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

[2]The Midwest includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

[3]The South includes Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[4]The West includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Table 7--Descriptive characteristics of female-headed and two-parent households

Variable	Female-headed households (Number = 204)	Two-parent households (Number = 936)
	Mean value	
Characteristics of the household:		
MINCOME	1,404.54	3,415.06
PC INCOME	515.20	888.25
DFOOD STAMPS	.36	.03
MFOOD STAMPS	63.41	6.21
PC FOODSTAMPS	19.77	1.32
DOTHER EARNER	.22	.98
% POVERTY	1.72	3.51
DPOVERTY	.47	.09
HHESIZE	3.03	4.05
PROP04	.14	.15
PROP511	.26	.18
PROP1218	.22	.13
DNORTHEAST[1]	.18	.19
DMIDWEST[2]	.28	.26
DSOUTH[3]	.31	.28
DWEST[4]	.23	.27
DWINTER	.17	.24
DSPRING	.22	.22
DSUMMER	.25	.21
DFALL	.36	.33
MFOOD	253.07	411.78
PC FOOD	89.37	105.31
PC FAH	59.41	67.28
PC FAFH	29.95	38.03
Characteristics of the female head:		
AGE	34.63	34.66
DBLACK	.25	.07
DHIGH SCHOOL	.79	.88
DCOLLEGE	.10	.21
DWORK	.74	.76
DFULLTIME	.55	.46
HOURS	40.06	33.92
WEEKS	31.14	32.42

[1]The Northeast includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

[2]The Midwest includes Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

[3]The South includes Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

[4]The West includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Table 8--Monthly per person food expenditures, by selected demographic characteristics

Characteristic	All households (Number = 1,140)		Female-headed households (Number = 204)		Two-parent households (Number = 936)		Mean per capita expenditures for food: All households	Female-headed households	Two-parent households
	Number	Percent	Number	Percent	Number	Percent	Dollars		
Season:									
Winter	255	22.4	35	17.2	220	23.5	103.78	94.21	105.26
Spring	250	21.9	44	21.6	206	22.0	103.95	93.92	106.09
Summer	252	22.1	51	25.0	201	21.5	108.29	97.33	111.07
Fall	383	33.6	74	36.3	309	33.0	96.79	78.88	101.08
Region:									
Northeast	216	18.9	37	18.1	179	19.1	112.55	93.91	116.41
Midwest	302	26.5	58	28.4	244	26.1	99.21	83.04	103.05
South	326	28.6	63	30.9	263	28.1	99.97	89.96	102.36
West	296	26.0	46	22.5	250	26.7	101.15	92.87	102.67
Race:									
Black	114	10.0	50	24.5	64	6.8	73.77	58.18	85.96
Nonblack	1,026	90.0	154	75.5	872	93.2	105.64	99.49	106.73
Poverty level:									
Poor[1]	182	16.0	95	46.6	87	9.3	61.76	55.89	68.17
Nonpoor	958	84.0	109	53.4	849	90.7	110.19	118.55	109.12

[1] Poor households are defined here as having income less than the 1988 Federal Poverty Income Guidelines for a household of the same size (U.S. Dept. Comm., Bur. Cen., Money Income and Poverty Status in the United States: 1988, Current Population Reports, Series P-60, No. 166, 1989b).

among two-parent households. The $58.18 that black households headed by a single female spent for food per person represented approximately 58 percent of what nonblack households headed by a single female spent per person for food. However, the $85.96 that black households with two parents spent for food represented more than 80 percent of what nonblack two-parent households spent for food per person. Poor households spent an average of $61.76, or approximately 56 percent of what nonpoor households spent for food per person, with the difference being 47 percent among female-headed households and 62 percent among two-parent households. Among nonpoor households, however, female-headed households spent more for food per person than did two-parent households.

Table 9 provides a more detailed breakdown of food expenditures into 15 food categories. Because female-headed households generally spent less for food than did two-parent households, the fact that female-headed households also spent less for most food categories is not surprising. Although absolute expenditures differed, the relative importance of the 15 food categories was similar for both types of households. For instance, food away from home represented by far the largest food expenditures item for both types of households, followed by bakery and cereal products, miscellaneous prepared products, and dairy products (together, these four food categories formed nearly 60 percent of monthly per person expenditures for food for both types of households).

Purchasing patterns, however, differed somewhat between the two types of households. As illustrated in table 9, except for bakery and cereal products and dairy products (which were purchased by nearly all households, regardless of type), a smaller proportion of female-headed households purchased the 13 remaining food categories, compared with two-parent households, during a 2-week period. Nineteen percent fewer female-headed households than two-parent households purchased fats and oils, and 9-14 percent fewer female-headed households purchased everything else during a 2-week period compared with two-parent households.

Table 9--Average monthly per capita expenditures for food, and proportion of households reporting positive expenditures

Item	Food expenditures		Proportion purchasing	
	Female-headed households	Two-parent households	Female-headed households	Two-parent households
	----Dollars----		----Percent----	
Monthly per capita expenditures for food	89.37	105.31	100.0	100.0
Bakery and cereal products	8.72	10.08	96.1	98.4
Beef	5.34	5.83	65.2	79.1
Beverages	5.52	6.46	83.8	92.7
Dairy products	8.12	9.07	95.1	97.3
Eggs	.79	.79	60.3	71.7
Fats and oils	1.44	1.68	55.9	74.6
Fish and seafood	1.47	1.81	39.2	51.3
Food away from home	29.95	38.03	82.4	94.2
Fruits	5.36	6.13	80.4	91.3
Miscellaneous prepared foods	7.68	9.43	84.3	92.6
Other meats	2.12	2.65	63.7	75.5
Pork	3.30	3.14	57.4	67.0
Poultry	2.30	2.61	49.5	62.4
Sugars and sweets	2.39	2.70	68.6	81.7
Vegetables	4.87	4.89	79.9	92.5

Since a smaller proportion of female-headed households purchased most food items, table 9 may provide a somewhat misleading idea of how expenditures differ by household type among those households that actually purchased the item. Table 10 provides average per person expenditures for only those households that purchased the specific food items during the sample period. Among those households that purchased a particular food category, per person expenditures are no longer consistently lower among female-headed households. For 7 of the 15 food categories, female-headed households spent approximately the same, if not more, than two-parent households. In other words, the reason female-headed households spent less, on average, for beef than two-parent households (table 9) is that fewer female-headed households purchased beef (70 percent) compared with two-parent households (83 percent). But among those households that purchased beef, female-headed households spent at least 10 percent more per person for beef than two-parent households spent.

Again, it should be emphasized that we are dealing with expenditures, not consumption. Higher expenditures do not necessarily translate into greater consumption, because households may pay more for a higher quality or more convenient product, and thus may end up consuming the same amount, or even less, despite higher expenditures.

The simple cross-tabulations above suggest that there are differences between female-headed and two-parent households in both their food purchasing patterns and their food expenditures. However, determining from these tables the extent to which these differences may be due to the obvious and significant income differences between the two types of households, or to the other household composition, education, race, time constraint, and regional differences identified in table 7, is not possible. We now use regression analyses to isolate the independent marginal effects of these income and sociodemographic differences on the household's food expenditure patterns and to determine whether the type of household exerts an independent and separate effect on food expenditures.

Table 10--Average monthly per-capita expenditures for food among households purchasing items

Item	Female-headed households	Two-parent households
	Dollars	
Bakery and cereal products	9.07	10.25
Beef	8.19*	7.38*
Beverages	6.58	6.96
Dairy products	8.54	9.32
Eggs	1.31*	1.11*
Fats and oils	2.58*	2.25*
Fish and seafood	3.74	3.52
Food away from home	36.37	40.36
Fruits	6.67	6.71
Miscellaneous prepared foods	9.11	10.18
Other meats	3.33	3.51
Pork	5.75*	4.68*
Poultry	4.65	4.19
Sugars and sweets	3.49	3.31
Vegetables	6.09*	5.28*

*Denotes a difference larger than 10 percent between the two types of households.

Empirical Results: Expenditures for Total Food, Food at Home, and Food Away from Home

The independent effects of household type on monthly per person food expenditures (total food, food at home, and food away from home) were analyzed using ordinary least squares regressions (table 11). Because all households purchase food, and because more than 90 percent purchase both food at home and food away from home, no corrections were made here for households reporting zero expenditures. Households with higher incomes spend more for food than do other households. Once income and other variables are controlled for, participation in the Food Stamp Program is not associated with any measurable difference in food expenditures. This may be due to the problems encountered with the food stamp variable.

Household size is important to food expenditures due to the presence of economies of scale, as evidenced from the large, positive coefficient associated with the inverse of household size. On average, larger households spend less on a per person basis for total food, food at home, and food away from home. In addition, households with a larger proportion of preschoolers spend less per capita for total food and food away from home.

Households in the Midwest and the South spend less for total food and food at home than do households in the Northeast. Expenditures for total food tend to be higher in the spring and summer than in the fall, with different patterns for food at home and food away from home. Expenditures for food at home are higher in the winter and summer than in the fall, while expenditures for food away from home are higher in the spring than in the fall.

Table 11--Ordinary least squares regressions on monthly per capita expenditures for total food, food at home, and food away from home

Variable	Total food	Food at home	Food away from home
CONSTANT	-11.35	25.37	36.84
LN (INCOME)	22.22***	8.65***	13.56***
DFOOD STAMPS	1.11	5.97	-4.88
1/HHESIZE	92.07***	54.88***	37.40*
PROP04	-50.83**	-18.85	-32.01**
PROP511	-26.67	-11.36	-15.25
PROP1218	-2.50	-2.27	-.089
DWINTER	6.92	-6.33**	.64
DSPRING	10.79**	2.78	8.02***
DSUMMER	9.24**	6.45**	2.81
DMIDWEST	-10.00**	-10.61***	.56
DSOUTH	-11.65**	-13.30***	1.66
DWEST	-7.28	-3.16	-4.09
AGE	-3.88**	-2.15*	-1.72
AGESQ	.069***	.042**	.027
DBLACK	-14.01**	-8.44**	-5.46
DHIGH SCHOOL	16.09***	8.33**	7.81**
DFULLTIME	-2.31	-7.24***	4.97**
DFEMALEHEAD	-6.27	-6.24	-.17
R^2	0.24	0.15	0.19

* Significant at 10-percent level.
** Significant at 5-percent level.
*** Significant at 1-percent level.

Food expenditures exhibit a U-shaped relationship with age of the female head, reaching a minimum at approximately 28 years. Thus, at the sample mean age of 34.66 years, expenditures increase with age of female head. Households in which the female head has at least a high school diploma spend approximately $16 more per person per month than households in which the female head does not have a high school diploma (20 percent of the female-headed households and 12 percent of two-parent households). This $16 difference is allocated fairly equally between food at home and food away from home.

Full-time work does not significantly influence total food expenditures because full-time work has a negative effect on expenditures for food at home, and a nearly offsetting positive effect on expenditures for food away from home. Thus, households in which the female head works full-time tend to spend more for food away from home and less for food at home.

Confirming the cross-tabular findings presented in table 8, we find that black households spend less for total food and food at home than nonblack households (mostly white households) spend, even after controlling for differences in income and other sociodemographic characteristics.

After controlling for the intervening factors above, we find that female-headed households spend approximately $6 less for food per person than two-parent households spend. This reduction in expenditures is reflected almost entirely in lower expenditures for food at home. Although the difference is not statistically significant, it may still be of economic and nutritional significance. However, the magnitude of the difference suggests that the observed lower expenditures among female-headed households are largely attributable to other factors associated with female-headed households, such as their lower income, the lower human capital of the female head, and their large representation among black households.

On average, the marginal propensity to spend for food out of income equals 0.027. That is, an increase of $10 in per person monthly income (including the value of food stamps) would increase food expenditures by 27 cents. Approximately a third of that increase would be allocated to food at home (11 cents), and the remaining two-thirds to food away from home (17 cents). These marginal propensities to spend translate into income elasticities of 0.22 for total food, 0.13 for food at home, and 0.37 for food away from home. Thus, a 10-percent increase in monthly per person income is associated with a 2.2-percent increase in monthly per person food expenditures, a 1.3-percent increase in monthly per person expenditures for food at home, and a 3.7-percent increase in monthly per person expenditures for food away from home. These elasticities are lower than those presented in Blaylock and Smallwood (1986). However, variations in functional form and in the variables controlled for might account for these differences.

Preliminary regression analysis included an interaction term of household type with income to allow for differences between the two types of households regarding the marginal propensity to spend for food. However, no significant effect for that interaction term was found, suggesting that female-headed households respond the same as two-parent households in how they allocate increases in income to food expenditures. The analyses in table 11 consequently do not include an interaction between household type and income.

From the above, we conclude that female-headed households spend less for food than do two-parent households. However, other determinants of food expenditures, such as income, education, and race, are even more important, in terms of the magnitude of their effects on food expenditures. We now analyze whether expenditures for specific categories differ between female-headed and two-parent households.

Theoretical Considerations: Households Reporting Zero Expenditures

When analyzing specific food categories, we confront the problem of observing a large proportion of households reporting zero expenditures for specific items. This might occur if:

- The survey period was too short, and the household did not happen to purchase the item during the survey's time period (that is, they purchase the item somewhat less frequently).

- The household did not purchase the item given current values of demand determinants, such as prices and income.

- The household never purchases the item (that is, the item is not in their utility function).

Survey information is usually not available to allow the researcher to differentiate between the reasons why households report zero expenditures. Although these differences have important implications for demand analysis, the absence of information often leads to the assumption that zero expenditures represent standard corner solutions; that is, that the household did not purchase the item given current income, prices, and other determinants of demand. The researcher then faces the econometric problem of how to estimate a regression given that the data contain a number of observations clustered at zero and wide variations in the amounts for those households that report positive expenditures. Use of ordinary least squares in cases like this yields biased estimates (Maddala, 1987).

The Tobit Model

The traditional method of handling censored data employs tobit analysis, which uses information from all households (those that purchase and those that do not purchase) to measure the relationship of household characteristics to the probability that the household will purchase a particular item and the quantity it will purchase.

The tobit model can be defined as:

$$y_i = X_i \beta + \epsilon_i \quad \text{if RHS} > 0$$
$$y_i = 0 \quad \text{otherwise,}$$

where $i=1,2,....n$ denotes a particular consumer unit, n is the number of sample consumer units, y_i is the level of expenditure, X_i is a vector of explanatory variables, β is a vector of response coefficients to be estimated, ϵ_i is an independently and normally distributed random disturbance term with a mean of zero and constant variance σ^2, and RHS denotes the right-hand side of the expression.

The parameters of the tobit model can be estimated using the maximum likelihood procedure, which maximizes the likelihood of observing the given sample values. To derive the likelihood function, we first separate the sample into two sets of observations. The first set contains the N_1 observations with positive expenditure values; the second set contains the N_2 observations for which expenditure values are zero. For all $y_i > 0$, the probability of y_i given X_i is simply the value of the normal density function, $f(\epsilon_i)$, evaluated at $\epsilon_i = y_i - X_i\beta$, where ϵ_i has mean zero and constant variance σ^2. For all $y_i=0$, the probability of y_i given X_i is the probability that $X_i\beta+\epsilon_i <= 0$. Because ϵ_i is normally distributed, this probability can be written as

$$\Pr(y_i = 0) = \Pr(\epsilon_i \leq -X_i \beta) = F(-z_i) = 1 - F(z_i),$$

where F is the unit-normal probability function, and $z_i = X_i\beta/\sigma$ is the standardized value of $X_i\beta$.

Given that ϵ_i is independently distributed across the sample, the likelihood function for the observed sample is the product of the probability of observing each household's consumption,

$$L = \prod_{i \in N_1} f(z_i) \prod_{i \in N_2} F(-z_i).$$

Maximizing the likelihood function L with respect to β and σ yields the maximum likelihood estimators. The β's determine not only the probability of observing a nonzero value for y_i,

$$\Pr(y_i > 0) = 1 - F[(-X_i\beta)/\sigma],$$

but also the mean of y_i for positive values of y_i, since

$$E(y^*) = X_i\beta + \sigma\,[f(z)/F(z)],$$

where y* denotes the expenditure level for those individuals who decide to purchase the item.

Because total demand for a product depends not only on the average amount purchased at any particular time, but also on the number of consumers purchasing the product in that same time period and the frequency of purchase, the tobit model provides valuable information for decomposing the market response into changes in expenditures among consumers and the probability of consumption (or market entry effects). For some products, these market entry effects may be more important than increases in the level of purchases by current users. McDonald and Moffitt (1981) illustrate how the tobit results can be decomposed to measure changes in the number of consumers and changes in the level of expenditures by current consumers. Blaylock and Smallwood (1986) used this approach to decompose the expenditure level response from the market entry response for household food expenditures.

Haines and others, (1988), however, criticize the tobit model because it estimates only one set of β coefficients, on which the consumer bases both the decision to purchase a good and the decision about how much of that good to purchase. In the tobit model, any variable that increases the probability that a consumer will purchase a specific good must also increase the mean quantity that the consumer will purchase given that the consumer purchases the item. However, Haines and others (1988) explain that certain determinants, such as religion or vegetarianism, may affect the yes/no consumption decision but may have a much smaller or no effect on the level of consumption. This is clearly a highly restrictive assumption, and one that Haines, and others, (1988) set out to test. They conclude that the determinants of the decision to consume a particular food group are often not the same as the determinants of how much of that food group to consume. Thus, they reject the tobit specification and recommend use of a two-step decision model, also referred to as the Cragg model.

The Two-Step Decision Model (Cragg Model)

The two-step decision model, one of several introduced by Cragg in 1971, is a variant of the tobit model. The two-step decision model allows the decision to purchase a good to be separate and independent from the decision about how much of the good to purchase. In theory, the two-step decision model allows for the possibility that even after the decision to purchase has been made, factors such as search, information, and transaction costs may inhibit the carrying out of desired plans, so that quantity purchased remains at zero. In other words, two steps are necessary before positive values of expenditure y_i are observed. First, a decision must be made to purchase. Second, favorable circumstances have to arise for the positive desire to be carried out. A probit model can represent the first decision,

$$Pr(y_i = 0) = F[(-X_i\beta_1)/\sigma_1],$$

where the subscript 1 refers to estimates obtained from the probit analysis, and σ_1 is assumed to equal 1.

A standard regression model could represent the second decision. However, to ensure non-negative expenditure values, a truncated regression specification is used instead. The density function for y_i, conditional on y_i being positive, is assumed normal and truncated at zero, so that

$$f(y_i|\,y_i>0) = 1/\sigma_2\ \{\ f[(y_i-X_i\beta_2)/\sigma_2]\ /\ F[(X_i\beta_2)/\sigma_2]\ \},$$

where, again, f and F are the density function and the distribution function of the standard normal, and the subscript 2 refers to estimates obtained from the truncated regression analysis.

Putting the two decisions together, the likelihood function for the observed sample becomes

$$L = \prod_{y_i=0} F(-X_i\beta_1) \prod_{y_i>0} \{F(X_i\beta_1)\ 1/\sigma_2\ \{\ f[(y_i-X_i\beta_2)/\sigma_2]\ /\ F[(X_i\beta_2)/\sigma_2]\}\ \},\ \text{or}$$

$$L = \prod_{y_i=0} F(-z_1) \prod_{y_i>0} \{ F(z_1)\, 1/\sigma_2\, [f(z_2)/F(z_2)] \}.$$

This likelihood function can be maximized with respect to β_1, β_2, and σ_2. Alternatively, β_1 can be obtained using the probit maximum likelihood estimator, using information on the entire sample, while β_2 and σ_2 can be obtained using a truncated normal estimator for the nonzero observations.

The two-step decision process estimator becomes the tobit estimator when $\beta_1=\beta_2/\sigma_2$ (Haines and others, 1988). Thus, the tobit is a special case of the two-step decision process model. The restriction can be easily tested using a likelihood ratio test. If the restriction is valid but is not imposed, efficiency in the estimates is lost but the results remain statistically correct. On the other hand, if the restriction is not valid and the tobit is used, parameter estimates are biased, and inferences can be misleading (Haines and others, 1988).

Advantages of the two-step decision model are that it does not restrict determinants of the decisions to purchase and about how much to purchase to be the same, and it uses a truncated distribution that explicitly restricts consumption to positive levels. Also, the two-step decision model includes the tobit as a special case, so that the data can test whether the tobit or two-step decision process is the appropriate model. A disadvantage is that it assumes complete independence between the decisions to purchase and of how much to purchase.

In the next section, we test the tobit model against the two-step decision model, using the likelihood ratio test. The appropriate model is then used to estimate the determinants of food expenditures for 15 disaggregated food categories for female-headed and two-parent households.

Testing the Tobit Specification Against the Two-Step Decision Model

The tobit model is tested against the two-step decision model in this section. The latter includes a probit regression, which models the household's purchasing decision, and a truncated normal regression, which models the household's expenditure level, given a positive purchasing decision. All three types of regressions--the probit, the tobit, and the truncated--were done using LIMDEP software.[10]

Table 12 shows the results of likelihood ratio tests, which overwhelmingly reject the null hypothesis (that the tobit restriction holds) for all 15 food categories at the 5-percent level. The rejection of the null hypothesis indicates that the household's decision of whether or not to purchase a food category has a different structure than the household's decision of how much to spend, given it has decided to make the purchase. This is consistent with the conclusions of Haines and others (1988).

A cursory examination of table 13--a summary of the regression results for the 15 food categories (appendix 3 contains the complete regression results for all 15 major food categories)--confirms the rejection of the null hypothesis. For each food category, column 1 presents the tobit results, column 2 presents the truncated normal estimations for observations with nonzero expenditures, and column 3 presents the probit results for the decision of whether or not to purchase the particular food category. The probit and the truncated regressions together represent the alternative to the tobit model, which Haines and others (1988) refer to as a two-step decision process.

Note from table 13 that each variable in each food category is associated with a set of three coefficients, one for the tobit, one for the probit, and one for the truncated regressions. An exception occurs for the fish and seafood category, which is missing the coefficients for the truncated regression. Examining the set of coefficients for each variable and for each food category, we find only a small number of cases in which all three coefficients are significant (16 out of a possible 266 if we ignore the fish and seafood category). In these 16 cases, the coefficients for the tobit, the truncated, and the probit differ appreciably in magnitude (table 14). The tobit specification typically understates the effects of the explanatory variables on the level of per person

[10] The truncated regression estimations presented some difficulties using the LIMDEP software for analyses of limited dependent variables. For food away from home, pork, and sugars and sweets, use of the BHHH algorithm solved the estimation problems. For fish and seafood, however--the food category with the lowest proportion of consumers--a change in the algorithm still did not solve the estimation problem. Therefore, regression coefficients are not available for fish and seafood.

food expenditures (truncated regressions), and overestimates the effects of the explanatory variables on the probability of purchase (probit regressions).

In most cases, for any variable in any food category, only one or two of the three regression coefficients are significant, indicating that different factors affect the decisions to purchase a specific food group and how much to spend for that purchase. When two regression coefficients are significant, both the tobit and truncated coefficients are usually significant. And although of the same sign, the tobit coefficient is usually smaller in magnitude than the truncated coefficient.

The patterns observed above suggest that the tobit specification, for most food categories in this sample, tends to better capture the effects of the explanatory variables on per person expenditures, rather than on the decision to purchase the food category. For bakery and cereal products, for example (table 15), the tobit fairly well captures the qualitative effects of the explanatory variables on expenditure levels, although it underestimates these effects. The two-step decision process provides additional information on the effects of the explanatory variables, such as the offsetting effects of household size, whereas increases in household size are associated with positive market entry effects but reduced expenditures due to economies of scale. For fats and oils, the tobit captures mainly the qualitative effects of the explanatory variables on the decision to purchase, but is unable to capture the effects of the explanatory variables on the level of expenditures. Thus, the tobit model, by restricting the factors that influence the decision to purchase to be the same as the factors that influence per person expenditures (in both sign and magnitude), places invalid restrictions on the model. Use of the tobit tends to underestimate the effects of explanatory variables on per person expenditure levels, and tends to overestimate potential market entry effects.

Table 12--Testing the tobit model against the two-step decision model: A likelihood ratio test of the 15 major food categories

	Log likelihood values			
Food category	Tobit	Truncated	Probit	$\lambda(r)$[1]
Bakery and cereal products	-3,729.1	-3,513.9	-99.9	230.6
Beef	-3,338.5	-2,604.5	-587.9	292.2
Beverages	-3,429.9	-2,965.8	-318.5	291.2
Dairy products	-3,658.3	-3,405.4	-141.9	222.0
Eggs	-1,558.3	-811.2	-673.2	147.8
Fats and oils	-2,126.9	-1,431.1	-639.8	112.0
Fish and seafood	-2,131.2	N/A	-756.5	N/A
Food away from home	-5,373.3	-4,798.4	-249.7	650.4
Fruits	-3,423.8	-2,897.3	-355.6	341.8
Miscellaneous prepared foods	-3,794.6	-3,353.4	-315.8	250.8
Other meats	-2,568.0	-1,849.6	-627.5	181.8
Pork	-2,731.2	-1,900.6	-722.8	215.6
Poultry	-2,425.3	-1,644.3	-733.6	94.8
Sugars and sweets	-2,675.3	-1,961.4	-559.2	309.4
Vegetables	-3,173.2	-2,692.4	-333.4	294.8

N/A = Not available.

[1] The test statistic $\lambda(r)$ is calculated as:

$\lambda(r) = 2$ [log u - log r]

$= 2$ [(log likelihood truncated + log likelihood probit) - log likelihood tobit].

Under the null hypothesis, it is distributed as a χ random variable with degrees of freedom equal to the number of variables in the regression. The value of the test statistic exceeds the critical value of $\chi^2_{df=19,\ .05} = 30.1$ at the 5-percent level for most food categories. Thus, the data overwhelmingly reject the tobit model.

Table 13--Summary of results from tobit (T), truncated (TR), and probit (PR) regressions[1]

Variable	Bakery			Beef			Beverages			Dairy			Eggs			Fats and oils			Fish and seafood			Food away from home		
	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR[2]	PR	T	TR	PR
CONSTANT	•		•						•			•	•	•			•		•				•	•
LN (INCOME)	•	•		•			•	•		•	•	•				•			•		•	•	•	•
DFOOD STAMPS				•	•																	•	•	•
1/HHESIZE		•	•		•	•	•	•			•			•	•		•					•	•	
PROPO4	•	•				•								•								•	•	
PROP511										•	•							•						
PROP1218														•		•		•						
DWINTER		•				•				•	•			•	•	•		•	•		•			
DSPRING				•		•	•	•													•	•	•	
DSUMMER				•			•	•		•	•					•		•						
DMIDWEST	•	•					•	•		•	•		•	•					•		•			
DSOUTH	•	•	•				•	•		•	•	•	•	•		•		•	•		•			
DWEST	•	•	•										•						•	•				
AGE	•						•										•							
AGESQ	•	•					•						•	•								•		
DBLACK	•	•					•	•		•	•	•				•						•		•
DHIGH SCHOOL	•	•								•	•		•	•		•		•				•	•	•
DFULLTIME	•	•		•		•	•		•	•						•		•	•		•	•	•	
DFEMALE HEAD				•												•		•						

See footnotes at end of table.

--Continued

Table 13--Summary of results from tobit (T), truncated (TR), and probit (PR) regressions[1]--Continued

Variable	Fruits			Miscellaneous products			Other meats			Pork			Poultry			Sugars			Vegetables		
	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR	T	TR	PR
CONSTANT	•	•									•			•			•			•	•
LN (INCOME)	•	•	•	•	•	•		•		•	•		•	•	•	•	•		•	•	
DFOOD STAMPS										•	•		•		•						
1/HHESIZE	•	•			•		•	•				•		•	•		•	•		•	•
PROPO4													•		•				•		
PROP511				•	•		•					•							•	•	
PROP1218		•				•	•					•							•	•	
DWINTER			•	•	•	•									•				•	•	•
DSPRING													•		•	•	•				•
DSUMMER	•	•	•													•	•		•		•
DMIDWEST	•	•											•	•	•		•				
DSOUTH	•	•					•						•		•	•	•				
DWEST						•							•		•						
AGE																•				•	
AGESQ																•					•
DBLACK				•	•					•	•		•		•			•			
DHIGH SCHOOL	•		•	•	•	•	•									•	•				
DFULLTIME	•		•	•			•					•							•	•	
DFEMALE HEAD			•				•	•				•									

[1]Dots represent a statistically significant coefficient (10-percent level).
[2]Truncated regression did not converge.

Table 14--Groupings for which the coefficients of the tobit, truncated, and probit regressions are significant at the 10-percent level[1]

Item	Tobit	Truncated	Probit
Bakery and cereal products:			
DSOUTH	-2.78	-4.52	-0.56
DWEST	-1.45	-1.91	-.57
Dairy:			
LN (INCOME)	1.01	1.69	.18
DSOUTH	-2.24	-3.90	-.58
DBLACK	-2.87	-6.79	-.41
Food away from home:			
LN (INCOME)	16.32	58.35	.48
DFOOD STAMPS	-10.34	-74.18	-.39
DHIGH SCHOOL	9.26	32.48	.32
Fruits:			
LN (INCOME)	1.18	4.83	.13
DSUMMER	1.40	3.71	.28
Miscellaneous prepared foods:			
LN (INCOME)	1.06	2.27	.14
DWINTER	1.90	3.60	.35
DHIGH SCHOOL	3.07	9.35	.32
Poultry:			
LN (INCOME)	.80	3.42	.10
DMIDWEST	-2.05	-4.42	-.42
Vegetables:			
DWINTER	1.18	2.43	.30

[1]Under the null hypothesis, in which the tobit is the true model, the effect of any variable on the decision to purchase is equal to the effect of that variable on the level of expenditure. Thus, for any variable, the coefficients for the truncated and the probit should be of the same sign and magnitude.

Empirical Results: Food Expenditure Patterns

With the tobit model overwhelmingly rejected by the likelihood ratio tests above, the analyses of food expenditure patterns by female-headed households are based on the two-step decision model. This process encompasses a probit analysis of the household's decision about whether to purchase the particular food group, and a separate truncated normal regression on the nonzero expenditure observations, which models the household's decision of how much to spend, given that the household has decided to purchase the particular food category.

Table 16 presents the results of the probit regressions on the decision to purchase, and table 17 presents the results of the truncated normal regressions on expenditure levels, given positive expenditures, for each of the 15 major food categories. Appendix 3 provides complete regression results for each food category.

Table 15--Comparison of results for tobit and two-step decision models for subsample of foods

Variable	Bakery and cereal products			Fats and oils		
	Tobit	Truncated	Probit	Tobit	Truncated	Probit
CONSTANT	7.74*	-4.42	-3.45*	-2.15	-14.73***	0.62
LN (INCOME)	1.30***	2.21***	.18	.23**	.36	.09
DFOOD STAMPS	.29	.55	-.32	.06	-.39	.03
1/HHESIZE	5.74	16.33**	-2.98*	1.86	12.95***	-.87
PROP04	-4.38*	-8.92**	-.51	1.05	1.30	.60
PROP511	.19	-.62	-.13	1.04	-.54	.91**
PROP1218	.60	-.25	1.43	1.36*	-1.21	1.30***
DWINTER	.80	1.58*	-.09	.39**	-.36	.37***
DSPRING	-.003	.10	-.06	.09	-.41	.11
DSUMMER	-.58	1.15	-.11	.37*	.27	.19*
DMIDWEST	-1.89***	-3.19***	.06	-.26	.21	-.16
DSOUTH	-2.78***	-4.52***	-.56*	-.55**	-.26	-.35***
DWEST	-1.45**	-1.19*	-.57*	.05	.95*	-.18
AGE	-.50**	-.54	-.05	.005	.39*	-.06
AGESQ	-.009**	.01**	-.002	.0006	-.004	.0009
DBLACK	-1.79**	-4.65***	.26	-.47*	-.85	-.19
DHIGH SCHOOL	1.66***	-3.04**	.06	.46*	.13	.33***
DFULLTIME	-1.33***	-2.33***	-.02	.41***	-.49	-.23***
DFEMALEHEAD	-.80	1.79	.11	-.70**	-.07	-.47**

*Significant at 10-percent level.
**Significant at 5-percent level.
***Significant at 1-percent level.

Table 16--Probit regressions on decision to purchase disaggregated foods (Number = 1,140)

Variable	Bakery	Beef	Beverages	Dairy	Eggs	Fats and oils	Fish	Food away from home
CONSTANT	3.45*	0.87	2.27*	4.02**	1.15	0.62	-1.04	0.46
LN (INCOME)	.18	.09	.08	.18*	.04	.09	.10*	.48***
DFOOD STMP	-.32	.19	-.03	-.05	.02	.03	-.04	-.39**
1/HHESIZE	-2.98*	-1.81**	-1.03	-1.53	-2.32***	-.87	-.53	-.40
PROP04	-.51	-.89*	-.87	-.02	-.16	.60	-.61	-.86
PROP511	-.13	-.27	-.31	.46	.27	.91**	-.15	-.46
PROP1218	1.43	.34	.91	1.33	.60	1.30***	.06	.27
DWINTER	-.09	.31***	.04	.19	.29**	.37***	.35***	.07
DSPRING	-.06	.25**	.13	-.004	.07	.11	.19*	-.20
DSUMMER	-.11	.09	.12	.27	-.12	.19*	.13	-.13
DMIDWEST	-.06	-.11	.08	-.44	-.12	-.16	-.34***	.02
DSOUTH	-.56*	-.08	-.22	-.58*	-.05	-.35***	-.38***	.20
DWEST	-.57*	.11	.05	-.72**	-.08	-.18	-.19	-.13
AGE	-.05	.007	-.04	-.11	-.02	-.06	.05	-.09
AGESQ	.002	-.0002	.0004	.001	.0003	.0009	-.0006	.001
DBLACK	.26	.07	-.05	-.41*	.07	-.19	.16	-.34*
DHIGH SCH	.06	-.17	-.007	-.41	.03	.33***	-.17	.32*
DFULLTIME	-.21	-.24***	-.30**	-.20	-.04	-.23***	-.23***	-.004
DFEMALEHD	.11	-.22	-.31	-.06	-.09	-.47**	-.17	-.09
Log likelihood	-99.9	-587.9	-318.5	-141.9	-673.2	-639.8	-756.5	-249.7

See footnotes at end of table.

--Continued

Table 16--Probit regressions on decision to purchase disaggregated foods (Number = 1,140)--Continued

Variable	Fruits	Miscellaneous	Other meats	Pork	Poultry	Sugars	Vegetables
CONSTANT	-0.55	0.45	0.22	0.83	.68	1.50	-3.68***
LN (INCOME)	.13*	.14*	.06	-.005	.10*	.06	.01
DFOOD STMP	-.19	-.08	.12	-.09	.48***	-.17	-.07
1/HHESIZE	-.34	-.96	-.60	-1.34*	-1.76**	-1.54*	-2.46**
PROP04	.66	.11	-.29	.03	-1.19**	-.03	-.83
PROP511	.91	.37	.12	.93**	-.53	.60	-.19
PROP1218	.66	1.26**	.19	1.08**	-.62	.33	-.38
DWINTER	.26*	.35**	.02	.06	.23**	.07	.30**
DSPRING	.10	.23	.02	-.07	.25**	.05	.29**
DSUMMER	.28*	-.02	.07	.03	.10	.05	.39***
DMIDWEST	.03	.01	-.01	-.05	-.42***	.06	-.17
DSOUTH	-.02	-.05	-.14	-.08	-.34***	.001	-.22
DWEST	-.12	.34*	-.11	-.02	-.34***	.04	-.12
AGE	.02	-.005	-.03	.01	-.0007	-.06	-.11
AGESQ	.00006	-.00006	.0005	.00003	.00005	.0009	.002*
DBLACK	-.030	-.10	-.18	.18	.28**	-.24*	-.11
DHIGH SCH	.27*	.32**	.13	.003	-.17	.20	.10
DFULLTIME	-.36***	-.17	-.08	-.20**	-.01	-.08	-.18
DFEMALEHD	-.40*	-.25	-.16	-.36*	-.19	-.16	-.20
Log likelihood	-355.6	-315.8	-627.5	-722.8	-733.6	-559.2	-333.4

* Significant at 10-percent level.
** Significant at 5-percent level.
*** Significant at 1-percent level.

Table 17--Truncated regressions on disaggregated food expenditures (Number = 1,140)

Variable	Bakery	Beef	Beverages	Dairy	Eggs	Fats and oils	Fish[1]	Food away from home[2]
CONSTANT	-4.42	-88.47	-21.68	-7.18	2.71*	-14.73***		-65.29***
LN (INCOME)	2.21***	4.77	3.01***	1.69***	-.01	.36		4.83***
DFOOD STMP	.55	26.60**	-3.67	-1.30	.23	-.39		-3.02
1/HHESIZE	16.33**	133.72**	30.69***	11.40*	3.50**	12.95***		42.92***
PROP04	-8.92**	-17.17	-7.74	-6.64[3]	-1.80**	1.30		.35
PROP511	-.62	-29.73	-1.46	-8.14**	-1.15[3]	-.54		-3.74
PROP1218	-.25	-7.40	3.70	-6.26[3]	-1.79**	-1.21		-15.32*
DWINTER	1.58*	-.99	1.40	2.44**	-.49**	-.36		-.64
DSPRING	.10	7.72	3.46**	1.25	-.07	-.41		.31
DSUMMER	1.15	10.43	4.46***	1.86*	.24	.27		3.71*
DMIDWEST	-3.19***	-6.43	-3.54**	-2.94***	-1.10***	-.21		-7.08***
DSOUTH	-4.52***	.12	-4.42***	-3.90***	-.73***	-.26		-7.02***
DWEST	-1.91*	-.47	.02	-.87	.24	.95*		-.50
AGE	-.54	-2.40	-.71	-.16	-.12[3]	.39*		.37
AGESQ	.01**	.04	.01[3]	.005	.002*	-.004		.003
DBLACK	-4.65***	-10.32	-6.27**	-6.79***	.31	-.85		-.86
DHIGH SCH	3.04**	6.61	.75	3.46***	-.71***	.13		2.98
DFULLTIME	-2.33***	-8.86[3]	-.80	-1.07	.23[3]	-.49		-1.97
DFEMALEHD	-1.79	-10.72	-2.41	.95	.16	-.07		-.21***
Log likelihood	-3,513.9	-2,604.5	-2,965.8	-3,405.4	-811.2	-1,431.1		-2,897.3
N	1,117	873	1,038	1,105	794	811	560	1,046

See footnotes at end of table.

--Continued

Table 17--Truncated regressions on disaggregated food expenditures (Number = 1,140)--Continued

Variable	Fruits	Miscellaneous	Other meats	Pork[2]	Poultry	Sugars[2]	Vegetables
CONSTANT	-65.29***	-23.92	-21.10	-95.66***	-47.74***	-25.49*	-30.94***
LN (INCOME)	4.83***	2.27**	2.15*	9.37***	3.42***	3.30***	1.07*
DFOOD STMP	-3.02	2.65	1.43	19.55***	4.29	2.10	1.16
1/HHESIZE	42.92***	36.50**	45.62***	30.37	22.50*	28.52***	27.73***
PROP04	0.35	-7.93	-3.66	-11.99	2.37	-3.18	-8.24[3]
PROP511	-3.74	-17.70**	2.89	-2.22	-1.91	6.10	-12.46***
PROP1218	-15.32*	-10.33	10.98[3]	4.76	-1.65	7.33	-11.14**
DWINTER	-.64	3.60*	-2.92[3]	2.68	-.96	-2.04	2.43**
DSPRING	.31	-.47	-1.99	.28	-.72	-5.45***	-1.38
DSUMMER	3.71*	1.77	.22	-1.91	-1.33	-6.70***	1.19
DMIDWEST	-7.08***	2.14	-.04	-2.79	-4.42**	-3.46*	-.97
DSOUTH	-7.02***	-2.47	-2.54	-5.36[3]	-1.84	-4.52**	-1.44
DWEST	-.50	1.64	-.74	-.09	-.20	-2.01	.44
AGE	.37	-.37	-.94	-.10	.41	-.87	.90*
AGESQ	.003	.007	.01	.006	-.0008	.01	-.009
DBLACK	-.86	-10.16***	.55	9.53**	1.49	-2.06	-2.02
DHIGH SCH	2.98	9.35***	3.57[3]	-2.30	1.92	4.51**	.15
DFULLTIME	-1.97	-1.76	-2.34[3]	.15	.39	-.76	-2.18**
DFEMALEHD	-.21	-2.63	-7.38**	1.70	.63	-2.31	1.97
Log likelihood	-2,897.3	-3,353.4	-1,849.6	-1,900.6	-1,644.3	-1,961.4	-2,692.4
N	1,019	1,039	837	744	685	905	1,028

[1] Not available, regression did not converge.
[2] Used BHHH algorithm.
* Significant at 10-percent level.
** Significant at 5-percent level.
*** Significant at 1-percent level.

All the factors included in the regressions influence at least some of the household's decisions to purchase a particular food category (table 16) or the household's expenditure level, given the decision to purchase (table 17). Per person income, participation in the Food Stamp Program, race, age, and education of the female head, time constraints of the female head (as proxied by whether she works full-time), household size and composition, region, and time of year are important determinants for at least some purchasing decisions. However, the influence of each factor depends on the particular food, and on whether we are looking at the decision to purchase or the expenditure level. For example, per person income significantly affects the purchasing decision for dairy products, fish and seafood, food away from home, fruits, miscellaneous prepared foods, and poultry, although it has no significant effect on the decision to purchase bakery products and cereals, beef, beverages, eggs, fats and oils, other meats, pork, sugars and sweets, or vegetables. And although per person income significantly affects expenditure levels for most food categories, it has no significant effect on expenditure levels for beef, eggs, and fats and oils.

Participation in the Food Stamp Program reduces the probability of purchasing food away from home, but increases the probability of purchasing poultry. In addition, Food Stamp Program participation significantly influences the expenditure levels for beef and pork, and adversely affects the level of expenditures for food away from home.

Black households are less likely than nonblack households (mainly whites) to purchase dairy products, food away from home, and sugars and sweets. Black households are more likely than their nonblack counterparts to purchase poultry. Age of the female head significantly influences only the decision to purchase vegetables, although households with older female heads tend to spend more per person for bakery products and cereals, eggs, fats and oils, and vegetables.

Households in which the female head has at least a high school diploma are more likely to purchase fats and oils, food away from home, fruits, and miscellaneous prepared foods. They also tend to spend more for bakery and cereal products, dairy products, food away from home, miscellaneous prepared foods, and sugars and sweets, and to spend less than other households for eggs. If expenditures for eggs are closely correlated with consumption of eggs, this result is consistent with a recent study by Putler and Frazao (1991a), which showed that women with higher education have reduced their consumption of eggs since 1977, possibly as a result of their higher awareness of the high cholesterol content of eggs and the adverse health effects of high intake of fat and cholesterol.

Full-time work by the female head exerts a greater effect on their purchasing decisions than their expenditure levels. Households in which the female head works full-time are less likely to purchase beef, beverages, fats and oils, fish, fruits, and other meats. Households in which the female head works full-time are not significantly more likely to purchase food away from home than are other households, although female-headed households tend to spend more for food away from home when they purchase any. They also tend to spend more for bakery and cereal products, and less for vegetables.

Smaller households are less likely to purchase bakery and cereal products, beef, eggs, pork, poultry, sugars and sweets, and vegetables. Smaller households tend to spend more for everything, however, due to the existence of economies of scale, which reduce per capita expenditures as family size increases. The presence of preschool children has the additional effect of decreasing the probability that the household will purchase beef and poultry, although it increases the probability of purchasing fats and oils and other meats. Households with a larger proportion of preschool children spend less than other households for bakery and cereal products, eggs, and food away from home. A larger proportion of elementary- and high-school-age children is associated with a higher probability of purchasing fats and oils, miscellaneous prepared foods, and other meats. Households with a larger proportion of children aged 5-18 spend less for eggs, fruits, and vegetables than do other households. They also tend to spend less for dairy products.

Regional differences in purchasing patterns are strongly evident. Households in the South and West are less likely than households in the Northeast to purchase bakery and cereal products, dairy products, and poultry. In addition, households in the South are less likely than households in the Northeast to purchase fats and oils, and fish. Households in the Midwest are less likely than households in the Northeast to purchase fish and poultry. Expenditures also tend to be higher in the Northeast. Households in the Midwest, South, and West spend less

for bakery and cereal products; households in the Midwest and the South spend less for beverages, dairy products, eggs, fruits, and sugars and sweets; and households in the Midwest spend less for poultry than do households in the Northeast. Households in the South spend more for fats and oils than do households in the Northeast.

Seasonal differences are also present. Households are more likely to purchase beef, eggs, fats and oils, fish, fruits, miscellaneous prepared foods, poultry, and vegetables during the winter than during the fall months. Beef, fish, poultry, and vegetables are more likely to be purchased in the spring than in the fall. Fats and oils, fruits, and vegetables are more likely to be purchased in the summer than in the fall. Expenditures for food away from home are higher in the spring compared with the fall.

Although type of household does not significantly influence total food expenditures, or expenditures for food at home and food away from home, household type exerts an independent adverse effect on the household's purchasing decisions for fats and oils, fruits, and other meats, and significantly and adversely influences expenditures for other meats.

Income Elasticities

Following Blaylock and Smallwood (1986), the effect on food expenditures associated with a change in one of the independent variables can be decomposed into two components. The first component represents the effect of a change in the explanatory variable on the probability of purchase, or the number of consumers (a market entry effect). The second component represents the effect of a change in the explanatory variable on the level of expenditures among those who purchase the item. Unlike Blaylock and Smallwood's tobit example, however, in the two-step decision model, these two components of the aggregate effect are estimated from two separate regressions, a probit and a truncated regression.

The effect of a change in one of the explanatory variables on the probability of purchase is estimated from the probit regression, where

$$P(y_i > 0) = F[(X_i\beta_1)/\sigma_1] = F(z_1),$$

where $z_1 = (X_i\beta_1)/\sigma_1$ and σ_1 is assumed to equal 1.

The effect of a change in the same explanatory variable on the level of expenditures among consumers is estimated from the truncated regression, where

$$E(y_i | y_i > 0) = X_i\beta_2 + \sigma_2 [f(z_2)/F(z_2)].$$

Putting the two effects together, we obtain the expected value of expenditures

$$E(y_i) = F(z_1)\, E(y_i | y_i > 0)$$

$$= F(z_1) \{ X_i\beta_2 + \sigma_2 [f(z_2)/F(z_2)] \}.$$

The effect on expenditures associated with a change in any one of the independent variables may be obtained by

$$\partial E(y_i)/\partial x_i = F(z_1)\, \partial E(y_i | y_i > 0)/\partial x_i + E(y_i | y_i > 0)\, \partial F(z_1)/\partial x_i$$

$$\partial E(y_i | y_i > 0)/\partial x_i = \partial(X_i\beta_2)/\partial x_i - z_2\sigma_2\, \partial z_2/\partial x_i\, f(z_2)/F(z_2) - \sigma_2\, \partial z_1/\partial x_i\, f^2(z_1)/F^2(z_1)$$

$$= \partial(X_i\beta_2)/\partial x_i \{1 - z_2 [f(z_2)/F(z_2)] - f^2(z_2)/F^2(z_2)\}.$$

Aside: $\partial f(z)/\partial x_i = - zf(z)\, \partial z/\partial x_i$ and $\partial z/\partial x_i = 1/\sigma [\partial(X_i\beta)/\partial x_i]$

so that the total effect may be obtained by

$$\partial E(y_i)/\partial x_i = F(z_1)\partial(X_i\beta_2)/\partial x_i \{1 - z_2 [f(z_2)/F(z_2)] - f^2[(z_2)/F^2(z_2)\} +$$

$$\{X_i\beta_2 + \sigma_2 [f(z_2)/F(z_2)]\} f(z_1) \partial z_1/\partial x_i,$$

where the subscript 1 refers to coefficients from the probit regressions, and the subscript 2 refers to coefficients from the truncated regressions. Multiplying this last equation by income and dividing by expenditures provides the percentage change in expenditures associated with a 1-percent change in income at the mean income level.

Table 18 presents the income elasticities for 14 food categories,[11] multiplied by a factor of 10 to reflect the percentage response in expenditures associated with a 10-percent increase in income. Because of the nonlinearities of the estimating equations, the income elasticities are estimated at two points: (1) at the mean income level of $821.50 per capita per month; and (2) at the mean income level among female-headed households, $515.20 per capita per month. The market entry effect and the expenditure level effect associated with each income level are also presented.

A 10-percent increase in income raises expenditures for food away from home by nearly 4 percent, and for pork and poultry by more than 2 percent. The income elasticity for beef is lower than that for pork or poultry, perhaps reflecting health concerns about dietary fat intake, and consumer perception that beef should be consumed in moderate amounts.[12] Note that these income elasticities differ from those by Blaylock and Smallwood (1986), but both their data and their analysis differ (they use 1980-81 data, control for different variables, and use tobit analysis).

Most of the effects on expenditures associated with an increase in income result from changes in expenditure levels by those who already purchase the food item. Market entry effects are relatively small for most food categories. This is not so surprising if we note that this analysis deals with expenditures for mostly aggregate food categories, and that large proportions of consumers already report purchasing most of these food categories. For example, at least 90 percent of the households report purchasing bakery and cereal products, beverages, dairy products, food away from home, fruits, miscellaneous and prepared foods, and vegetables (table 9). Fewer than half of the households report purchases for fish and seafood. Where a significant proportion of households is already in the market, an increase in income is not likely to have much of a market entry effect, but is more likely to influence the amounts or quality of the product purchased.

Conclusions

A number of studies reveal that female-headed households have lower food expenditures than households with both a female and a male head. The question arises as to whether the lower food expenditures among female-headed households reported herein are due to certain characteristics often associated with being a female-headed household, such as poverty, low education, being black, or to the type of household and their being headed by a single female. The presence of a male head in two-parent households might influence both food consumption patterns and food spending decisions, and might translate into different food expenditures and food spending patterns between households with and without a male head. For example, a study by Putler and Frazao (1991) revealed that, in 1985, women in households with a male head consumed significantly larger shares of dietary fat from red meats than did women in households without a male head. Putler and Frazao (1991) attributed this difference to the male head's influences on food choices. Andrews, and others (1990) analyzed food expenditures of female- and dual-headed households, and rejected the hypothesis that the same model can be used to explain food expenditures for the two types of households. They found, for example, that female-headed households spend more of each additional dollar of income for food than do similar dual-headed households. They attributed this difference in food spending to the influence of the male head on food choices among dual-headed households.

---

[11] Due to unavailability of results for the truncated regression for fish and seafood, estimating the marginal propensity to spend or the income elasticity for fish and seafood was not possible.

[12] Why consumers view pork and beef differently is not known. Perhaps the aggressive advertisement by pork producers, emphasizing pork as being leaner than before ("the other white meat"), may be partly responsible for this difference in consumer behavior.

Table 18--Per capita effects of a 10-percent increase in income on monthly food expenditures

Item	At average income level of $821.50			At average income level of $515.20		
	Total effect	Market entry effect	Expenditure level effect	Total effect	Market entry effect	Expenditure level effect
Total food[1]	2.2	N/A	N/A	2.2	N/A	N/A
Food away from home	3.96	0.49	3.48	3.91	0.71	3.20
Food at home:[1]	1.40					
Bakery goods	1.24	[2]	1.24	1.23	[2]	1.23
Beef	.96	.39	.57	.96	.41	.56
Beverages	1.35	.13	1.22	1.32	.14	1.18
Dairy	1.16	.20	.96	1.18	.23	.95
Eggs	.16	.19	-.04	.16	.20	- .04
Fats and oils	.98	.45	.53	1.00	.47	.53
Fruits	1.82	.20	1.62	1.78	.22	1.56
Miscellaneous foods	.97	.20	.77	.98	.23	.76
Other meats	1.38	.46	.92	1.37	.47	.89
Pork	2.34	-.02	2.36	2.18	-.02	2.19
Poultry	2.46	.65	1.81	2.42	.68	1.74
Sugars	1.63	.22	1.41	1.57	.22	1.35
Vegetables	1.21	.60	.61	1.20	.60	.61

N/A = Not available.

[1] Income elasticity (total effect) for total food and for food at home were obtained from the ordinary least squares (OLS) regressions presented in table 11, and thus the total effects cannot be decomposed into market entry and expenditure level effects. Furthermore, because all individuals in the sample reported some expenditures for total food, and because all but three individuals reported some expenditures for food at home, there would be no market entry effect.

[2] Less than 0.005.

The results of this study, however, suggest that, on a per person basis, female-headed households actually spend less for food than do similar two-parent households, although this difference is not statistically significant. The difference is reflected primarily in the lower (but not statistically significant) expenditures for food at home by female-headed households, with little observable difference in expenditures for food away from home between the two types of households.

Differences in food expenditure patterns are examined after disaggregating food expenditures into 15 categories. Cross-tabular comparisons indicate that female-headed households not only spend less than two-parent households fc nearly all food categories, they are also less likely to purchase most of the 15 food categories. However, am ıg those households that purchase a particular food category, female-headed households actually spend the sam or more, on a per capita basis, than other households spend for 7 of the 15 food categories. Thus, the decision to purchase a particular food category seems to be important.

Tobit analysis is the method traditionally used to correct for the frequent reporting of zero expenditures by households that do not purchase a particular food category during the sample period. However, the tobit analysis constrains the factors that influence the decision to purchase to similarly influence the expenditure level. The two-step decision model, an alternative to the tobit model, suggested by Haines and others (1988), encompasses a probit regression to model the decision to purchase and a truncated regression to model the independent--albeit positive--expenditure level. In this study, the tobit model is overwhelmingly rejected for 14 food categories.[13] Using the two-step decision model, expenditure patterns are found to differ noticeably between the two types of households for three of the food categories. Female-headed households are less likely to purchase fats and oils, fruits, and other meats, and to spend less for other meats, compared with similar two-parent households.

Although type of household influences food expenditures, the key concept above is "all else equal." Female-headed households differ considerably from two-parent households regarding other important determinants of food expenditures. Female-headed households tend to be black, to have less-educated female heads, and to have lower incomes. The effects of these characteristics on food expenditures predominate, and are primarily responsible for, the observed lower food expenditures among female-headed households.

Income effects on food expenditures are all positive. A 10-percent increase in income is associated with a more than 2-percent increase in total food spending, and a nearly 4-percent increase in spending for food away from home. In this analysis, the marginal propensities to spend for food out of cash income and out of food stamps were constrained to be the same, due to problems with the food stamp variable (appendix 2). In addition, the analyses above do not allow for differences in the marginal propensity to spend for food out of total income between the two types of households, as per Andrews and others (1990). However, preliminary regressions that allowed for differences between the two types of households in marginal propensities to spend for food out of income could not reject that there were no differences.

Data differences likely explain the discrepancies between the results above and those by Andrews and others (1990). The latter used data from USDA's 1985 Continuing Survey of Food Intakes by Individuals (CSFII), which included only households in which there was a woman aged 19-50. Furthermore, in the CSFII, expenditures were based on respondent recall of usual expenditures during the past 2 months. This study used data from the BLS 1988 Continuing Consumer Expenditures Survey, which collected data on the actual value of food purchased over a period of 2 weeks. Although the dependent variables are similar, they are not equal.

The results of this study suggest a need to further investigate whether there are differences between female-headed and two-parent households. Use of different data sets, and the ability to separate the marginal propensity to spend for food out of cash income and out of food stamps would be useful. For the moment, attempts to increase food expenditures among female-headed households might be more successful if they focused on increasing income and education in female-headed households.

---

[13] Due to the unavailability of truncated coefficients for the category of fish and seafood, a comparison was not possible for that food category.

Analysis on the relationship between food expenditures, food quality, and food consumption is also needed. For example, in this study it was not possible to ascertain whether the slightly lower food expenditures among female-headed households resulted from: (1) purchasing less food, (2) purchasing food of lower nutritional value, (3) purchasing fewer expensive foods (such as convenience foods, or fast foods), (4) paying lower prices for the food purchased, or (5) a combination of the above. Additional research is needed to investigate how differences in food expenditures translate into actual intake of food and nutrients for the two types of households.

References

Allin, S., H. Beebout, P. Doyle, and C. Trippe. "Current Perspectives on Food Stamp Program Participation." Paper presented at the Food and Nutrition Service Research Conference on Food Stamp Policy Issues: Results from Recent Research. Washington, DC. February 22, 1990.

Andrews, M.S., J. Gerson, and M. Stuart. "Gender-Based Differences in Food Consumption: A Comparison of Food Spending Patterns for Female and Dual-Headed Households in the United States, 1985." Paper presented at the Second Annual Women's Policy Research Conference. Washington, DC. June 1-2, 1990.

Bassi, L.J. "Poverty Among Women and Children: What Accounts for the Change?" AEA Papers and Proceedings 78 (2): 91-95. May 1988.

Beller, A.H., and J.W. Graham. "Child Support Payments: Evidence From Repeated Cross Sections." AEA Papers and Proceedings 78 (2): 81-85. May 1988.

Blackburn, M.L. "Trends in Poverty in the United States, 1967-84." Review of Income and Wealth 36 (1): 53-66. March 1990.

Blaylock, J.R., and D.M. Smallwood. U.S. Demand for Food: Household Expenditures, Demographics, and Projections. TB-1713. U.S. Dept. Agr., Econ. Res. Serv. 1986.

Boyle, M. "Spending Patterns and Income of Single and Married Parents." Monthly Labor Review 112 (3): 37-41. March 1989.

Cragg, J.G. "Some Statistical Models for Limited Dependent Variables with Application to the Demand for Durable Goods." Econometrica 39: 829-44. 1971.

Devaney, B., and T. Fraker. "The Effect of Food Stamps on Food Expenditures: An Assessment of Findings from the Nationwide Food Consumption Survey." American Journal of Agricultural Economics 71: 99-104. February 1989.

Fraker, T.M. The Effects of Food Stamps on Food Consumption: A Review of the Literature. U.S. Dept. Agr., Food Nutr. Serv. October 1990.

Haines, P.S., D.K. Guilkey, and B.M. Popkin. "Modeling Food Consumption Decisions as a Two-Step Process." American Journal of Agricultural Economics 70: 543-52. August 1988.

Holmboe-Ottesen, G., O. Mascarenhas, and M. Wandel. "Women's Role in Food Production and Nutrition: Implications for Their Quality of Life." Food and Nutrition Bulletin 10: 8-15. 1988.

Horton, S., and C. Campbell. "Wife's Employment, Food Expenditures, and Apparent Nutrient Intake: Evidence from Canada." American Journal of Agricultural Economics 73: 784-94. August 1991.

Klein, B.W., and P.L. Rones. "A Profile of the Working Poor." Monthly Labor Review, pp. 3-13. October 1989.

Kniesner, T.J., M.B. McElroy, and S.P. Wilcox. "Getting Into Poverty Without a Husband, and Getting Out, With or Without." AEA Papers and Proceedings 78 (2): 86-90. May 1988.

Lin, T.F., and P. Schmidt. "A Test of the Tobit Specification Against an Alternative Suggested by Cragg." Review of Economics & Statistics 66: 174-77. 1984.

Maddala, G.S. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press. 1987.

McDonald, J.., and R.A. Moffitt. "The Uses of Tobit Analysis." Review of Economics & Statistics 63: 318-21. 1981.

Novak, M. "The Truth About Poverty." Forbes p. 82. December 11, 1989.

Putler, D.S., and E. Frazao. "Assessing the Effects of Diet/Health Awareness on the Consumption and Composition of Fat Intake." The Economics of Food Safety. J.A. Caswell, ed. Ames, IA: Iowa State University Press. 1991a.

_____. "Diet and Health Concerns About Fat Intake." Food Review, Vol. 14, Issue 1. January - March 1991b.

Rawlings, S.W. "Single Parents and Their Children." Studies in Marriage and The Family. Current Population Reports, Special Studies, Series P-23, No. 162. U.S. Dept. Comm., Bur. Cen. 1989.

Salathe, L.E., and R.C. Buse. Household Food Consumption Patterns in the United States. TB-1587. U.S. Dept. Agr., Econ., Stat., Coop. Serv. January 1979.

Smallwood, D.M., N. Blisard, and J.R. Blaylock. Food Spending in American Households, 1980-1988. SB-824. U.S. Dept. Agr., Econ. Res. Serv. 1991.

U.S. Department of Agriculture, Food and Nutrition Service. Characteristics of Food Stamp Households. Office of Analysis and Evaluation. Summer 1988.

U.S. Department of Commerce, Bureau of the Census. Changes in American Family Life. Current Population Reports, Special Studies, Series P-23, No. 163. 1989a.

_____. Money Income and Poverty Status in the United States: 1988. Current Population Reports, Consumer Income, Series P-60, No. 166. 1989b.

Williams, R.L., J.T. Lessler, S.C. Wheeless, and J.B. Wildfire. Study of WIC Participant and Program Characteristics, 1988. Final Report. Volume 1: Summary of Findings. Prepared for Food and Nutrition Service, U.S. Dept. Agr., contract number 53-3198-7-57. Research Triangle Institute, NC. April 10, 1990.

Appendix 1--Definitions of Food Groups

Bakery and cereal products - Includes bread (white and other than white), crackers, cookies, biscuits and rolls, cakes, cupcakes, bread and cracker products, pies, tarts, sweet rolls, coffee cakes, doughnuts, other specified frozen and refrigerated bakery products, such as cookies, bread and cake dough, and batter, ready-to-eat and cooked cereals, pasta, flour, prepared flour mixes, and other cereal products, such as cornmeal, cornstarch, and rice.

Beef - Includes ground beef, roasts, steaks, veal, and other cuts of beef, excluding canned beef.

Beverages - Refers to nonalcoholic beverages, such as diet and nondiet carbonated drinks (cola, fruit, and other carbonated drinks), coffee (roasted, instant, and freeze-dried), tea (loose, instant, and ready-to-drink), and other nonalcoholic beverages, including noncarbonated fruit drinks, breakfast substitutes, chocolate-flavored powders, and other specified nonalcoholic beverages.

Dairy products - Includes fresh whole milk and other fresh milks (such as buttermilk), fresh cream (table cream, whipping cream, fresh sour cream, and fresh sour cream dressings), butter, cheese, ice cream and ice-cream products, yogurt, powdered milk, condensed and evaporated milk, liquid and powdered diet beverages, malted milk, milk shakes, chocolate milk, and other specified dairy products.

Eggs - Includes fresh eggs, powdered eggs, and egg substitutes.

Fats and oils - Includes margarine, shortening and salad dressings, nondairy cream substitutes and imitation milk, and peanut butter.

Fish and seafood - Includes canned fish and seafood and fresh and frozen finfish and shellfish.

Food away from home - Includes lunch, dinner, breakfast, brunch, snacks, and nonalcoholic beverages at restaurants, vending machines, and carryouts, including tips; also includes board, meals for someone away at school, and catered affairs.

Fruits - Includes all fresh fruits, frozen fruits and fruit juices, canned and dried fruits, and canned or bottled fruit juices.

Miscellaneous prepared foods - Includes frozen prepared meals and other foods, canned and packaged soups, potato chips, nuts, and other snacks, condiments and seasonings, olives, pickles, relishes, sauces and other gravies, baking needs and other specified condiments, other canned and packaged prepared foods, salads, desserts, and baby foods.

Other meats - Includes frankfurters, lunch meats, such as bologna, liverwurst, and salami, lamb, mutton, goat, and game.

Pork - Includes bacon, pork chops, ham (including canned), roasts, sausage, and other cuts of pork.

Poultry - Includes fresh and frozen chickens and other fresh and frozen poultry (cornish hens, turkey, duck, etc.).

Sugars and sweets - Includes sugar, candy, and chewing gum, artificial sweeteners, jams, jellies, preserves, fruit butters, syrup, fudge mixes, icings, and other prepared sweets.

Vegetables - Includes all fresh, frozen, canned, and dried vegetables, and vegetable juices.

Appendix 2--Problems with the Food-Stamp Variable

Problems with the food stamp variable surfaced in preliminary analyses in which the value of the food stamp benefits was entered as a separate variable from the value of money income. The results did not support the common empirical evidence of a marginal propensity to spend for food out of food stamps that was greater than the marginal propensity to spend for food out of money income. Further examination of the data revealed that 40 percent of the households receiving food stamps reported monthly values of food expenditures that were lower than the monthly value of food stamps received.

Part of the problem might be due to the manner in which the CCES collected data on participation in the Food Stamp Program. The CCES did not obtain information on whether the household was a current participant in the Food Stamp Program, and the information used to determine current participation status (date food stamps were last received in the past month) presented problems (described below). In addition, some respondents

might have misinterpreted the question, and reported only their money expenditures for food, not including the value of expenditures made with the coupons. Finally, food spending patterns could differ according to time of month and proximity of the survey period to receipt of food stamps (see below), so that information on food expenditures over a 2-week period may underestimate the value of monthly expenditures for food.

Program Participation Status

The CCES collected data on food stamps using five queries:

8a. "During the past 12 months have any members of your CU[14] received any food stamps?"

b. "In how many of the past 12 months were food stamps received?"

9a. "In the past month, have any members of your CU received any food stamps?"

b. "When were food stamps received? (list all dates on which stamps were received during the past month)"

c. "What is the dollar value of the food stamps received on (date in b)."

How respondents interpreted the time frame "in the past month" of question 9 is unclear. From the raw data, it seems as if some respondents interpreted it to mean "in the past 30 days," whereas others interpreted it to mean "in the month prior to this one." There might also have been other interpretations, because some respondents reported dates for three consecutive months. As a hypothetical illustration, one respondent interviewed on March 10 might report that food stamps were received March 3, whereas another respondent interviewed on the same date might report that food stamps were received February 3, and yet another respondent might report that food stamps were received February 3, and January 3. Since the questionnaire does not provide information about whether the consumer unit is still a Food Stamp Program participant, whether the reported date of February 3 represents the last time they received food stamps, or just the date in the past (previous) month is unclear.

Of the 103 households in the study sample that reported receiving food stamps in the past 12 months, 12 households (12 percent) reported a date more than 30 days prior to the survey. Ascertaining whether those 12 households interpreted the question to mean "in the previous month," or whether they were no longer receiving food stamps and that was actually the last date they received food stamps is not possible. For purposes of this analysis, we assumed that if the date reported was in the previous month, the household was still receiving food stamps, and the respondent had interpreted the question to mean "in the month before this one." However, this assumption could be wrong, and some of those 12 households might no longer be receiving food stamps. In those cases, food expenditures for the current month might be quite low, perhaps even lower than the value of food stamps the household used to receive.

Food Spending Patterns

Another problem involving the use of food stamps relates to the fact that the time units for food stamps and food expenditures are different. Respondents report the value of food stamps received for a month, but their food expenditures cover only a 2-week period. Although it is mathematically easy to convert the 2 weeks of food expenditures into a monthly value, there is an important (implicit) assumption behind such transformation. This assumption is that, for all households, food expenditures over any 2-week period represent approximately half of the food expenditures over a month.

It is not clear how reasonable this assumption is. Consumer units facing a budget constraint may do their bulk food shopping immediately after a pay period, before all the money disappears. Or, among households receiving food stamps, the bulk food shopping may occur shortly after receiving the food stamps. Towards the

[14] CU denotes consumer unit.

end of the month these households might buy less, buy lower quality foods, or supplement their food stocks with milk and other perishable foods. A comparison between food stamp recipient households and low-income nonrecipient households, using data from USDA's 1979-80 Survey of Food Consumption in Low-Income Households, supports this hypothesis. Among food stamp recipients, 39 percent reported doing their major food shopping on a monthly basis, and 47 percent reported doing their major food shopping every week or every other week. Among the low-income nonrecipients, however, only 10 percent reported doing their major food shopping on a monthly basis, whereas 70 percent reported doing their major food shopping every week or every other week (Fraker, 1990).

For consumer units that do not face a severe budget constraint, time constraints might dictate the convenience of fewer but larger shopping trips, supplemented by occasional smaller purchases of fresh foods. Either way, the information obtained over a 2-week period might not represent accurate monthly estimates of food expenditures. If the 2-week period covers a major shopping trip, conversion of the 2-week average into monthly estimates would overestimate the household's true monthly expenditures for food. Conversely, if the 2-week period does not cover the time period of a major shopping trip, conversion of the 2-week average into monthly estimates would underestimate the household's true monthly expenditures for food. There is no information available about monthly patterns for food spending, so this assumption cannot be tested.

Because of these difficulties in dealing with the food stamp variable, we decided to include the value of food stamps in the measure of household income, rather than keep the value of food stamps as a separate variable.

Appendix 3--Results from the Tobit, Truncated, and Probit Regressions for Each of the 15 Disaggregated Food Categories

Appendix table 1--Bakery and cereal products[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	7.74*	(4.55)	-4.42	(8.31)	3.45*	(2.09)
LN (INCOME)	1.30***	(.29)	2.21***	(.57)	.18	(.12)
DFOOD STAMPS	.29	(.86)	.55	(1.73)	-.32	(.33)
1/HHESIZE	5.74	(3.76)	16.33**	(6.69)	-2.98*	(1.67)
PROP04	-4.38*	(2.41)	-8.92**	(4.41)	-.51	(1.17)
PROP511	-.19	(2.10)	-.62	(3.67)	-.13	(1.06)
PROP1218	.60	(2.19)	-.25	(3.80)	1.43	(1.21)
DWINTER	.80	(.54)	1.58*	(.95)	-.09	(.26)
DSPRING	-.003	(.55)	.10	(.99)	-.06	(.26)
DSUMMER	.58	(.54)	1.15	(.96)	-.11	(.25)
DMIDWEST	-1.89***	(.60)	-3.19***	(1.02)	-.06	(.38)
DSOUTH	-2.78***	(.59)	-4.52***	(1.04)	-.56*	(.34)
DWEST	-1.45**	(.60)	-1.91*	(1.02)	-.57*	(.34)
AGE	-.50**	(.23)	-.54	(.41)	-.05	(.11)
AGESQ	.009***	(.003)	.01**	(.006)	.002	(.002)
DBLACK	-1.79**	(.70)	-4.65***	(1.46)	.26	(.34)
DHIGH SCHOOL	1.66***	(.64)	3.04**	(1.21)	.06	(.29)
DFULLTIME	-1.33***	(.42)	-2.33***	(.75)	-.21	(.20)
DFEMALEHEAD	-.80	(.91)	-1.79	(1.65)	.11	(.47)
Log likelihood	-3,729.1		-3,513.9		-99.9	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 2--Beef products[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	4.50	(6.04)	-88.47	(62.40)	.87	(.94)
LN (INCOME)	.74*	(.39)	4.77	(4.19)	.09	(.06)
DFOOD STAMPS	3.04***	(1.14)	26.60**	(12.19)	.19	(.18)
1/HHESIZE	3.81	(4.98)	133.72**	(55.03)	-1.81**	(.78)
PROP04	-3.75	(3.18)	-17.17	(31.60)	-.89*	(.51)
PROP511	-2.42	(2.75)	-29.73	(27.44)	-.27	(.46)
PROP1218	1.60	(2.87)	-7.40	(26.94)	.34	(.49)
DWINTER	1.17	(.71)	.99	(7.20)	.31***	(.12)
DSPRING	1.70**	(.72)	7.72	(7.16)	.25**	(.12)
DSUMMER	1.29*	(.72)	10.43	(7.25)	.09	(.11)
DMIDWEST	-1.05	(.79)	-6.43	(7.70)	-.11	(.13)
DSOUTH	-.36	(.78)	.12	(7.21)	-.08	(.13)
DWEST	.30	(.79)	-.47	(7.39)	.11	(.13)
AGE	-.34	(.31)	-2.40	(2.70)	.007	(.05)
AGESQ	.006	(.004)	.04	(.04)	-.0002	(.0007)
DBLACK	-.68	(.92)	-10.32	(10.04)	.07	(.15)
DHIGH SCHOOL	-.05	(.83)	6.61	(7.97)	-.17	(.14)
DFULLTIME	-1.62***	(.55)	-8.86	(5.76)	-.24***	(.09)
DFEMALEHEAD	-2.01*	(1.21)	-10.72	(12.12)	-.22	(.19)
Log likelihood	-3,338.5		-2,604.5		-587.9	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 3--Nonalcoholic beverages[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	4.69	(4.09)	-21.68	(13.54)	2.27*	(1.27)
LN (INCOME)	.94***	(.26)	3.01***	(.96)	.08	(.08)
DFOOD STAMPS	-.35	(.78)	-3.67	(3.07)	-.03	(.22)
1/HHESIZE	6.65*	(3.40)	30.69***	(11.04)	-1.03	(.96)
PROP04	-2.71	(2.18)	-7.74	(7.33)	-.87	(.66)
PROP511	-.45	(1.89)	-1.46	(6.02)	-.31	(.59)
PROP1218	2.54	(1.97)	3.70	(6.11)	.91	(.65)
DWINTER	.50	(.49)	1.40	(1.61)	.04	(.15)
DSPRING	1.09**	(.49)	3.46**	(1.63)	.13	(.15)
DSUMMER	1.50***	(.49)	4.46***	(1.58)	.12	(.15)
DMIDWEST	-1.01*	(.54)	-3.54**	(1.69)	.08	(.17)
DSOUTH	-1.59***	(.53)	-4.42***	(1.72)	-.22	(.16)
DWEST	-.004	(.54)	.02	(1.60)	.05	(.17)
AGE	-.41*	(.21)	-.71	(.64)	-.04	(.07)
AGESQ	.007**	(.003)	.01	(.008)	.0004	(.0009)
DBLACK	-1.31**	(.63)	-6.27**	(2.58)	-.05	(.18)
DHIGH SCHOOL	.23	(.57)	.75	(1.85)	-.007	(.18)
DFULLTIME	-.63*	(.38)	-.80	(1.20)	-.30**	(.12)
DFEMALEHEAD	-1.23	(.83)	-2.41	(2.74)	-.31	(.24)
Log likelihood	-3,429.9		-2,965.8		-318.5	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 4--Dairy products[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	5.56	(4.38)	-7.18	(8.47)	4.02**	(1.89)
LN (INCOME)	1.01***	(.28)	1.69***	(.58)	.18*	(.10)
DFOOD STAMPS	-.20	(.83)	-1.30	(1.80)	-.05	(.32)
1/HHESIZE	3.35	(3.62)	11.40*	(6.84)	-1.53	(1.45)
PROP04	-3.30	(2.32)	-6.64	(4.45)	-.02	(1.00)
PROP511	-3.60*	(2.02)	-8.14**	(3.83)	.46	(.90)
PROP1218	-2.24	(2.11)	-6.26	(3.95)	1.33	(1.03)
DWINTER	1.36***	(.52)	2.44**	(.99)	.19	(.22)
DSPRING	.58	(.53)	1.25	(1.03)	-.004	(.21)
DSUMMER	1.15**	(.52)	1.86*	(1.00)	.27	(.23)
DMIDWEST	-1.73***	(.58)	-2.94***	(1.07)	-.44	(.33)
DSOUTH	-2.24***	(.57)	-3.90***	(1.08)	-.58*	(.32)
DWEST	-.91	(.58)	-.87	(1.04)	-.72**	(.32)
AGE	-.24	(.23)	.16	(.42)	-.11	(.10)
AGESQ	.005	(.003)	.005	(.006)	.001	(.002)
DBLACK	-2.87***	(.67)	-6.79***	(1.67)	-.41*	(.22)
DHIGH SCHOOL	1.33**	(.61)	3.46***	(1.28)	-.41	(.32)
DFULLTIME	-.67*	(.40)	-1.07	(.77)	-.20	(.17)
DFEMALEHEAD	.56	(.88)	.95	(1.69)	.06	(.39)
Log likelihood	-3,658.3		-3,405.4		-141.9	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 5--Eggs[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	2.04**	(.84)	2.71*	(1.62)	1.15	(.90)
LN (INCOME)	.04	(.05)	-.01	(.11)	.04	(.06)
DFOOD STAMPS	.09	(.16)	.23	(.32)	.02	(.17)
1/HHESIZE	-.85	(.70)	3.50**	(.36)	-2.32***	(.75)
PROP04	-.70	(.44)	-1.80**	(.93)	-.16	(.49)
PROP511	-.20	(.39)	-1.15	(.77)	.27	(.43)
PROP1218	-.20	(.40)	-1.79**	(.81)	.60	(.45)
DWINTER	.04	(.10)	-.49**	(.21)	.29**	(.11)
DSPRING	.02	(.10)	-.07	(.21)	.07	(.11)
DSUMMER	-.02	(.10)	.24	(.20)	-.12	(.11)
DMIDWEST	-.42***	(.11)	-1.10***	(.25)	-.12	(.12)
DSOUTH	-.27**	(.11)	-.73***	(.22)	-.05	(.12)
DWEST	.01	(.11)	.24	(.21)	-.08	(.12)
AGE	-.07	(.04)	-.12	(.08)	-.02	(.05)
AGESQ	.001*	(.0006)	.002*	(.001)	.0003	(.0006)
DBLACK	.15	(.13)	.31	(.25)	.07	(.14)
DHIGH SCHOOL	-.22*	(.12)	-.71***	(.22)	.03	(.13)
DFULLTIME	.03	(.08)	.23	(.16)	-.04	(.08)
DFEMALEHEAD	-.02	(.17)	.16	(.32)	-.09	(.19)
Log likelihood	-1,558.3		-811.2		-673.2	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 6--Fats and oils[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	-2.15	(1.70)	-14.73***	(4.81)	.62	(.92)
LN (INCOME)	.23**	(.11)	.36	(.29)	.09	(.06)
DFOOD STAMPS	.06	(.32)	-.39	(.88)	.03	(.17)
1/HHESIZE	1.86	(1.46)	12.95***	(3.63)	-.87	(.74)
PROP04	1.05	(.89)	1.30	(2.24)	.60	(.50)
PROP511	1.04	(.77)	-.54	(1.92)	.91**	(.43)
PROP1218	1.36*	(.81)	-1.21	(2.02)	1.30***	(.45)
DWINTER	.39**	(.20)	-.36	(.49)	.37***	(.11)
DSPRING	.09	(.20)	-.41	(.52)	.11	(.11)
DSUMMER	.37*	(.20)	.27	(.49)	.19*	(.11)
DMIDWEST	-.26	(.22)	-.21	(.54)	-.16	(.13)
DSOUTH	-.55**	(.22)	-.26	(.54)	-.35***	(.12)
DWEST	.05	(.22)	.95*	(.53)	-.18	(.13)
AGE	.005	(.09)	.39*	(.22)	-.06	(.05)
AGESQ	.0006	(.001)	-.004	(.003)	.0009	(.0007)
DBLACK	-.47*	(.16)	-.85	(.78)	-.19	(.14)
DHIGH SCHOOL	.46*	(.24)	.13	(.62)	.33***	(.13)
DFULLTIME	-.41***	(.16)	-.49	(.39)	-.23***	(.09)
DFEMALEHEAD	.70**	(.34)	-.07	(.87)	-.47**	(.18)
Log likelihood	-2,126.9		-1,431.1		-639.8	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 7--Fish and seafood[1, 2]

Variable	Tobit		Probit	
CONSTANT	-8.30*	(4.48	-1.04	(.87)
LN (INCOME)	.96***	(.30)	.10*	(.06)
DFOOD STAMPS	.16	(.87)	-.04	(.17)
1/HHESIZE	.14	(3.69)	-.53	(.72)
PROP04	-1.29	(2.36)	-.61	(.46)
PROP511	-1.03	(2.02)	-.15	(.40)
PROP1218	-.53	(2.12)	.06	(.42)
DWINTER	1.02*	(.52)	.35***	(.10)
DSPRING	.69	(.53)	.19*	(.10)
DSUMMER	.69	(.53)	.13	(.10)
DMIDWEST	-2.31***	(.57)	-.34***	(.11)
DSOUTH	-1.89***	(.57)	-.38***	(.11)
DWEST	-1.03*	(.57)	-.19	(.12)
AGE	.13	(.22)	.05	(.05)
AGESQ	-.0009	(.003)	-.0006	(.0006)
DBLACK	.47	(.68)	.16	(.13)
DHIGH SCHOOL	-.32	(.61)	-.17	(.12)
DFULLTIME	-1.27***	(.41)	-.23***	(.08)
DFEMALEHEAD	-.45	(.90)	-.17	(.17)
Log likelihood	-2,131.2		-756.5	

[1] Standard errors in parentheses.
[2] Truncated regression not available, regression did not converge.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 8--Food away from home[1]

Variable	Tobit		Truncated[2]		Probit	
CONSTANT	-46.92*	(26.70)	-409.59***	(107.97)	.46	(1.33)
LN (INCOME)	16.32***	(1.79)	58.35***	(8.64)	.48***	(.08)
DFOOD STAMPS	-10.34**	(5.23)	-74.18**	(30.69)	-.39**	(.70)
1/HHESIZE	37.94*	(22.11)	153.32*	(80.26)	-.40	(1.03)
PROP04	-35.22**	(14.14)	-158.07***	(55.84)	-.86	(.72)
PROP511	-16.26	(12.23)	-67.34	(45.58)	-.46	(.65)
PROP1218	2.28	(12.79)	-12.61	(45.73)	.27	(.70)
DWINTER	1.38	(3.15)	.63	(11.64)	.07	(.18)
DSPRING	7.98**	(3.19)	33.74***	(11.29)	-.20	(.16)
DSUMMER	2.34	(3.17)	10.80	(11.24)	-.13	(.17)
DMIDWEST	.30	(3.48)	-.27	(12.25)	.02	(.19)
DSOUTH	1.79	(3.45)	-.91	(11.90)	.20	(.19)
DWEST	-4.74	(3.51)	-16.84	(12.86)	-.13	(.18)
AGE	-2.24	(1.37)	-4.57	(4.96)	-.09	(.07)
AGESQ	.03*	(.02)	.07	(.065)	.001	(.001)
DBLACK	-7.00*	(4.13)	-18.64	(17.47)	-.34*	(.18)
DHIGH SCHOOL	9.26**	(3.77)	32.48**	(16.04)	.32*	(.17)
DFULLTIME	4.94**	(2.43)	19.65**	(8.87)	-.004	(.13)
DFEMALEHEAD	-.12	(5.38)	3.67	(20.75)	-.09	(.25)
Log likelihood	-5,373.3		-4,798.4		-249.7	

[1] Standard errors in parentheses.
[2] Used BHHH algorithm.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 9--Fruits[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	-7.24*	(4.29)	-65.29***	(21.51)	-.55	(1.16)
LN (INCOME)	1.18***	(.28)	4.83***	(1.49)	.13*	(.07)
DFOOD STAMPS	-.75	(.82)	-3.02	(4.36)	-.19	(.20)
1/HHESIZE	7.80**	(3.56)	42.92***	(15.94)	-.34	(.90)
PROP04	1.24	(2.27)	.35	(9.84)	.66	(.63)
PROP511	1.05	(1.89)	-3.74	(8.40)	.91	(.56)
PROP1218	-1.95	(2.06)	-15.32*	(9.11)	.66	(.59)
DWINTER	.34	(.51)	-.64	(2.20)	.26*	(.15)
DSPRING	.25	(.52)	.31	(2.25)	.10	(.14)
DSUMMER	1.40***	(.51)	3.71*	(2.11)	.28*	(.14)
DMIDWEST	-1.49***	(.56)	-7.08***	(2.49)	.03	(.16)
DSOUTH	-1.53***	(.56)	-7.02***	(2.45)	-.02	(.16)
DWEST	-.40	(.57)	-.50	(2.19)	-.12	(.16)
AGE	.03	(.22)	.37	(.91)	.02	(.06)
AGESQ	.002	(.003)	.003	(.01)	.00006	(.0009)
DBLACK	-.10	(.66)	-.86	(3.04)	-.03	(.17)
DHIGH SCHOOL	.99*	(.60)	2.98	(2.87)	.27*	(.15)
DFULLTIME	-.98**	(.39)	-1.97	(1.69)	-.36***	(.11)
DFEMALEHEAD	-.76	(.86)	-.21	(3.84)	-.40*	(.23)
Log likelihood	-3,423.8		-2,897.3		-355.6	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 10--Miscellaneous and prepared products[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	-1.74	(5.85)	-23.92	(16.80)	.45	(1.17)
LN (INCOME)	1.06***	(.37)	2.27**	(1.12)	.14*	(.07)
DFOOD STAMPS	.66	(1.11)	2.65	(3.51)	-.08	(.21)
1/HHESIZE	7.78	(4.82)	36.50**	(14.30)	-.96	(.93)
PROP04	-2.56	(3.08)	-7.93	(8.88)	.11	(.66)
PROP511	-4.76*	(2.68)	-17.70**	(7.90)	.37	(.58)
PROP1218	-.89	(2.80)	-10.33	(8.12)	1.26**	(.63)
DWINTER	1.90***	(.69)	3.60*	(1.91)	.35**	(.16)
DSPRING	.48	(.70)	-.47	(2.04)	.23	(.15)
DSUMMER	.61	(.70)	1.77	(1.98)	-.02	(.14)
DMIDWEST	.71	(.76)	2.14	(2.13)	.01	(.16)
DSOUTH	-.74	(.76)	-2.47	(2.22)	-.05	(.16)
DWEST	1.16	(.77)	1.64	(2.13)	.34*	(.18)
AGE	-.19	(.30)	-.37	(.82)	-.005	(.06)
AGESQ	.003	(.004)	.007	(.01)	-.00006	(.0008)
DBLACK	-2.60***	(.90)	-10.16***	(3.39)	-.10	(.17)
DHIGH SCHOOL	3.07***	(.82)	9.35***	(2.91)	.32**	(.16)
DFULLTIME	-.90*	(.54)	-1.76	(1.52)	-.17	(.12)
DFEMALEHEAD	-1.20	(1.17)	-2.63	(3.59)	-.25	(.24)
Log likelihood	-3,794.6		-3,353.4		-315.8	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 11--Other meats[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	0.18	(2.74)	-21.10	(16.56)	0.22	(0.91)
LN (INCOME)	.25	(.18)	2.15*	(1.14)	.06	(.06)
DFOOD STAMPS	-.02	(.52)	1.43	(3.17)	.12	(.17)
1/HHESIZE	4.29*	(2.26)	45.62***	(15.56)	-.60	(.75)
PROP04	-.33	(1.44)	-3.66	(8.34)	-.29	(.50)
PROP511	2.21*	(1.25)	2.89	(7.02)	.12	(.44)
PROP1218	3.58***	(1.30)	10.98	(7.40)	.19	(.46)
DWINTER	-.31	(.32)	-2.92	(1.89)	.02	(.11)
DSPRING	-.37	(.33)	-1.99	(1.85)	.02	(.11)
DSUMMER	.12	(.32)	.22	(1.67)	.07	(.11)
DMIDWEST	-.12	(.36)	-.04	(1.81)	-.01	(.13)
DSOUTH	-.62*	(.35)	-2.54	(1.95)	-.14	(.12)
DWEST	-.15	(.36)	-.74	(1.88)	-.11	(.13)
AGE	-.11	(.14)	-.94	(.76)	-.03	(.05)
AGESQ	.002	(.002)	.01	(.01)	.0005	(.0007)
DBLACK	-.26	(.42)	.55	(2.42)	-.18	(.14)
DHIGH SCHOOL	.64*	(.38)	3.57	(2.34)	.13	(.13)
DFULLTIME	-.70***	(.25)	-2.34	(1.44)	-.08	(.09)
DFEMALEHEAD	-1.62***	(.55)	-7.38**	(3.63)	-.16	(.19)
Log likelihood	-2,458.0		-1,849.6		-627.5	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 12--Pork[1]

Variable	Tobit		Truncated[2]		Probit	
CONSTANT	-.80	(4.60)	-95.66***	(34.69)	.83	(.89)
LN (INCOME)	.96***	(.30)	9.37***	(2.68)	-.005	(.06)
DFOOD STAMPS	2.04**	(.87)	19.55***	(6.22)	-.09	(.17)
1/HHESIZE	-2.55	(3.75)	30.37	(20.39)	-1.34*	(.74)
PROP04	-2.19	(2.41)	-11.99	(14.57)	.033	(.47)
PROP511	.29	(2.08)	-2.22	(11.77)	.93**	(.41)
PROP1218	1.09	(2.17)	4.76	(11.95)	1.08**	(.43)
DWINTER	.36	(.54)	2.68	(3.09)	.06	(.11)
DSPRING	.13	(.55)	.28	(3.16)	-.07	(.11)
DSUMMER	.14	(.54)	-1.91	(3.13)	.03	(.11)
DMIDWEST	-.41	(.59)	-2.79	(3.35)	-.05	(.12)
DSOUTH	-.79	(.59)	-5.36	(3.44)	-.08	(.12)
DWEST	-.44	(.60)	-.09	(3.31)	-.02	(.12)
AGE	-.21	(.24)	-.10	(1.31)	.01	(.05)
AGESQ	.004	(.003)	.006	(.02)	.00003	(.0006)
DBLACK	1.55**	(.69)	9.53**	(4.07)	.18	(.14)
DHIGH SCHOOL	-.14	(.63)	-2.30	(3.55)	.003	(.12)
DFULLTIME	-.22	(.42)	.15	(2.41)	-.20**	(.08)
DFEMALEHEAD	-.48	(.91)	1.70	(4.88)	-.36*	(.18)
Log likelihood	-2,731.2		1,900.6		-722.8	

[1] Standard errors in parentheses.
[2] Used BHHH algorithm.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 13--Poultry[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	-1.77	(3.79)	-47.74***	(18.06)	.68	(.88)
LN (INCOME)	.80***	(.24)	3.42***	(1.17)	.10*	(.06)
DFOOD STAMPS	2.04***	(.71)	4.29	(2.93)	.48***	(.17)
1/HHESIZE	-2.95	(3.11)	22.50*	(11.93)	-1.76**	(.73)
PROP04	-3.86*	(1.99)	2.37	(7.92)	-1.19**	(.47)
PROP511	-1.93	(1.72)	-1.91	(6.73)	-.53	(.40)
PROP1218	-2.21	(1.80)	-1.65	(6.96)	-.62	(.42)
DWINTER	.62	(.45)	-.96	(1.71)	.23**	(.11)
DSPRING	.75*	(.45)	-.72	(1.70)	.25**	(.11)
DSUMMER	.15	(.45)	-1.33	(1.74)	.10	(.10)
DMIDWEST	-2.05***	(.49)	-4.42**	(2.00)	-.42***	(.12)
DSOUTH	-1.41***	(.48)	-1.84	(1.72)	-.34***	(.12)
DWEST	-1.18**	(.49)	-.20	(1.73)	-.34***	(.12)
AGE	-.03	(.19)	.41	(.73)	-.0007	(.05)
AGESQ	.001	(.003)	-.0008	(.009)	.00005	(.0006)
DBLACK	1.10*	(.56)	1.49	(2.08)	.28**	(.14)
DHIGH SCHOOL	.27	(.52)	1.92	(2.04)	-.17	(.13)
DFULLTIME	.006	(.34)	.39	(1.31)	-.01	(.08)
DFEMALEHEAD	-.62	(.75)	.63	(2.86)	-.19	(.18)
Log likelihood	-2,425.3		-1,644.3		-733.6	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 14--Sugars and sweets[1]

Variable	Tobit		Truncated[2]		Probit	
CONSTANT	2.28	(2.61)	-25.49*	(15.14)	1.50	(.97)
LN (INCOME)	.52***	(.17)	3.30***	(1.13)	.06	(.06)
DFOOD STAMPS	-.08	(.50)	2.10	(3.06)	-.17	(.17)
1/HHESIZE	.93	(2.16)	28.52**	(12.37)	-1.54*	(.79)
PROP04	-.25	(1.37)	-3.18	(7.66)	-.03	(.53)
PROP511	1.90	(1.18)	6.10	(6.41)	.60	(.47)
PROP1218	1.65	(1.24)	7.33	(6.64)	.33	(.48)
DWINTER	-.21	(.31)	-2.04	(1.57)	.07	(.12)
DSPRING	-.67**	(.31)	-5.45***	(1.92)	.05	(.12)
DSUMMER	-.81***	(.31)	-6.70***	(1.99)	.05	(.12)
DMIDWEST	-.45	(.34)	-3.46*	(1.80)	.06	(.13)
DSOUTH	-.65*	(.34)	-4.52**	(1.87)	.001	(.13)
DWEST	-.25	(.34)	-2.01	(1.73)	.04	(.13)
AGE	-.26*	(.13)	-.87	(.72)	-.06	(.05)
AGESQ	.004**	(.002)	.01	(.01)	.0009	(.0007)
DBLACK	-.66	(.40)	-2.06	(2.47)	-.24*	(.14)
DHIGH SCHOOL	.91**	(.36)	4.51**	(2.35)	.20	(.13)
DFULLTIME	.24	(.24)	-.76	(1.28)	-.08	(.09)
DFEMALEHEAD	-.53	(.52)	-2.31	(2.96)	-.16	(.20)
Log likelihood	-2,675.3		-1,961.4		-559.2	

[1] Standard errors in parentheses.
[2] Used BHHH algorithm.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.

Appendix table 15--Vegetables[1]

Variable	Tobit		Truncated		Probit	
CONSTANT	.43	(3.27)	-30.94***	(10.76)	-3.68***	(1.34)
LN (INCOME)	.37**	(.21)	1.07*	(.65)	.01	(.08)
DFOOD STAMPS	.06	(.62)	1.16	(1.99)	-.07	(.21)
1/HHESIZE	3.44	(2.71)	27.73***	(7.97)	-2.46**	(.98)
PROP04	-3.27*	(1.73)	-8.24	(5.31)	-.83	(.68)
PROP511	-3.48**	(1.50)	-12.46***	(4.59)	-.19	(.62)
PROP1218	-3.38**	(1.57)	-11.14**	(4.75)	-.38	(.65)
DWINTER	1.18***	(.39)	2.43**	(1.16)	.30**	(.15)
DSPRING	.04	(.39)	-1.38	(1.27)	.29**	(.15)
DSUMMER	.87**	(.39)	1.19	(1.17)	.39***	(.15)
DMIDWEST	-.55	(.43)	-.97	(1.27)	-.17	(.17)
DSOUTH	-.66	(.42)	-1.44	(1.27)	-.22	(.17)
DWEST	-.04	(.43)	.44	(1.25)	-.12	(.17)
AGE	.07	(.17)	.90*	(.51)	-.11	(.07)
AGESQ	.0003	(.002)	-.009	(.007)	.002*	(.001)
DBLACK	-.79	(.50)	-2.02	(1.70)	-.11	(.17)
DHIGH SCHOOL	.05	(.46)	.15	(1.40)	.10	(.17)
DFULLTIME	-.83***	(.30)	-2.18**	(.94)	-.18	(.12)
DFEMALEHEAD	.34	(.66)	1.97	(1.94)	-.20	(.26)
Log likelihood	-3,173.2		-2,692.4		-333.4	

[1] Standard errors in parentheses.
* Significant at the 10-percent level.
** Significant at the 5-percent level.
*** Significant at the 1-percent level.