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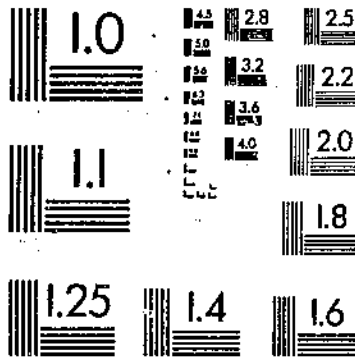
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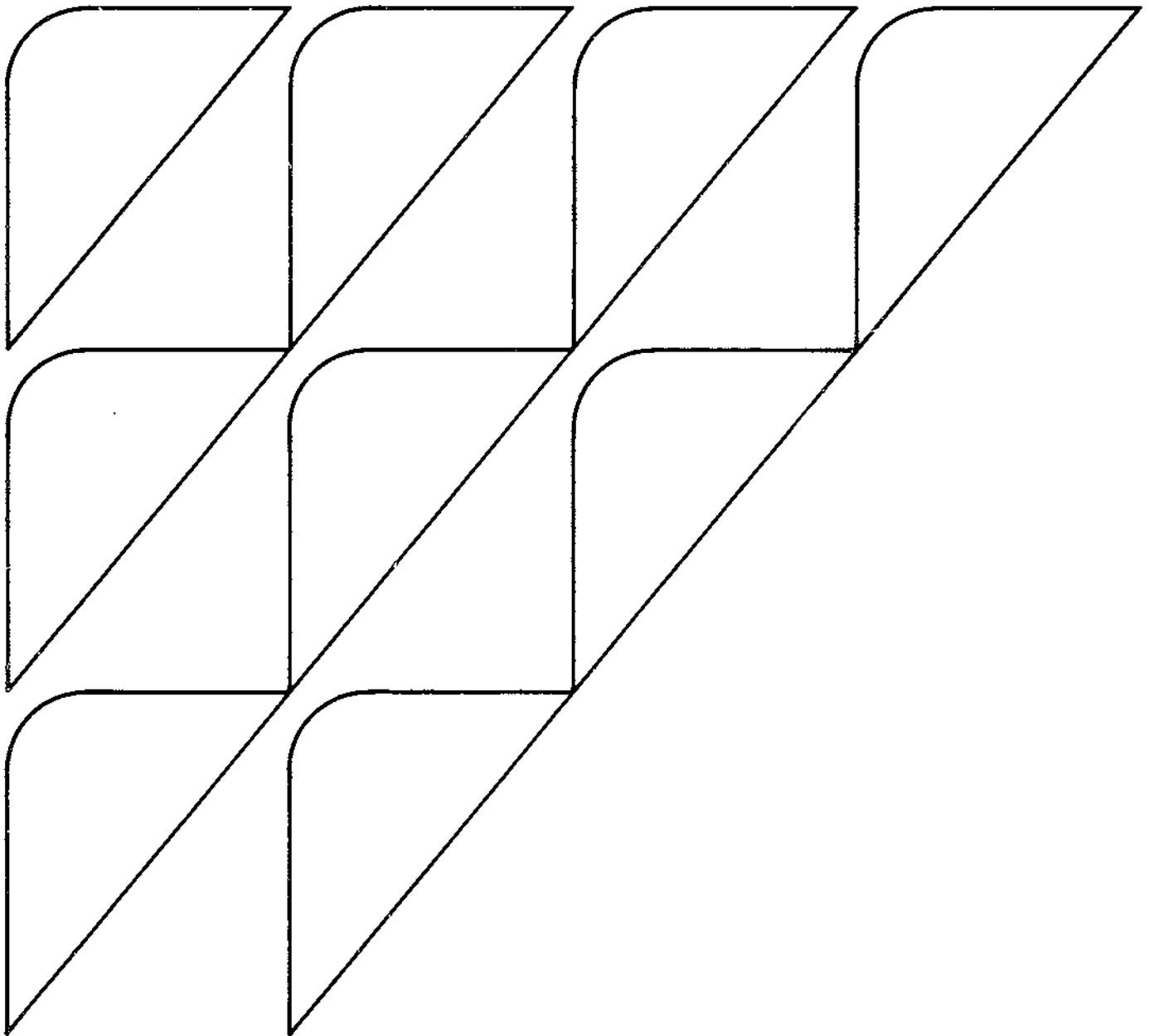
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# Household Expenditures for Fruits, Vegetables, and Potatoes

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**Household Expenditures for Fruits, Vegetables, and Potatoes.**

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**Abstract**

Higher income households spend more per person on most fruit, vegetable, and potato products than do lower income households but less on dried vegetables and canned potatoes. Similarly, households in the Northeast and in central city locations spend more for fruit, vegetable, and potato products than do others. This study measures the effects of income, household size and age composition, race, food stamp program participation, geographic region and urbanization of household residence, and season of the year on household expenditures for 32 fruit, vegetable, and potato products. The study is based on a tobit analysis of data obtained in the 1977-78 USDA Nationwide Food Consumption Survey.

**Keywords:** Fruits, vegetables, potatoes, household expenditures, socioeconomic characteristics, tobit analysis, 1977-78 USDA Nationwide Food Consumption Survey.

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## Summary

Higher income households spend more per person on most fruit, vegetable, and potato products than do lower income households but less on dried vegetables and canned potatoes. Similarly, households in the Northeast and in central city locations, as well as older persons, spend more on fruit, vegetable, and potato products than do others. Blacks and nonwhite/nonblacks spend 3.4 and 20.5 percent more, respectively, than do whites for fruits, vegetables, and potato products. Recipients of Federal food stamps spend more for vegetables and potatoes but less for fruit than do nonrecipients.

This study analyzes the impact of income and other household characteristics on per person expenditures for 32 fruit, vegetable, and potato groups and sub-groups using data from the U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey.

The authors used tobit analysis to obtain information on the relationship of income and other household characteristics to (1) changes in the proportion of consumers using the product and (2) changes in the level of expenditures by those already using the item. Tobit analysis is a statistical procedure used to analyze simultaneously both the probability and level of consumption. The household characteristics analyzed include income, household size and age composition, region and urban location of household, race, season of the year, and participation in the Federal food stamp program. Results can be used to estimate the effects of changing income and household characteristics on fruit, vegetable, and potato expenditures and the proportion of the market using these items during a given time period.

Simulation of consumption behavior using the estimated statistical model allows one to examine the individual effects of factors that influence consumption. Using this method, highlights for the seven factors analyzed in this study include the following:

*Income*—A 10-percent increase in income generates a 5.6-percent increase in expenditures on noncitrus fruits rich in vitamin C, such as melons and strawberries, a 4.75-percent increase in frozen vegetables, and more than a 2-percent increase in vegetable juice, fresh citrus fruit, frozen fruit juice, and dried fruit. However, the same increase in income decreases expenditures by more than 1 percent for dried vegetables and canned potatoes. As a whole, expenditures on fruits, vegetables, and potatoes increase about 1.23 percent with a 10-percent increase in income.

*Region*—Per person expenditures on fruits, vegetables, and potatoes are highest in the Northeast. Compared with consumers in the Northeast as a base, consumers in the South spend 18.1 percent less, those in the North Central region spend 17.4 percent less, and those in the West spend 6.4 percent less. Regional expenditure patterns for particular items may vary significantly from this average. For example, expenditures on potatoes are highest in the North Central region and lowest in the West.

*Urbanization*—Per person expenditures are highest in the central cities and lowest in the nonmetropolitan areas. This pattern holds for both fresh and processed items, but the differences are slightly larger for fresh items, as would be expected, because of gardening.



*Race*—Blacks spend approximately 3.4 percent more on fruits, vegetables, and potatoes consumed from home supplies than do whites, and the composite group of nonwhites/nonblacks spends about 20.5 percent more than do whites. However, these averages cannot be generalized to particular commodity groups due to wide variations.

*Season*—Expenditure levels for fruits, vegetables, and potatoes as a group are fairly constant across seasons, but there is substantial switching between fresh and processed items.

*Age*—Age is a major factor influencing per person expenditures on fruits, vegetables, and potatoes. Expenditure levels generally increase with age. Major exceptions are for the 0- to 2-year-old group which has the highest per person consumption of fruits, and teenagers who have the highest consumption of potato chips, potato sticks, and potato salads.

*Food stamp program*—Other factors being the same, participants in the Federal food stamp program are found to spend about 21 percent more for vegetables, 1 percent less for fruits, and 11 percent more for potatoes than do nonparticipants. Food stamp recipients generally spend relatively more on canned goods than on frozen goods compared with nonrecipients.

# Household Expenditures for Fruits, Vegetables, and Potatoes

David M. Smallwood and James R. Blaylock

## Introduction

American consumers spend approximately 16 cents out of every dollar spent on food to purchase fruits (6.7 cents), vegetables (7.3 cents), and potatoes (1.7 cents). Of each dollar spent on these food items, consumers spend approximately 25 cents on fresh vegetables, 21.3 cents on processed vegetables, 23.3 cents on fresh fruits, 19.6 cents on processed fruits, and 10.8 cents on potatoes (table 1). These figures are based on an analysis of data acquired in the 1977-78 USDA Nationwide Food Consumption Survey (NFCS), the most recent survey of its kind available. This study measures the influence of income and other household characteristics on the demand for purchased fruits, vegetables, and potatoes.

In 1981, fruits, vegetables, and potatoes accounted for about \$60.3 billion (21 percent) in consumer expenditures on domestically produced farm foods. At the farm level, they accounted for almost \$13.3 billion or 16 percent of the total farm value of foods (11). Not only do these figures show the importance of fruits, vegetables, and potatoes to farmers' income, but also the significant value added by transporters, processors, wholesalers, and retailers.

The dietary importance of fruits, vegetables, and potatoes is also obvious when one considers that they account for approximately 91 percent of ascorbic acid, 48 percent of vitamin A, 39 percent of magnesium, 36 percent of vitamin B<sub>6</sub>, and 28 percent of iron in our diets (10).

Future consumption patterns of fruits, vegetables, and potatoes will have important implications for consumers, producers, and marketers. These consumption patterns will be determined by changes in both supply and demand factors. Information contained in this report can be used to project consumer expenditures as income and the demographics of the population change.

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<sup>1</sup>Italicized numbers in parentheses refer to references in the Bibliography.

## Theoretical and Empirical Considerations

A traditional model of consumer budgeting, commonly referred to as Engel analysis, provides the economic framework for this study. Engel analysis, named after Ernst Engel who analyzed family budgets in the 1800's, is based on the classical theory of consumer demand and the assumption that prices are constant among consumers (1). According to classical demand theory, consumers seek to allocate their income among alternative goods in an effort to maximize their utility or well-being. Given constant prices, the budgeting model can be expressed mathematically as a set of expenditure functions, one for each good, and a budget restriction equating the sum of expenditures to consumer income.

Food consumption and budgeting patterns observed in cross-sectional survey data are "snapshots" of a wide variety of households in different circumstances. Analysts usually assume at the outset that the consumption patterns of similar households in different circumstances reflect what would occur if the circumstances changed for a particular household. One can then use statistical models to measure the implied behavioral response parameters. Hence, the fact that one does not usually observe a particular household under changing circumstances does not prevent the measurement of these response parameters.

In specifying a statistical model, one must establish controls for those household features which contribute substantially to differences in consumption among households. Income and household composition are the response parameters of primary importance in this study. Other determinants of consumption, such as geographic region, urbanization, and season of year, are also included in the model to improve the measurement and statistical properties of the model but are of less economic concern. The omission of a relevant explanatory variable which is correlated with an included variable will bias the parameter estimator for the corresponding included variable. Therefore, it is important to include all the relevant determinants of household consumption.

Household composition and size are considered two of the most important demand factors that help explain food consumption variation among households (9). Several alternative procedures have been used in Engel analyses to model these effects. At one extreme, each household member contributes equally to the household demand for food and, hence, household size is measured simply by the number of individuals residing in the household. No adjustments are made for either age or sex of the individual members. At the

**Table 1—Allocation of at-home food dollar to fruits, vegetables, and potatoes**

Item <sup>1</sup>	Budget dollar	
	Food at home	Fruits, vegetables, and potatoes
	Cents	
Food at home	100.0	<sup>2</sup>
Vegetables, fruits, and potatoes	15.7	100.0
Vegetables and potatoes	9.0	57.1
Vegetables and fruits	14.0	89.2
Vegetables	7.3	46.3
Fresh	3.9	25.0
Dark green	.5	2.9
Deep yellow	.3	1.7
Light green	1.3	8.3
Tomatoes	.7	4.2
Other	1.3	8.3
Canned	2.1	13.3
Frozen	.8	5.0
Juice	.2	1.3
Dried	.3	1.7
Fruits	6.7	42.9
Fresh	3.7	23.3
Citrus	.8	5.0
Other vitamin C	.3	2.1
Other	2.6	16.3
Canned	.7	4.6
Frozen	.1	.4
Juice	2.2	13.8
Fresh	.5	2.9
Canned	.8	5.0
Frozen	1.0	6.3
Dried	.1	.8
Potatoes, including sweet	1.7	10.8
Fresh	.9	5.8
Canned	.1	.4
Frozen	.1	.8
Dehydrated	.1	.4
Chips, sticks, and salads	.6	3.8

Note: Group and subgroup totals may not add due to rounding.

<sup>1</sup>For item definitions, see table 4.

<sup>2</sup>Not applicable.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

other extreme, each individual in the household is given a weight relative to an arbitrary consumption standard, such as an adult male. The magnitude of these weights, commonly referred to as adult equivalent (AE) scales, reflects the relative consumption requirements of individual household members. These weights generally vary by age and sex and differ from one commodity to another (1). The AE scale for income is determined by a weighted average of all commodity scales. A major problem with applications of AE scales is that they are usually unknown prior to the analysis and must be estimated from the data. Also, econometric problems hinder the estimation of AE scales. This study uses a compromise between these two extremes.

Individual food item prices influence consumer purchases. Relative item prices reflect the rate at which consumers can substitute among alternative goods. The more narrowly a product group is defined, the more numerous are the substitutes and the more easily consumers can substitute. However, in household survey data where information on many detailed items is gathered over a short time period, one can usually assume that observed price differences reflect variation in product content and quality rather than variation in relative prices for the same product. Consequently, the influence of item prices on purchase behavior is modeled differently in household and aggregate time series data.

Food consumption is often measured in terms of quantity (physical weight) and money value (expenditure) in household surveys. The quantity measure is closely related to the physical satisfaction of demand and the need to fulfill certain nutritional requirements (12). The money value of purchased foods is a measure of consumer satisfaction and economic well-being obtained through the market place in the sense that the prices consumers pay reflect the unit value of the goods. The money value of a purchased product group such as fruits and vegetables is a price- or value-weighted sum of the physical quantities used. For example, the money-value measure of consumption considers that a consumer who purchases a pound of green beans for \$1 and a pound of asparagus for \$2 receives twice the satisfaction from the pound of asparagus compared with the pound of green beans because of the delicacy status of asparagus. This difference in satisfaction exists despite the fact that asparagus and green beans may be similar nutritionally.

Viewing expenditures as a value-weighted quantity provides a link between household budget analysis and the traditional theory of consumer demand. It has been shown that using prices as weights to aggregate

items into groups is consistent with economic theory when relative item prices are constant (3). Consequently, the use of expenditures or money value provides a consistent method for aggregating many detailed and heterogeneous items into a manageable number of product groups when using cross-sectional data.

The relationship of item prices within a food group is not always the same among numerous households. These relationships often vary systematically by season, by geographic region, and by levels of urbanization. Consequently, these variables should be included in the measurement models to control for these effects.

A problem specific to analyses of household survey data is how to handle the zero values reported for the consumption of individual items or small groups of items. Numerous zero values are not uncommon in household surveys and the economic interpretation one should give to these observations is not always clear. A researcher does not usually know whether a given zero value represents a household that (1) never consumes the item, (2) never consumes the item given the current values of the household's demand factors, or (3) consumes the item infrequently (4). The category to which a nonconsuming household belongs has important implications for demand analysis. However, the frequency or infrequency of a given product's use by a particular household is not usually reported, and consequently, it must be inferred by examining the reported use or nonuse by many similar households. By examining many households, one can determine the probability of consumption during a given time period and relate this probability to household characteristics. The model used in this study assumes that the probability of consumption is related to household income and other selected socioeconomic and demographic features.

### Measurement Procedures

The statistical model presented in this section measures simultaneously the relationship of household characteristics to the probability that an item will be purchased and to the amount of the purchase.

Household surveys of food consumption, expenditures, or both usually contain a large number of households that report detailed information on food consumption over a short time. The time period, usually 1 or 2 weeks, is not long enough to represent the average consumption pattern for any particular household. However, by examining a group of similar households,

one can infer how a typical household within the group would behave over a longer period. Assuming this is a valid procedure, one can draw inferences regarding the average consumption, probability of use, and the amount consumed per person during a given period. If one discards the observations on households that do not use an item during the survey and the probability of use or nonuse is determined by the same household characteristics which determine the level of use, then traditional regression procedures will yield biased estimates of the behavioral relationships, and valuable information on the probability of use will have been ignored. The tobit statistical procedure is used in this study to analyze simultaneously the probability of purchase and the level of item expenditures (5, 6, 8). Information from both consuming and nonconsuming households is used.

The tobit model can be expressed mathematically for a typical consumer unit,  $i$ , as

$$\begin{aligned} y_i &= X_i\beta + \epsilon_i && \text{if } X_i\beta + \epsilon_i > 0 \\ y_i &= 0 && \text{if } X_i\beta + \epsilon_i \leq 0 \end{aligned} \quad (1)$$

where  $i = 1, 2, \dots, n$ ,  $n$  is the number of sample consumer units,  $y_i$  is item expenditures,  $X$  is a vector of explanatory variables,  $\beta$  is a vector of response coefficients to be estimated, and  $\epsilon_i$  is an independently and normally distributed random disturbance term with a mean of zero and constant variance,  $\sigma^2$ . The level of expenditures for the  $i$ th consumer unit is determined by the combination of a determinate component,  $X_i\beta$ , and a stochastic component,  $\epsilon_i$ . The determinate or nonstochastic portion of the model is a linear function of household characteristics and their respective response parameters. Expenditures differ among households due to varying household characteristics and the stochastic element which embodies the unobserved factors and idiosyncrasies of individual consumer units.

The tobit model can be estimated by the maximum likelihood procedure. The maximum likelihood estimator is that estimator of the model parameters which maximizes the likelihood of observing the given sample values. To derive the likelihood function for the tobit model, one must separate the sample observations into two classes: those with positive expenditures and those with zero expenditures. For all  $y_i > 0$ , the probability of  $y_i$  given  $X_i$  is simply the value of the normal density of  $\epsilon$ ,  $f(\epsilon)$ , with mean zero and variance  $\sigma^2$  evaluated at  $\epsilon_i = y_i - X_i\beta$ . For all  $y_i = 0$ , the probability of  $y_i$  given  $X_i$  is the probability that  $X_i\beta + \epsilon \leq 0$ .

Since  $\epsilon_i$  is normally distributed, this probability is given by

$$P(\epsilon_i \leq -X_i\beta) = F(-z_i) \quad (2)$$

where  $F$  is the unit normal probability function and  $z_i = X_i\beta/\sigma$  is the standardized value of  $\epsilon_i$ . Given that  $\epsilon_i$  is independently distributed across the sample, the likelihood function for the sample is the product of the probability of observing each consumer unit as expressed by

$$L = \prod_{i \in S_1} f(z_i) \prod_{i \in S_2} F(-z_i) \quad (3)$$

where  $S_1$  is the set of observations with  $y_i > 0$ ,  $S_2$  is the set of observations with  $y_i = 0$ , and  $f(\cdot)$  and  $F(\cdot)$  are the unit-normal density and probability functions, respectively. Maximizing  $L$  with respect to  $\beta$  yields the maximum likelihood estimators. Although  $L$  is highly nonlinear, there are many computer programs available which can easily solve this problem.

The expected value of expenditures for households with characteristics denoted by  $X$  is given by

$$E(y) = X\beta F(z) + \sigma f(z). \quad (4)$$

This includes both consuming and nonconsuming households. The expected value of expenditures for only those consuming the item is given by

$$\begin{aligned} E(y^*) &= E(y | y > 0) \\ &= E(y | \epsilon > X\beta) \\ &= X\beta + \sigma f(z)/F(z). \end{aligned} \quad (5)$$

From (4) and (5), the relationship between the expected value of expenditure for all households and the expected value for consuming households is shown as

$$E(y) = F(z)E(y^*). \quad (6)$$

Since  $F(z)$  is a probability function and  $0 \leq F(z) \leq 1$ , it follows that  $E(y) \leq E(y^*)$ . In other words, the degree to which the expected value of expenditures by consumers exceeds the expected value of expenditures over all consumer units is directly related to the probability or proportion of consumers using the item.

One is often interested in the market response in expenditures associated with a change in one of the explanatory variables. The total change in the ex-

pected value of expenditures associated with a change in  $x_j$  is given by

$$\partial E(y)/\partial x_j = F(z)[\partial E(y^*)/\partial x_j] + E(y^*)[\partial F(z)/\partial x_j] \quad (7)$$

and using two relationships for the unit normal distribution,  $\partial F(z)/\partial z = f(z)$  and  $\partial f(z)/\partial x_j = -zf(z)$ , then

$$\partial F(z)/\partial x_j = f(z)[\partial X\beta/\partial x_j]/\sigma \quad (8)$$

and

$$\begin{aligned} \partial E(y^*)/\partial x_j &= \partial X\beta/\partial x_j + (\sigma/F(z))\partial f(z)/\partial x_j \\ &\quad - (\sigma f(z)/F(z)^2)\partial F(z)/\partial x_j \\ &= \partial X\beta/\partial x_j [1 - zf(z)/F(z) - f(z)^2/F(z)^2]. \end{aligned} \quad (9)$$

The aggregate market response is composed of two components: one component is due to changes in the level of expenditures by consumers and the other component is due to a change in the number of consumers. The partial derivative given by (9) expresses the marginal expenditure response due to changes in expenditures by consumers. Based on (7), (8), and (9), the fraction of the total response due to this effect is given by

$$[1 - zf(z)/F(z) - f(z)^2/F(z)^2]. \quad (10)$$

The formulas described above can be used to compute the expected value of consumer expenditures and the probability of consumers' using these items for a particular household type by evaluating the formulas using the characteristics of the typical household and the estimated parameter values. The market-level response is computed by aggregating these responses over all consumer units in the market. The probability of purchase at the market level can be interpreted as the proportion of the market population which purchases the item during the time period.

It is often convenient to express consumer demand responses to changes in continuous explanatory variables in terms of elasticities. Elasticities measure the percentage change in expenditures associated with a 1-percent change in the explanatory variable. Demand elasticities are most often reported with respect to income or prices. The general formula for an elasticity with respect to an explanatory variable  $x_j$  is given by

$$\eta = \frac{\partial E(y)}{\partial x_j} \cdot \frac{x_j}{E(y)}. \quad (11)$$

## Household Expenditures for Fruits, Vegetables, and Potatoes

For the tobit model, the total elasticity is found by substituting into equation (11) from equations (4) and (7). The proportion of the total demand elasticity which is attributable to expanded or contracted consumption by consumers is given by expression (10).

### Data

The U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey (NFCS) is the source of data used in this analysis. This survey contains the most recent and comprehensive data on household food consumption and nutrition available. The survey is composed of two parts: (1) a 1-week recall of the kinds, quantities, values, and sources of food used from home supplies, and (2) an individual intake record of each household member listing the kinds and quantities of foods eaten both at home and away from home.<sup>2</sup> The 1-week recall portion of the survey provides the basis for this analysis.

The NFCS sample is comprised of approximately 15,000 households and is representative of the 48 contiguous States. The sample was chosen using a multistage, stratified probability sampling procedure. Households in the 1977-78 NFCS sample were surveyed between April 1977 and March 1978 with approximately equal numbers of households reporting in each of the four seasons.<sup>3</sup> After the sample survey was completed, sample weighting factors were computed. These weights are used in the tabular analyses to improve the representation of the sample.

Information on household characteristics and food use was obtained in the survey through personal interviews with the household member most responsible for food purchases and preparation. The households were contacted at least 1 week prior to the interview and asked to keep unstructured notes on food use and

expenditures to assist them during the interview. In addition, trained interviewers used a detailed food item list to assist the respondents in recalling information on the kinds, quantities, values, and sources of food used from home supplies during the 7 days immediately preceding the interview. Foods were measured in the form in which they entered the household. The quantities and values reported relate only to food used from home supplies during a 7-day period. Consequently, the data do not include foods purchased or received and consumed away from home such as at restaurants and schools.

There are three main sources for fruits, vegetables, and potatoes used from home supplies: purchased, grown at home, and gifts. As would be expected, purchases are the primary source for these foods. Approximately 83.6 percent of fruits, vegetables, and potatoes are purchased directly in the market place, 10.8 percent are homegrown, and the remaining 5.6 percent are received as a gift or for pay.<sup>4</sup> Still more are purchased in the form of mixtures such as soups and frozen dinners. Approximately 99 percent of all households use some form of purchased fruits, vegetables, or potatoes and consequently few, if any, rely completely on home-produced items during an average week. Some 29 percent of the observed households use some form of home-produced food. Because this study's emphasis is on goods moving through retail channels, we exclude the money value of non-purchased items.

Average weekly expenditures per person for 32 fruit, vegetable, and potato categories are delineated by each of six major household characteristics and reported in appendix tables 2 through 7. These tables aid in estimating average expenditure levels and gross differences associated with these characteristics, as for example, the examination of regional expenditure patterns. However, these numbers do not isolate expenditure differences associated with any single classification variable because many other important factors also change. For instance, household size and age composition, racial composition, income, and other factors differ across regions. Appendix tables 1 and 8 reveal the wide variation in the level and percentage of food expenditures spent on food at home and the extent that average household size and income vary across selected household classifications. Measures of the isolated impact of individual factors, such as income, on expenditures are needed for many other types of analyses. The tobit model is

<sup>2</sup>Home supplies include foods used at home during the 7 days before the date of the survey interview, whether bought or received without direct expenditure. Included were foods eaten at home, foods carried from home in packaged meals, foods thrown away, and foods fed to pets. Excluded from home supplies were commercial pet food and household food fed to animals raised for commercial purposes; food that was given away for use outside the home; and food consumed at restaurants, fast-food outlets, roadside stands, and meals at friends' or relatives' homes. Fruits and vegetables purchased at restaurants and other places, and brought home for consumption are included in the analysis. However, fruits and vegetables purchased as ingredients in other foods such as in soups or frozen dinners are classified as mixtures in the survey data and are excluded from this analysis.

<sup>3</sup>For a more complete description of the data, see Rizek (7).

<sup>4</sup>Percentages are based on the money value of consumption reported in table 2.

used to measure these net impacts. The following sections describe such a method and report on estimates of these net or isolated effects.

### Model Specification and Variables

The vector of household socioeconomic and demographic variables,  $X_i$  in equation (1), used to explain

the observed expenditure patterns in the tobit model, is given in table 3 together with descriptions of the variables and their sample means. Table 4 describes the fruit, vegetable, and potato categories analyzed in the study. For each product category, the same general model specification is applied. Note that throughout this study potatoes are contained and analyzed as a group separate from other vegetables. The disaggregate product groups were defined by three-digit

**Table 2—Percent of households using fruits, vegetables, and potatoes in a week and weekly per person money value of usage from home supplies, by source**

Item	Percentage using—			Money value		
	Total <sup>1</sup>	Purchased	Homegrown	Total <sup>1</sup>	Purchased	Homegrown
	----- Percent -----			----- Dollars -----		
Vegetables, fruits, and potatoes	99	99	29	2.87	2.40	0.31
Vegetables and potatoes	98	97	27	1.71	1.37	.25
Vegetables and fruits	99	99	29	2.59	2.14	.30
Vegetables	97	95	26	1.43	1.11	.23
Fresh	93	88	26	.91	.60	.23
Dark green	36	27	7	.10	.07	.02
Deep yellow	40	34	5	.06	.04	.01
Light green	80	73	15	.28	.20	.06
Tomatoes	55	38	13	.19	.10	.07
Other	77	69	16	.29	.20	.07
Canned	72	71	<sup>2</sup>	.32	.32	<sup>2</sup>
Frozen	34	34	<sup>2</sup>	.12	.12	<sup>2</sup>
Juice	17	15	2	.04	.03	.01
Dried	20	19	<sup>3</sup>	.04	.04	<sup>3</sup>
Fruits	94	93	10	1.16	1.03	.06
Fresh	84	79	10	.68	.56	.06
Citrus	41	38	1	.14	.12	<sup>3</sup>
Other vitamin C	15	12	2	.06	.05	.01
Other	78	73	8	.48	.39	.05
Canned	33	33	<sup>2</sup>	.11	.11	<sup>2</sup>
Frozen	2	2	<sup>2</sup>	.01	.01	<sup>2</sup>
Juice	71	70	<sup>3</sup>	.34	.33	<sup>3</sup>
Fresh	15	15	<sup>3</sup>	.07	.07	<sup>3</sup>
Canned	33	32	<sup>3</sup>	.12	.12	<sup>3</sup>
Frozen	38	38	<sup>3</sup>	.15	.15	<sup>3</sup>
Dried	11	10	<sup>3</sup>	.03	.02	<sup>3</sup>
Potatoes, including sweet	84	79	6	.28	.26	.02
Fresh	74	67	6	.16	.14	.02
Canned	4	4	<sup>2</sup>	.01	.01	<sup>2</sup>
Frozen	10	10	<sup>2</sup>	.02	.02	<sup>2</sup>
Dehydrated	5	5	<sup>2</sup>	.01	.01	<sup>2</sup>
Chips, sticks, and salads	31	31	<sup>2</sup>	.09	.09	<sup>2</sup>

Note: Group and subgroup dollar values may not add due to rounding.

<sup>1</sup>Includes foods received as gift or pay.

<sup>2</sup>Not applicable.

<sup>3</sup>Less than 1 percent or 0.01 dollar.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

## Household Expenditures for Fruits, Vegetables, and Potatoes

item codes provided on the computer tapes and represent major food marketing groups.

The allocation of one's budget among alternative goods and services is determined in part by the size of

one's budget. In turn, the budget is determined by one's income. This relationship, however, is unlikely to be an exact identity. Differences arise due to borrowing, saving, taxes, and transfers. The longer the time period over which income is measured, the more

**Table 3—Definitions and sample means of independent variables**

Variable	Mean	Definition
<b>Region:</b>		
Northeast	0.2459	Omitted base region
North Central	.2398	Equals 1 if household resides in North Central region, zero otherwise
South	.3391	Equals 1 if household resides in Southern region, zero otherwise
West	.1752	Equals 1 if household resides in Western region, zero otherwise
<b>Urbanization:</b>		
Central city	.3115	Omitted base group
Suburban	.3513	Equals 1 if household resides in suburban location, zero otherwise
Nonmetropolitan	.3372	Equals 1 if household resides in nonmetropolitan location, zero otherwise
<b>Race:</b>		
White	.8445	Omitted base group
Black	.1244	Equals 1 if household head is black, zero otherwise
Nonwhite/nonblack	.0311	Equals 1 if household head is nonwhite/nonblack, zero otherwise
Log income	4.2590	Log of weekly per-person after-tax household income including bonus value of food stamp transfers
<b>Season:</b>		
Spring	.2507	Omitted base season
Summer	.2320	Equals 1 if household was surveyed in the summer quarter, zero otherwise
Fall	.2694	Equals 1 if household was surveyed in the fall quarter, zero otherwise
Winter	.2579	Equals 1 if household was surveyed in the winter quarter, zero otherwise
Household size (inverse)	.4846	Inverse of household size (members)
Guest meals	.4643	Number of per-person guest meals served by a household during the survey week
<b>Household age composition:</b>		
Proportion age 0-2 years	.0326	Proportion of household composed of members 0-2 years old
Proportion age 3-12 years	.1163	Proportion of household composed of members 3-12 years old
Proportion age 13-19 years	.0913	Proportion of household composed of members 13-19 years old
Proportion age 20-39 years	.2929	Proportion of household composed of members 20-39 years old
Proportion age 40-64 years	.2076	Omitted base group
Proportion age 65 years and over	.1841	Proportion of household composed of members 65 years or older
Food stamp program participation	.0752	Equals 1 if household participates in the food stamp program, zero otherwise



likely it is to be representative of one's typical or average purchasing power. Friedman argues that this permanent or representative income is the appropriate measure to include in economic analyses of consumption and that transitory changes in income have little if any effect on current consumption (2).

Three alternative measures of income are reported in the NFCS data: the aggregate of "last month's income" reported by source of income and household member, "last year's" reported before-tax income, and "last year's" reported after-tax income. This last measure is believed to be the most closely related to permanent

Table 4—Product groups and their composition<sup>1</sup>

Product group	Description
Vegetables, fruits, and potatoes	All fresh and processed fruits and vegetables including potatoes
Vegetables and potatoes	All fresh and processed vegetables including potatoes
Vegetables and fruits	All fresh and processed vegetables and fruits excluding potatoes
Vegetables	All fresh and processed vegetables excluding potatoes
Fresh	Fresh vegetables excluding potatoes
Dark green	Includes collards, spinach, and related greens; broccoli; and peppers
Deep yellow	Includes carrots, carrots and peas, pumpkin, and winter squash
Light green	Includes asparagus, lima beans, snap beans, wax beans, kidney beans, cabbage, lettuce, okra, peas, artichokes, soybeans, bean curd, and brussels sprouts
Tomatoes	Includes only tomatoes
Other	Includes celery, cucumbers, onions, garlic, leeks, beets, cauliflower, corn, turnips, eggplant, mushrooms, radishes, summer squash, and mixed vegetables
Canned	All commercially canned vegetables excluding potatoes
Frozen	All commercially frozen vegetables excluding potatoes
Juice	Includes tomato and other vegetable juices
Dried	Includes dried beans and peas, baked beans, and other dried or dehydrated vegetables except potatoes
Fruits	Includes all fresh and processed fruits
Fresh	Includes fresh citrus, melons, berries, apples, and other fresh fruit
Citrus	Includes grapefruits, lemons, limes, oranges, and other citrus fruits
Other vitamin C	Includes canteloups and papayas, muskmelon, strawberries, mangos, guava, currants, and persimmons
Other	Includes apples, bananas, berries, cherries, melons other than canteloup, peaches, pears, pineapple, and other fruit
Canned	Includes all commercially canned fruits
Frozen	Includes all commercially frozen fruits
Juice	Includes all fresh, canned, and frozen fruit juice
Fresh	Includes all fresh fruit juices
Canned	Includes all commercially canned fruit juices
Frozen	Includes all commercially frozen fruit juices
Dried	Raisins, prunes, and other dry or dehydrated fruits
Potatoes, including sweet	Includes all fresh and processed potatoes and sweetpotatoes
Fresh	Includes fresh potatoes and sweetpotatoes
Canned	Includes commercially canned potatoes and sweetpotatoes
Frozen	Includes commercially frozen potatoes and sweetpotatoes
Dehydrated	Includes commercially dehydrated potatoes
Chips, sticks, and salads	Includes potato chips, potato sticks, potato crisps, preshaped potato chips, and commercially prepared potato salads, mashed potatoes, scalloped, and au gratin potatoes

<sup>1</sup>Product subgroups are uniquely defined by three-digit codes provided on the 1977-78 USDA Nationwide Food Consumption Survey computer tapes.

income and is used in this study. For participants in the Federal food stamp program, the net value of food stamps is added to their reported money income. The value of other in-kind transfers is not reported in the survey, and consequently additional adjustments cannot be made.

The tobit expenditure equation models are specified on a per-person basis. Adjustments for household size and composition are accounted for by the inclusion of the inverse of household size and the proportion of household members in selected age groups as explanatory variables in the model. This modified per capita specification is a pragmatic solution to the complex alternative of adult equivalent scales and also helps to alleviate additional econometric problems associated with heteroskedasticity which are often found in household expenditure models.

### Empirical Results

Estimated parameters for 32 fruit, vegetable, and potato expenditure category tobit equations are presented in appendix table 9. Summary statistics useful for model evaluation are also included. These parameter estimates can be used to evaluate the proportion of consumers using these items during a week and the level of expenditures by consumers with a specified set of household characteristics. For convenience, the estimated responses in per capita weekly expenditures for fruits, vegetables, and potatoes associated with changes or differences in household demand factors are presented. The estimated responses are evaluated at the sample means for all variables except the one being examined in the particular table.

#### Influence of Income

The influence of income on weekly per capita fruit, vegetable, and potato expenditures is measured in the form of elasticities and changes in expenditure levels (table 5). For presentation, the elasticities have been multiplied by a factor of 10 to approximate the percentage response in expenditures associated with a 10-percent increase in income. The product groups most responsive to a change in income are other fruits rich in vitamin C, frozen vegetables, frozen fruits, vegetable juice, and frozen fruit juice. A 10-percent increase in income raises expenditures on these items more than 2 percent and as high as 5.6 percent for some items. Higher income is associated with lower expenditures on dried and canned vegetables and fresh, canned, and dehydrated potatoes. Income is a significant determinant of consumer expenditures for

all food groups analyzed although its effects on canned vegetables, potatoes, dehydrated potatoes, and fresh potatoes are small.

The probability or frequency of use phenomenon accounts for more than half of the total expenditure response for all but the major categories. The smaller, more narrowly defined product groups have a smaller probability of being used in a particular week. For example, 33 percent of the demand response for vegetables is due to changes in the proportion of households consuming these foods while 76 percent of the total demand response for dark-green vegetables is attributed to this factor. Similar relationships are found between other major groups and their respective subgroups. The relatively larger response in the subgroups can be partially attributed to product switching and substitution among foods within the groups.

Average per capita expenditures on fruits, vegetables, and potatoes are simulated at selected per capita income levels using the estimated tobit equations evaluated for an average sample household. Income is measured in constant 1977 dollars, and the results are reported in table 6. Expenditures in all categories with positive income elasticities increase with income. Expenditures in categories with negative elasticities decline with rising incomes. As would be expected, the largest percentage changes in expenditures are for those item groups with the largest income elasticities. However, these responses are not as large as would be predicted using the elasticities. This is because the consumer response to income diminishes as income rises.<sup>5</sup> For example, raising per capita income from \$2,000 to \$4,000 increases average vegetable and fruit expenditures by 10 percent while extrapolation from the values reported in table 5 would give an increase of 13.4 percent. Also, note that the effect of an additional \$2,000 of income—from \$4,000 to \$6,000—increases expenditures by only 6.0 percent, revealing the diminishing effect of income on expenditures at higher income levels.

#### Influence of Household Characteristics

Household characteristics other than income which are hypothesized to influence consumer demand for fruits, vegetables, and potatoes include region and urban location of household residence, race, season, household size and age composition, and whether or not the household participates in the Federal food

<sup>5</sup>This result is largely due to the semilogarithmic specification for income. Also, the response associated with the probability of use declines as the probability of use increases.

stamp program. The influence of each of these factors is analyzed. Differences in per capita expenditures associated with these factors are simulated using the estimated tobit equations evaluated at alternative levels of the particular factor being examined and at the sample average for other household features. For example, households are grouped into four categories according to their region of residence:

Northeast—Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

North Central—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

South—Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

West—Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Table 5—Fruit, vegetable, and potato expenditure response associated with a 10-percent increase in income

Item	Expenditure response			Share of total response due to market entry
	Total response	Market entry response	Expenditure level response	
	Percent			
Vegetables, fruits, and potatoes	1.23	0.29	0.94	23
Vegetables and potatoes	.89	.24	.65	27
Vegetables and fruits	1.34	.34	1.00	26
Vegetables	1.08	.36	.72	33
Fresh	1.51	.67	.84	45
Dark green	1.57	1.20	.36	76
Deep yellow	1.93	1.41	.52	73
Light green	1.64	.90	.74	55
Tomatoes	1.72	1.22	.50	71
Other	1.90	1.10	.80	58
Canned	-.41	-.22	-.19	54
Frozen	4.75	3.46	1.29	73
Juice	2.70	2.19	.51	81
Dried	-3.30	-2.61	-.69	79
Fruits	1.66	.62	1.04	37
Fresh	1.90	.93	.97	49
Citrus	2.19	1.56	.63	71
Other vitamin C	5.64	4.78	.89	85
Other	1.70	.91	.79	54
Canned	1.75	1.29	.46	74
Frozen	3.64	3.26	.38	90
Juice	1.70	.96	.74	57
Fresh	1.23	1.01	.22	82
Canned	1.13	.83	.30	73
Frozen	3.22	2.29	.93	71
Dried	3.17	2.16	1.01	68
Potatoes, including sweet	.04	.02	.02	47
Fresh	-.62	-.34	.28	55
Canned	-1.24	-1.08	-.16	87
Frozen	1.35	1.13	.22	84
Dehydrated	-.51	-.44	-.07	87
Chips, sticks, and salads	1.70	1.27	.43	75

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

## Household Expenditures for Fruits, Vegetables, and Potatoes

The Northeast region is used as the base region and differences in expenditures across regions are expressed as differences from this base via the use of dummy variables. The dummy variable representing the region of residence is set equal to 1 and the dummy variables for other regions are set equal to 0. If the household resides in the Northeast (base) region, then the three regional dummy variables are set equal to 0. A similar procedure is used to examine the other household features.

**Region:** Expenditure patterns for fruit, vegetables, and potatoes vary substantially across geographic regions (table 7). Households in the Northeast spend about 7-18 percent more per person on the average than do their counterparts in other regions. Households in the North Central and Southern regions spend about the same in the aggregate. Regional patterns, however, vary considerably among individual commodity groups. For example, households in the North Central region spend about 21 percent less per person

**Table 6—Simulated weekly per person expenditures for fruits, vegetables, and potatoes at different per capita income levels**

Item	Income level				
	\$2,000 (base)	\$4,000	\$6,000	\$8,000	\$10,000
	Dollars	Percent <sup>1</sup>			
Vegetables, fruits, and potatoes	2.539	9.1	14.5	18.4	21.4
Vegetables and potatoes	1.546	6.5	10.3	13.0	15.2
Vegetables and fruits	2.281	10.0	16.0	20.3	23.6
Vegetables	1.227	7.9	12.7	16.1	18.8
Fresh	.674	11.3	18.1	23.1	27.0
Dark green	.066	11.6	18.8	24.2	28.4
Deep yellow	.044	14.5	23.7	30.5	36.0
Light green	.225	12.3	19.9	25.4	29.8
Tomatoes	.101	12.9	20.9	26.8	31.6
Other	.218	14.4	23.4	30.0	35.3
Canned	.392	-2.8	-4.4	-5.6	-6.5
Frozen	.099	40.6	69.3	92.0	111.0
Juice	.032	20.8	34.6	45.1	53.7
Dried	.046	-20.1	-30.3	-36.9	-41.6
Fruits	1.082	12.6	20.2	25.7	30.0
Fresh	.579	14.5	23.4	29.9	35.0
Citrus	.116	16.7	27.4	35.3	41.7
Other vitamin C	.020	49.2	86.6	117.6	144.5
Other	.408	12.8	20.7	26.4	31.0
Canned	.104	13.0	21.2	27.3	32.1
Frozen	.005	29.1	49.5	65.7	79.2
Juice	.370	12.7	20.6	26.3	30.9
Fresh	.075	8.9	14.5	18.5	21.7
Canned	.137	8.2	13.3	16.9	19.8
Frozen	.122	25.7	42.7	55.7	66.4
Dried	.021	25.0	41.9	55.1	65.9
Potatoes, including sweet	.277	.3	.4	.5	.6
Fresh	.158	-4.2	-6.6	-8.3	-9.6
Canned	.007	-8.2	-12.7	-15.8	-18.2
Frozen	.015	9.8	16.0	20.5	24.1
Dehydrated	.008	-3.5	-5.5	-6.8	-7.9
Chips, sticks, and salads	.065	12.6	20.5	26.4	31.0

<sup>1</sup>Percentage change in item expenditures given rise in income from \$2,000 to level shown.

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

on vegetables than do similar households in the Northeast and those in the South spend about 12 percent less. The situation is reversed for fruits. Households in the North Central region spend about 17 percent less than do those in the Northeast while those in the South spend approximately 27 percent less.

**Urbanization:** Expenditures per person for most fruit, vegetable, and potato items are highest in the central cities compared with expenditures by similar households in suburban and nonmetropolitan areas (table 8). On the average, per capita expenditures are

12 percent less in suburban areas and 20 percent less in nonmetropolitan areas compared with central cities. This pattern is exhibited for both fresh and processed commodities, but the differences are slightly larger for fresh ones. This may be due to the higher incidence of home gardening in suburban and nonmetropolitan areas. Although this pattern is not exhibited in the potato group as a whole, expenditures on fresh potatoes do follow this pattern.

**Race:** Other factors being equal, blacks spend about 3.4 percent more per person on fruits, vegetables, and

Table 7—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by region

Item	Northeast (base)	Region		
		Percentage change from base		
		North Central	South	West
	Dollars	Percent		
Vegetables, fruits, and potatoes	3.097	-17.4	-18.1	-6.4
Vegetables and potatoes	1.796	-16.0	-10.9	-8.3
Vegetables and fruits	2.837	-19.6	-19.8	-5.7
Vegetables	1.466	-20.7	-12.3	-6.9
Fresh	.850	-24.8	-18.3	-2.3
Dark green	.101	-49.4	-37.4	-11.8
Deep yellow	.060	-21.6	-36.9	8.7
Light green	.261	-11.5	-7.1	4.1
Tomatoes	.133	-45.1	-17.2	13.7
Other	.289	-27.2	-23.3	-4
Canned	.392	-2.3	.5	-11.2
Frozen	.170	-32.7	-28.9	-16.2
Juice	.036	7.0	-2.1	26.2
Dried	.024	23.1	123.3	72.6
Fruits	1.400	-16.8	-27.1	-3.9
Fresh	.750	-13.9	-27.6	.8
Citrus	.178	-23.6	-44.1	-17.2
Other vitamin C	.031	-22.4	-29.5	61.6
Other	.511	-12.8	-24.1	2.5
Canned	.117	23.1	-16.5	-1.4
Frozen	.008	-9.3	-49.6	-35.5
Juice	.521	-29.3	-30.1	-18.0
Fresh	.191	-75.2	-64.4	-68.5
Canned	.150	-19.0	2.0	10.8
Frozen	.166	-1.8	-27.7	1.8
Dried	.031	-9.6	-46.1	15.6
Potatoes, including sweet	.276	8.5	1.7	-11.5
Fresh	.157	-6.2	6.7	-20.4
Canned	.006	12.9	6.2	-8
Frozen	.019	16.7	-39.7	-25.5
Dehydrated	.008	39.3	-33.8	14.9
Chips, sticks, and salads	.065	45.0	1.8	4.8

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

## Household Expenditures for Fruits, Vegetables, and Potatoes

potatoes consumed from home supplies than do whites, and the composite group composed of nonwhites/nonblacks spends about 20.5 percent more than do whites (table 9). However, the racial per capita expenditure patterns vary widely among commodities and commodity groups. For instance, whites spend about the same as do blacks on fruits and about 1.6 percent more on potatoes; whites also spend about 12 percent more than do nonwhites/nonblacks on potatoes, 15.9 percent less on fruits, and 29.1 percent less on vegetables.

**Season:** Average seasonal expenditure differences for the three major groups are relatively small, usually within  $\pm 8$  percent of spring expenditures (table 10). However, much larger seasonal variation is found for items within these major groups. Group expenditures are tempered by seasonal switching of expenditures between fresh and processed items. Storable fresh items such as potatoes exhibit a much smaller seasonal pattern than do more perishable items like fresh citrus, as would be expected.

**Table 8—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by urbanization**

Item	Central city (base)	Urbanization	
		Percentage change from base	
		Suburban	Nonmetropolitan
	Dollars	Percent	
Vegetables, fruits, and potatoes	3.075	-11.8	-19.6
Vegetables and potatoes	1.816	-10.1	-20.6
Vegetables and fruits	2.785	-13.4	-21.1
Vegetables	1.500	-13.4	-24.5
Fresh	.860	-14.9	-27.5
Dark green	.098	-27.8	-49.4
Deep yellow	.056	-10.6	-25.8
Light green	.274	-7.7	-19.1
Tomatoes	.143	-26.5	-36.2
Other	.291	-14.4	-33.2
Canned	.420	-10.1	-15.5
Frozen	.148	-.5	-29.5
Juice	.043	-6.6	-26.2
Dried	.043	-22.2	-3.3
Fruits	1.314	-12.8	-16.3
Fresh	.732	-13.2	-22.2
Citrus	.156	-18.2	-30.1
Other vitamin C	.034	-9.2	-40.7
Other	.509	-13.2	-21.6
Canned	.110	2.4	11.7
Frozen	.007	-33.5	-11.3
Juice	.446	-12.3	-15.0
Fresh	.108	-22.8	-54.3
Canned	.160	-15.3	-7.7
Frozen	.138	11.4	7.3
Dried	.025	-3.7	-2.9
Potatoes, including sweet	.278	4.9	-4.8
Fresh	.160	-5.0	-8.3
Canned	.007	-1.7	-20.6
Frozen	.016	14.2	-22.2
Dehydrated	.007	16.0	-18.3
Chips, sticks, and salads	.062	33.4	12.9

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

**Age:** Age of the consumer is a major factor influencing fruit, vegetable, and potato consumption (table 11). Per capita expenditures generally are higher for older individuals. For example, compared with the base group of individuals age 40-64 years, vegetable consumption is 35 percent less for those 0-2 years; 20 percent less for those 3-12 years; 13 percent less for those 13-19 years; 7 percent less for those 20-39 years; and 3 percent more for those 65 years and over. Excluding the 0- to 2-year-olds, who have the highest average consumption of fruits, we find that fruit ex-

penditures also increase with a consumer's age. Fruit expenditures for infants and toddlers are primarily in the form of canned and frozen items rather than fresh ones. Expenditures for potato chips, sticks, and salads are predictably highest for teenagers and lowest for the elderly.

**Food Stamp Program:** Food stamp recipients spend about 21 percent more for vegetables, 1 percent less for fruits, and 11 percent more for potatoes than non-food stamp recipients when all other factors remain

Table 9—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by race

Item	White (base)	Race	
		Black	Nonwhite/nonblack
	Dollars	Percentage change from base	
		-----Percent-----	
Vegetables, fruits, and potatoes	2.713	3.4	20.5
Vegetables and potatoes	1.606	4.1	20.2
Vegetables and fruits	2.423	3.8	24.3
Vegetables	1.282	6.7	29.1
Fresh			
Dark green	.722	6.5	25.1
Deep yellow	.061	143.5	72.6
Light green	.053	-47.8	-3.5
Light green	.243	11.3	20.2
Tomatoes	.110	-8.3	55.4
Other	.248	-21.8	19.1
Canned	.383	-8.9	37.7
Frozen	.127	48.7	-37.7
Juice	.043	-59.4	-13.2
Dried	.035	64.9	147.9
Fruits	1.176	-1	15.9
Fresh	.638	-8	26.4
Citrus	.124	26.5	58.8
Other vitamin C	.031	-56.0	-18.5
Other	.446	-3.7	26.4
Canned	.125	-45.7	-37.1
Frozen	.007	-62.3	-69.1
Juice	.396	13.6	13.7
Fresh	.068	112.0	85.9
Canned	.142	24.6	23.6
Frozen	.157	-37.4	-31.1
Dried	.028	-59.2	-38.5
Potatoes, including sweet	.279	-1.6	-12.0
Fresh	.150	13.3	13.4
Canned	.006	19.1	-66.5
Frozen	.018	-48.2	-76.0
Dehydrated	.008	-61.6	-59.6
Chips, sticks, and salads	.077	-36.0	-47.2

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

## Household Expenditures for Fruits, Vegetables, and Potatoes

**Table 10—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by season**

Item	Season			
	Spring (base)	Percentage change from base		
		Summer	Fall	Winter
	Dollars	-----Percent-----		
Vegetables, fruits, and potatoes	2.767	1.2	-5.4	1.0
Vegetables and potatoes	1.657	-5.2	-5.7	2.8
Vegetables and fruits	2.477	1.7	-5.7	.5
Vegetables	1.335	-5.8	-6.1	2.5
Fresh	.786	-3.8	-14.6	-7.2
Dark green	.073	-17.3	-2.2	3.1
Deep yellow	.047	-13.5	1.2	23.5
Light green	.260	-1.9	-13.0	-2.2
Tomatoes	.130	-6.5	-31.4	-17.1
Other	.266	-3.9	-16.8	-13.4
Canned	.363	-7.3	8.6	19.8
Frozen	.137	-23.6	-.9	9.2
Juice	.040	-13.7	3.8	-5.4
Dried	.032	-2.5	36.3	49.6
Fruits	1.176	8.6	-4.5	-1.2
Fresh	.641	22.8	-9.4	-8.6
Citrus	.154	-50.5	-30.4	29.0
Other vitamin C	.081	19.5	-86.7	-93.0
Other	.399	50.4	10.8	-5.8
Canned	.125	-27.6	-11.3	7.2
Frozen	.007	-47.9	-21.6	-5.5
Juice	.390	-2.2	7.3	8.6
Fresh	.063	.9	42.4	40.5
Canned	.145	-1.7	-2.8	9.2
Frozen	.154	-7.2	-2.2	-8.7
Dried	.023	-13.6	33.9	15.7
Potatoes, including sweet	.276	-5.3	.1	8.0
Fresh	.149	-7.2	4.9	10.9
Canned	.007	-40.8	10.9	.6
Frozen	.018	-16.9	-14.8	-7.3
Dehydrated	.008	-33.3	-24.1	3.7
Chips, sticks, and salads	.070	9.1	-6.7	10.8

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.



Table 11—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by age group

Item	Age (years)					
	40-64 (base)	Percentage change from base				
		0-2	3-12	13-19	20-39	65 and over
Dollars	Percent					
Vegetables, fruits, and potatoes	2.903	-17.7	-13.2	-10.6	-8.7	0.6
Vegetables and potatoes	1.725	-32.9	-16.1	-10.7	-4.2	-3.3
Vegetables and fruits	2.617	-16.5	-13.8	-12.4	-11.1	1.6
Vegetables	1.408	-34.8	-20.3	-13.3	-6.9	-3.2
Fresh	.819	-50.7	-20.5	-19.0	-14.1	-1.7
Dark green	.085	-69.5	-37.7	-27.7	-18.1	-5.1
Deep yellow	.052	-33.6	3.2	-20.4	-24.6	25.0
Light green	.273	-58.9	-19.3	-4.0	-15.3	3.3
Tomatoes	.110	-33.6	19.1	5.3	2.3	-4.7
Other	.277	-44.7	-24.3	-23.9	-15.2	-6.7
Canned	.376	31.3	-9.0	7.0	5.4	-2.2
Frozen	.119	27.6	35.0	35.3	5.0	7.4
Juice	.048	-87.7	-26.1	-11.3	-15.3	-30.4
Dried	.052	-70.9	-47.8	-55.4	-23.1	-13.8
Fruits	1.231	13.0	-2.0	-9.5	-16.0	8.3
Fresh	.693	-27.9	1.1	-11.1	-23.2	8.7
Citrus	.136	-38.8	-2.5	9.4	-22.3	19.1
Other vitamin C	.026	-54.4	19.9	-23.2	-11.6	85.1
Other	.495	-20.9	2.7	-16.9	-26.5	2.6
Canned	.120	511.6	6.4	-27.1	-47.0	41.0
Frozen	.005	164.3	156.4	99.5	-41.6	47.9
Juice	.395	37.6	10.2	6.1	-1.2	-1.5
Fresh	.076	-30.6	20.6	10.1	-3.8	-3.7
Canned	.151	151.0	-6.0	-19.6	-10.1	-1.3
Frozen	.134	45.2	30.4	30.5	3.6	5.5
Dried	.020	270.1	45.1	-2.7	15.5	81.0
Potatoes, including sweet	.273	-16.2	-4	7.4	10.4	-5.9
Fresh	.181	-35.6	-29.7	-36.4	-29.0	10.0
Canned	.006	2,244.7	-14.0	-2.0	-12.6	13.8
Frozen	.013	91.9	98.5	218.5	50.3	-47.8
Dehydrated	.005	185.8	119.1	111.8	30.6	25.5
Chips, sticks, and salads	.050	55.2	173.8	196.2	119.6	-55.2

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

equal, including per capita income (table 12). The largest differences are for dried vegetables (37 percent more), dehydrated potatoes (31 percent more), frozen fruits (53 percent less), and frozen potatoes (46 percent less). Food stamp recipients tend to have a distinct preference for canned goods as opposed to frozen. This may be due to the lack of storage space for frozen goods or the lack of familiarity with these items.

**Table 12—Simulated weekly per person expenditures for fruits, vegetables, and potatoes by food stamp status**

Item	Food stamp nonrecipient (base)	Food stamp recipient (percentage change from base)
	Dollars	Percent
Vegetables, fruits, and potatoes	2.720	10.6
Vegetables and potatoes	1.601	19.3
Vegetables and fruits	2.433	10.4
Vegetables	1.284	21.1
Fresh	.728	9.1
Dark green	.069	19.4
Deep yellow	.049	-5.3
Light green	.248	1.9
Tomatoes	.110	6.3
Other	.240	13.3
Canned	.373	37.0
Frozen	.132	-4.1
Juice	.038	24.6
Dried	.037	71.2
Fruits	1.182	-1.0
Fresh	.644	-3.6
Citrus	.128	8.8
Other vitamin C	.028	-6.5
Other	.449	-6.5
Canned	.115	2.5
Frozen	.006	-53.3
Juice	.404	-1.1
Fresh	.075	15.9
Canned	.147	3.3
Frozen	.149	-19.8
Dried	.025	-16.0
Potatoes, including sweet	.276	11.1
Fresh	.150	23.1
Canned	.006	18.2
Frozen	.017	-46.3
Dehydrated	.007	30.8
Chips, sticks, and salads	.074	-26.6

Source: Based on tobit analysis of the 1977-78 USDA Nationwide Food Consumption Survey.

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## Appendix Tables

Appendix table 1—Weekly per capita food expenditures and the percentage spent on at-home purchases by selected demographic groups

Demographic group	Food expenditures			Percentage at home
	Total	At home	Away	
	Dollars			Percent
All	19.25	14.24	5.01	74.0
Season:				
Spring	19.45	14.10	5.35	72.5
Summer	19.21	14.17	5.04	73.8
Fall	18.93	14.03	4.90	74.1
Winter	19.41	14.65	4.76	75.5
Region:				
Northeast	21.99	16.17	5.82	73.5
North Central	18.25	13.65	4.60	74.8
South	17.34	13.10	4.24	75.5
West	20.22	14.39	5.83	71.2
Race:				
White	19.78	14.39	5.39	72.8
Black	16.45	13.37	3.08	81.3
Nonwhite/nonblack	16.98	13.80	3.18	81.3
Income quintile:				
I—lowest	15.96	13.70	2.26	85.8
II	17.17	13.62	3.54	79.3
III	18.31	13.68	4.63	74.7
IV	19.55	14.20	5.35	72.6
V—highest	23.34	15.58	7.76	66.8
Household size:				
1 member	27.40	18.32	9.08	66.8
2 members	23.16	16.64	6.52	71.8
3 members	20.06	14.85	5.21	74.0
4 members	17.94	13.41	4.53	74.7
5 members	16.84	12.71	4.14	75.4
6 or more members	14.55	11.68	2.88	80.2
Urbanization:				
Central city	20.41	15.19	5.23	74.4
Suburban	20.32	14.59	5.73	71.8
Nonmetropolitan	16.90	12.96	3.94	76.7

Source: 1977-78 USDA Nationwide Food Consumption Survey.

**Household Expenditures for Fruits, Vegetables, and Potatoes**

**Appendix table 2—Weekly per person expenditures for fruits, vegetables, and potatoes  
by income quintile, 1977-78**

Item	Income quintile					Not reported
	I (lowest)	II	III (middle)	IV	V (highest)	
	<i>Dollars</i>					
Vegetables, fruits, and potatoes	2.49	2.37	2.24	2.30	2.60	2.41
Vegetables and potatoes	1.48	1.39	1.29	1.30	1.45	1.36
Vegetables and fruits	2.23	2.12	1.98	2.02	2.34	2.16
Vegetables	1.23	1.14	1.03	1.03	1.19	1.10
Fresh	.64	.60	.54	.56	.68	.61
Dark green	.09	.07	.06	.05	.07	.07
Deep yellow	.04	.04	.04	.04	.05	.04
Light green	.22	.19	.18	.18	.23	.20
Tomatoes	.11	.11	.09	.09	.11	.09
Other	.18	.19	.17	.19	.23	.20
Canned	.38	.36	.32	.30	.30	.31
Frozen	.10	.10	.11	.12	.15	.11
Juice	.03	.02	.03	.04	.04	.03
Dried	.07	.06	.03	.02	.02	.04
Fruits	1.00	.98	.95	1.00	1.15	1.05
Fresh	.54	.54	.51	.55	.65	.58
Citrus	.12	.12	.12	.11	.14	.13
Other vitamin C	.04	.04	.04	.04	.06	.05
Other	.38	.37	.36	.39	.44	.40
Canned	.10	.11	.11	.10	.11	.11
Frozen	.01	.01	.00	.00	.01	.01
Juice	.34	.31	.30	.32	.36	.33
Fresh	.09	.08	.06	.06	.06	.06
Canned	.15	.11	.11	.10	.12	.12
Frozen	.10	.12	.13	.16	.19	.15
Dried	.02	.02	.02	.03	.03	.03
Potatoes, including sweet	.25	.25	.26	.28	.26	.26
Fresh	.17	.16	.13	.12	.12	.14
Canned	.01	.01	.01	.01	.01	.01
Frozen	.01	.02	.02	.03	.03	.02
Dehydrated	.01	.01	.01	.01	.01	.01
Chips, sticks, and salads	.06	.07	.09	.11	.10	.08

Note: Group and subgroup totals may not add due to rounding.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

Appendix table 3—Weekly per person expenditures for fruits, vegetables, and potatoes by region, 1977-78

Item	Region				
	All	Northeast	North Central	South	West
	<i>Dollars</i>				
Vegetables, fruits, and potatoes	2.40	2.79	2.20	2.13	2.63
Vegetables and potatoes	1.37	1.58	1.22	1.31	1.43
Vegetables and fruits	2.14	2.52	1.92	1.87	2.41
Vegetables	1.11	1.30	.94	1.05	1.21
Fresh	.60	.73	.49	.54	.71
Dark green	.07	.10	.05	.06	.07
Deep yellow	.04	.05	.04	.03	.05
Light green	.20	.22	.17	.20	.22
Tomatoes	.10	.12	.07	.09	.13
Other	.20	.25	.17	.16	.24
Canned	.32	.35	.30	.33	.30
Frozen	.12	.15	.10	.10	.12
Juice	.03	.03	.03	.03	.03
Dried	.04	.03	.02	.05	.04
Fruits	1.03	1.23	.98	.82	1.20
Fresh	.56	.67	.55	.43	.68
Citrus	.12	.15	.12	.09	.14
Other vitamin C	.05	.06	.04	.03	.07
Other	.39	.46	.38	.31	.47
Canned	.11	.11	.12	.09	.11
Frozen	.01	.01	.01	.00	.01
Juice	.33	.41	.28	.28	.37
Fresh	.07	.13	.04	.05	.06
Canned	.12	.12	.09	.13	.14
Frozen	.15	.17	.15	.10	.17
Dried	.02	.03	.02	.02	.03
Potatoes, including sweet	.26	.27	.28	.26	.22
Fresh	.14	.14	.14	.16	.11
Canned	.01	.01	.01	.01	.01
Frozen	.02	.03	.03	.01	.02
Dehydrated	.01	.01	.01	.01	.01
Chips, sticks, and salads	.09	.09	.10	.07	.08

Note: Group and subgroup totals may not add due to rounding.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

## Household Expenditures for Fruits, Vegetables, and Potatoes

**Appendix table 4—Weekly per person expenditures for fruits, vegetables, and potatoes  
by urbanization, 1977-78**

Item	Urbanization			
	All	Central city	Suburban	Nonmetropolitan
	<i>Dollars</i>			
Vegetables, fruits, and potatoes	2.40	2.76	2.43	2.06
Vegetables and potatoes	1.37	1.58	1.39	1.17
Vegetables and fruits	2.14	2.50	2.16	1.80
Vegetables	1.11	1.32	1.12	.92
Fresh	.60	.74	.62	.46
Dark green	.07	.11	.06	.04
Deep yellow	.04	.05	.04	.03
Light green	.20	.23	.21	.17
Tomatoes	.10	.12	.09	.08
Other	.20	.24	.21	.14
Canned	.32	.36	.31	.30
Frozen	.12	.14	.13	.08
Juice	.03	.03	.03	.03
Dried	.04	.05	.02	.04
Fruits	1.03	1.18	1.04	.89
Fresh	.56	.67	.57	.46
Citrus	.12	.15	.12	.10
Other vitamin C	.05	.05	.05	.03
Other	.39	.47	.40	.32
Canned	.11	.10	.11	.11
Frozen	.01	.01	.01	.01
Juice	.33	.38	.32	.29
Fresh	.07	.10	.07	.03
Canned	.12	.14	.10	.12
Frozen	.15	.14	.16	.14
Dried	.02	.02	.03	.02
Potatoes, including sweet	.26	.26	.27	.25
Fresh	.14	.15	.13	.14
Canned	.01	.01	.01	.01
Frozen	.02	.02	.03	.02
Dehydrated	.01	.01	.01	.01
Chips, sticks, and salads	.09	.07	.10	.08

Note: Group and subgroup totals may not add due to rounding.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

Appendix table 5—Weekly per person expenditures for fruits, vegetables, and potatoes by race, 1977-78

Item	Race			
	All	White	Black	Nonwhite/nonblack
	<i>Dollars</i>			
Vegetables, fruits, and potatoes	2.40	2.41	2.28	2.77
Vegetables and potatoes	1.37	1.36	1.39	1.58
Vegetables and fruits	2.14	2.14	2.02	2.57
Vegetables	1.11	1.09	1.14	1.38
Fresh	.60	.60	.61	.75
Dark green	.07	.05	.14	.10
Deep yellow	.04	.04	.02	.04
Light green	.20	.20	.21	.21
Tomatoes	.10	.10	.08	.16
Other	.20	.20	.15	.24
Canned	.32	.32	.31	.43
Frozen	.12	.12	.13	.06
Juice	.03	.03	.02	.03
Dried	.04	.03	.07	.10
Fruits	1.03	1.04	.88	1.19
Fresh	.56	.57	.50	.69
Citrus	.12	.12	.12	.17
Other vitamin C	.05	.05	.02	.03
Other	.39	.40	.35	.49
Canned	.11	.12	.05	.10
Frozen	.01	.01	.00	.00
Juice	.33	.33	.32	.38
Fresh	.07	.06	.11	.11
Canned	.12	.11	.14	.15
Frozen	.15	.16	.07	.12
Dried	.02	.03	.01	.01
Potatoes	.26	.27	.25	.20
Fresh	.14	.13	.17	.13
Canned	.01	.01	.01	.00
Frozen	.02	.02	.01	.01
Dehydrated	.01	.01	.00	.00
Chips, sticks, and salads	.09	.09	.05	.05

Note: Group and subgroup totals may not add due to rounding.

Sources: 1977-78 USDA Nationwide Food Consumption Survey.

Household Expenditures for Fruits, Vegetables, and Potatoes

Appendix table 6—Weekly per person expenditures for fruits, vegetables, and potatoes by season, 1977-78

Item	Season				
	All	Spring	Summer	Fall	Winter
	Dollars				
Vegetables, fruits, and potatoes	2.40	2.43	2.39	2.31	2.49
Vegetables and potatoes	1.37	1.42	1.29	1.32	1.47
Vegetables and fruits	2.14	2.16	2.15	2.05	2.21
Vegetables	1.11	1.14	1.04	1.07	1.19
Fresh	.60	.66	.61	.55	.60
Dark green	.07	.07	.06	.07	.07
Deep yellow	.04	.04	.03	.04	.05
Light green	.20	.21	.20	.18	.21
Tomatoes	.10	.11	.10	.08	.09
Other	.20	.22	.22	.17	.18
Canned	.32	.31	.28	.33	.37
Frozen	.12	.12	.09	.12	.14
Juice	.03	.03	.03	.04	.04
Dried	.04	.03	.03	.04	.04
Fruits	1.03	1.02	1.10	.98	1.02
Fresh	.56	.56	.69	.49	.51
Citrus	.12	.13	.07	.11	.19
Other vitamin C	.05	.08	.08	.01	.01
Other	.39	.36	.54	.37	.31
Canned	.11	.11	.08	.11	.13
Frozen	.01	.01	.00	.01	.01
Juice	.33	.31	.31	.35	.35
Fresh	.07	.06	.06	.08	.07
Canned	.12	.11	.11	.12	.12
Frozen	.15	.14	.14	.15	.16
Dried	.02	.02	.02	.03	.03
Potatoes, including sweet	.26	.27	.24	.25	.28
Fresh	.14	.14	.13	.14	.14
Canned	.01	.01	.00	.01	.01
Frozen	.02	.02	.02	.02	.02
Dehydrated	.01	.01	.01	.01	.01
Chips, sticks, and salads	.09	.09	.09	.08	.09

Note: Group and subgroup totals may not add due to rounding.

Source: 1977-78 USDA Nationwide Food Consumption Survey.



Appendix table 7—Weekly per person expenditures for fruits, vegetables, and potatoes by household size, 1977-78

Item	Household size (number of members)						
	All	1	2	3	4	5	6 or more
	<i>Dollars</i>						
Vegetables, fruits, and potatoes	2.40	3.61	2.96	2.51	2.22	2.00	1.79
Vegetables and potatoes	1.37	1.94	1.67	1.46	1.28	1.15	1.04
Vegetables and fruits	2.14	3.34	2.69	2.23	1.95	1.75	1.55
Vegetables	1.11	1.68	1.40	1.18	1.01	.90	.80
Fresh	.60	.99	.82	.64	.53	.46	.40
Dark green	.07	.12	.09	.07	.06	.05	.05
Deep yellow	.04	.07	.06	.04	.04	.03	.03
Light green	.20	.32	.27	.20	.18	.15	.14
Tomatoes	.10	.17	.13	.10	.08	.08	.07
Other	.20	.31	.27	.22	.18	.14	.12
Canned	.32	.40	.35	.35	.31	.29	.27
Frozen	.12	.19	.15	.13	.11	.10	.07
Juice	.03	.06	.05	.04	.03	.02	.02
Dried	.04	.04	.04	.04	.03	.03	.04
Fruits	1.03	1.66	1.29	1.05	.94	.85	.74
Fresh	.56	.90	.73	.57	.50	.47	.41
Citrus	.12	.20	.17	.12	.11	.10	.09
Other vitamin C	.05	.09	.07	.04	.03	.03	.03
Other	.39	.61	.49	.40	.35	.34	.29
Canned	.11	.14	.13	.12	.10	.09	.08
Frozen	.01	.01	.01	.01	.01	.00	.00
Juice	.33	.57	.38	.34	.31	.27	.24
Fresh	.07	.15	.08	.06	.06	.04	.05
Canned	.12	.23	.14	.13	.11	.10	.07
Frozen	.15	.19	.16	.15	.14	.13	.12
Dried	.02	.04	.03	.02	.02	.02	.01
Potatoes	.26	.27	.27	.27	.27	.25	.24
Fresh	.14	.16	.16	.14	.13	.12	.12
Canned	.01	.01	.01	.01	.01	.01	.01
Frozen	.02	.02	.02	.02	.03	.02	.02
Dehydrated	.01	.01	.01	.01	.01	.00	.01
Chips, sticks, and salads	.09	.08	.07	.09	.10	.09	.08

Note: Group and subgroup totals may not add due to rounding.

Source: 1977-78 USDA Nationwide Food Consumption Survey.

**Household Expenditures for Fruits, Vegetables, and Potatoes**

**Appendix table 8—Mean after-tax annual money income and household size by selected demographic groups**

Demographic group	Annual income after taxes	Household size (members)
	Dollars	Number
All	11,478	2.95
Season:		
Spring	11,312	2.96
Summer	11,239	2.95
Fall	11,419	2.95
Winter	11,984	2.95
Region:		
Northeast	12,091	2.99
North Central	12,045	3.04
South	9,924	2.92
West	12,340	2.84
Race:		
White	12,135	2.89
Black	7,557	3.20
Nonwhite/nonblack	9,587	3.77
Income quintile:		
I—lowest	3,385	2.01
II	7,020	2.68
III	10,469	3.13
IV	14,567	3.41
V—highest	23,168	3.54
Household size:		
1 member	6,355	1.00
2 members	11,250	2.00
3 members	12,573	3.00
4 members	14,231	4.00
5 members	14,791	5.00
6 or more members	14,664	6.78
Urbanization:		
Central city	10,127	2.75
Suburban	13,398	3.12
Nonmetropolitan	10,676	2.97

Source: 1977-78 USDA Nationwide Food Consumption Survey.

Appendix table 9—Tobit model for vegetables, fruits, and potatoes: Parameter estimates and summary statistics<sup>1</sup>

Independent variables	Vegetables, fruits, and potatoes	Vegetables and potatoes	Vegetables and fruits	Vegetables			
				Total	Fresh		Total
					Dark green	Deep yellow	
Constant	1.3251*** (.1795)	1.0364*** (.1173)	1.0948*** (.1731)	0.7416*** (.1079)	0.3325*** (.0848)	-0.2730*** (.0660)	-0.1666*** (.0304)
North Central	-.5758*** (.0549)	-.3160*** (.0358)	-.6043*** (.0530)	-.3483*** (.0330)	-.2740*** (.0259)	-.2062*** (.0204)	-.0399*** (.0090)
South	-.5994*** (.0521)	-.2134*** (.0339)	-.6113*** (.0503)	-.2041*** (.0312)	-.1984*** (.0245)	-.1449*** (.0187)	-.0734*** (.0087)
West	-.2079*** (.0590)	-.1614*** (.0385)	-.1710*** (.0569)	-.1127*** (.0354)	-.0237 (.0277)	-.0406** (.0205)	.0143 (.0094)
Suburban	-.3851*** (.0490)	-.1993*** (.0320)	-.4046*** (.0473)	-.2256*** (.0294)	-.1616*** (.0230)	-.1022*** (.0173)	-.0182** (.0080)
Nonmetropolitan	-.6485*** (.0504)	-.4130*** (.0329)	-.6418*** (.0486)	-.4219*** (.0303)	-.3081*** (.0238)	-.2046*** (.0185)	-.0475*** (.0084)
Black	.0988 (.0641)	.0722* (.0418)	.1003 (.0618)	.0977* (.0385)	.0611** (.0303)	.2898*** (.0218)	-.0977*** (.0120)
Nonwhite/nonblack	.5894*** (.1116)	.3510*** (.0727)	.6301*** (.1076)	.4147*** (.0669)	.2265*** (.0521)	.1694*** (.0368)	-.0058 (.0183)
Log income	.3615*** (.0343)	.1599*** (.0224)	.3637*** (.0331)	.1629*** (.0206)	.1450*** (.0162)	.0473*** (.0127)	.0310*** (.0058)
Summer quarter	.0351 (.0547)	-.0947*** (.0358)	.0472 (.0528)	-.0886*** (.0329)	-.0377 (.0258)	-.0562*** (.0204)	-.0227** (.0093)
Fall quarter	-.1603*** (.0529)	-.1047*** (.0345)	-.1556*** (.0510)	-.0939*** (.0317)	-.1503*** (.0250)	-.0068 (.0194)	.0019 (.0089)
Winter quarter	.0301 (.0535)	.0509 (.0349)	.0145 (.0516)	.0381 (.0321)	-.0731*** (.0252)	.0094 (.0195)	.0344*** (.0088)
Family size (inverse)	1.1063*** (.0950)	.4779*** (.0620)	1.0716*** (.0917)	.4325*** (.0572)	.1510*** (.0450)	-.1587*** (.0353)	-.0505*** (.0162)
Guest meals	.3470*** (.0178)	.2629*** (.0117)	.3096*** (.0172)	.2132*** (.0107)	.1274*** (.0083)	.0399*** (.0060)	.0193*** (.0028)
Proportion age 0-2	-.5573** (.2179)	-.6528*** (.1423)	-.4760** (.2102)	-.5899*** (.1309)	-.6036*** (.1032)	-.3282*** (.0822)	-.0631* (.0371)
Proportion age 3-12	-.4131*** (.1289)	-.3092*** (.0841)	-.3956*** (.1243)	-.3319*** (.0774)	-.2191*** (.0607)	-.1407*** (.0473)	.0052 (.0216)
Proportion age 13-19	-.3318** (.1346)	-.2039** (.0879)	-.3571*** (.1298)	-.2147*** (.0809)	-.2026*** (.0635)	-.0981** (.0492)	-.0360 (.0228)
Proportion age 20-39	-.2703*** (.0654)	-.0790* (.0427)	-.3189*** (.0631)	-.1105*** (.0393)	-.1484*** (.0309)	-.0612** (.0240)	-.0442*** (.0111)
Proportion age 65 and over	.0171 (.0689)	-.0624 (.0450)	.0452 (.0665)	-.0513 (.0415)	-.0173 (.0326)	-.0162 (.0256)	.0375*** (.0115)
Food stamp program participation	.3064*** (.0786)	.3339*** (.0513)	.2758*** (.0759)	.3037*** (.0472)	.0847** (.0372)	.0541* (.0279)	-.0087 (.0140)
Summary statistics:							
Mean square error	3.2831	1.3547	3.0397	1.1134	.5965	.0405	.0137
Probability of purchase at means	.9291	.9081	.9145	.8720	.7699	.2388	.3100
Observed nonlimit values (proportion)	.9891	.9712	.9858	.9530	.8741	.2588	.3366
Income elasticity (total)	.1225	.0889	.1340	.1083	.1507	.1565	.1929

See footnotes at end of table.

Continued—

Appendix table 9—Tobit model for vegetables, fruits, and potatoes: Parameter estimates and summary statistics—Continued<sup>1</sup>

Independent variables	Vegetables—Continued						
	Fresh—Continued			Canned	Frozen	Other	
	Light green	Tomatoes	Other			Juice	Dried
Constant	-0.0286 (.0423)	-0.2205*** (.0536)	0.0427 (.0477)	-0.3381*** (.0623)	-1.0466*** (.0819)	-0.7807*** (.0844)	-0.0397 (.0528)
North Central	-.0470*** (.0128)	-.1809*** (.0167)	-.1307*** (.0145)	-.0135 (.0188)	-.1716*** (.0241)	.0192 (.0253)	.0405*** (.0175)
South	-.0289** (.0122)	-.0605*** (.0153)	-.1104*** (.0137)	-.0030 (.0179)	-.1489*** (.0228)	-.0060 (.0246)	.1665*** (.0158)
West	.0162 (.0137)	.0431*** (.0167)	-.0016 (.0153)	-.0681*** (.0204)	-.0787*** (.0254)	.0668** (.0265)	.1099*** (.0182)
Suburban	-.0318*** (.0114)	-.0988*** (.0143)	-.0663*** (.0128)	-.0634*** (.0169)	-.0024 (.0213)	-.0196 (.0223)	-.0523*** (.0146)
Nonmetropolitan	-.0820*** (.0118)	-.1411*** (.0150)	-.1637*** (.0134)	-.0989*** (.0173)	-.1468*** (.0226)	.0858*** (.0236)	-.0071 (.0145)
Black	.0420*** (.0152)	-.0265 (.0191)	-.0962*** (.0173)	-.0530** (.0222)	.1170*** (.0283)	-.2414*** (.0353)	.1085*** (.0171)
Nonwhite/nonblack	.0738*** (.0258)	.1466*** (.0303)	.0746*** (.0288)	.2015*** (.0379)	-.1884*** (.0538)	-.0406 (.0522)	.2073*** (.0282)
Log income	.0637*** (.0081)	.0537*** (.0103)	.0781*** (.0091)	-.0241** (.0119)	.2037*** (.0157)	.0764*** (.0161)	-.0685*** (.0101)
Summer quarter	-.0074 (.0128)	-.0216 (.0160)	-.0165 (.0145)	-.0423** (.0191)	-.1119*** (.0248)	-.0416 (.0258)	-.0050 (.0168)
Fall quarter	-.0533*** (.0124)	-.1164*** (.0158)	-.0749*** (.0140)	.0478*** (.0182)	-.0040 (.0234)	.0106 (.0244)	.0645*** (.0157)
Winter quarter	-.0089 (.0125)	-.0595*** (.0158)	-.0593*** (.0141)	.1073*** (.0184)	.0384 (.0235)	-.0159 (.0249)	.0848*** (.0158)
Family size (inverse)	-.0212 (.0225)	-.0123 (.0285)	-.0839*** (.0255)	-.0268 (.0333)	-.0953** (.0430)	-.0996** (.0446)	-.2111*** (.0295)
Guest meals	.0467*** (.0041)	.0338*** (.0050)	.0595*** (.0046)	.0782*** (.0061)	.0399*** (.0074)	.0143* (.0078)	.0280*** (.0049)
Proportion age 0-2	-.3016*** (.0518)	-.1200* (.0652)	-.2275*** (.0580)	.1683** (.0739)	.1045 (.0968)	-.5225*** (.1131)	-.2436*** (.0638)
Proportion age 3-12	-.0825*** (.0302)	.0557 (.0381)	-.1132*** (.0341)	-.0532 (.0443)	.1298** (.0575)	-.0868 (.0603)	-.1355*** (.0370)
Proportion age 13-19	-.0163 (.0315)	.0161 (.0401)	-.1113*** (.0357)	.0396 (.0462)	.1309** (.0604)	-.0349*** (.0614)	-.1658*** (.0395)
Proportion age 20-39	-.0648*** (.0154)	.0070 (.0194)	-.0687*** (.0174)	.0310 (.0228)	.0206 (.0289)	-.0483 (.0298)	-.0570*** (.0203)
Proportion age 65 and over	.0132 (.0163)	-.0148 (.0210)	-.0294 (.0184)	-.0130 (.0242)	.0298 (.0313)	-.1034*** (.0328)	-.0325 (.0208)
Food stamp program participation	.0074 (.0187)	.0193 (.0235)	.0522** (.0210)	.1956*** (.0268)	-.0178 (.0370)	.0634 (.0394)	.1186*** (.0205)
Summary statistics:							
Mean square error	.1054	.0504	.1261	.2261	.0908	.0200	.0172
Probability of purchase at means	.6420	.3586	.5979	.6566	.3135	.1349	.1799
Observed nonlimit values (proportion)	.7202	.3737	.6872	.7217	.3310	.1430	.2046
Income elasticity (total)	.1642	.1722	.1905	-.0414	.4754	.2695	-.3299

See footnotes at end of table.

Continued—

Appendix table 9—Tobit model for vegetables, fruits, and potatoes: Parameter estimates and summary statistics—Continued<sup>1</sup>

Independent variables	Fruit					
	Total	Fresh				Canned
		Total	Citrus	Other vitamin C	Other	
Constant	0.2257** (.1107)	0.0019 (.0881)	-0.2779*** (.0662)	-1.4772*** (.1475)	-0.0572 (.0729)	-0.4273*** (.0746)
North Central	-.2745*** (.0336)	-.1408*** (.0266)	-.1066*** (.0196)	-.0976** (.0451)	-.0962*** (.0219)	.0826*** (.0218)
South	-.4533*** (.0321)	-.2907*** (.0254)	-.2205*** (.0189)	-.1333*** (.0442)	-.1877*** (.0210)	-.0679*** (.0215)
West	-.0625* (.0362)	.0081 (.0285)	-.0756*** (.0208)	.1958*** (.0448)	.0179 (.0235)	-.0054 (.0241)
Suburban	-.1996*** (.0301)	-.1313*** (.0238)	-.0772*** (.0175)	-.0381 (.0392)	-.0989*** (.0196)	.0090 (.0202)
Nonmetropolitan	-.2549*** (.0309)	-.2270*** (.0246)	-.1344*** (.0184)	-.1998*** (.0425)	-.1666*** (.0203)	.0425** (.0206)
Black	-.0015 (.0396)	-.0074 (.0316)	.0900*** (.0232)	-.3030*** (.0645)	-.0253 (.0262)	-.2224*** (.0290)
Nonwhite/nonblack	.2192*** (.0685)	.2234*** (.0538)	.1834*** (.0377)	-.0789 (.0952)	.1682*** (.0443)	-.1716*** (.0495)
Log income	.2379*** (.0212)	.1725*** (.0168)	.0829*** (.0127)	.2185*** (.0286)	.1165*** (.0139)	.0671*** (.0142)
Summer quarter	.1203*** (.0337)	.1950*** (.0267)	-.2522*** (.0208)	.0848** (.0362)	.2905*** (.0221)	-.1215*** (.0227)
Fall quarter	-.0639** (.0325)	-.0667*** (.0258)	-.1359*** (.0193)	-.7937*** (.0480)	.0678*** (.0213)	-.0464** (.0215)
Winter quarter	-.0166 (.0329)	-.0791*** (.0262)	.1046*** (.0187)	-1.0060*** (.0561)	-.0379* (.0218)	.0277 (.0214)
Family size (inverse)	.5170*** (.0586)	.1091** (.0466)	-.1033*** (.0351)	-.3220*** (.0798)	.0189 (.0387)	-.2418*** (.0408)
Guest meals	.1085*** (.0108)	.0692*** (.0085)	.0359*** (.0061)	.0590*** (.0122)	.0399*** (.0071)	.0291*** (.0070)
Proportion age 0-2	.1848 (.1339)	-.2825*** (.1068)	-.1747** (.0809)	-.2843 (.1917)	-.1590* (.0681)	.9976*** (.0830)
Proportion age 3-12	-.0293 (.0793)	.0107 (.0629)	-.0097 (.0470)	.0704 (.1068)	.0190 (.0519)	.0242 (.0528)
Proportion age 13-19	-.1407 (.0830)	-.1066 (.0659)	.0345 (.0490)	-.0991 (.1136)	-.1266** (.0546)	-.1176** (.0560)
Proportion age 20-39	-.2396*** (.0404)	-.2316*** (.0321)	-.0927*** (.0242)	-.0467 (.0541)	-.2046*** (.0266)	-.2277*** (.0285)
Proportion age 65 and over	.1195*** (.0424)	.0796** (.0336)	.0681*** (.0253)	.2473*** (.0568)	.0185 (.0278)	.1399*** (.0283)
Food stamp program participation	-.0143 (.0486)	-.0327 (.0388)	.0321 (.0287)	-.0256 (.0763)	-.0452 (.0322)	.0093 (.0334)
Summary statistics:						
Mean square error	1.1034	.5232	.0769	.0425	.3067	.0729
Probability of purchase at means	.8394	.7190	.3528	.0728	.6624	.3018
Observed nonlimit values (proportion)	.9214	.7833	.3739	.1133	.7180	.3230
Income elasticity (total)	.1662	.1900	.2192	.5648	.1701	.1745

See footnotes at end of table.

Continued—

Appendix table 9—Tobit model for vegetables, fruits, and potatoes: Parameter estimates and summary statistics—Continued<sup>1</sup>

Independent variables	Fruit—Continued						
	Frozen	Juice				Frozen	Dried
		Total	Fresh	Canned	Frozen		
Constant	-2.6369*** (.3560)	-0.2120*** (.0757)	-1.3720*** (.2050)	-0.6145*** (.0925)	-0.7452*** (.0754)	-1.1752*** (.1126)	
North Central	-.0409 (.0950)	-.2378*** (.0228)	-.9554*** (.0629)	-.1002*** (.0285)	-.0078 (.0219)	-.0303 (.0312)	
South	-.2774*** (.1006)	-.2457*** (.0216)	-.7303*** (.0552)	.0098 (.0265)	-.1356*** (.0215)	-.1791*** (.0320)	
West	-.1802 (.1112)	-.1409*** (.0245)	-.8089*** (.0652)	.0511* (.0299)	.0078 (.0237)	.0446 (.0328)	
Suburban	-.1643* (.0932)	-.0884*** (.0204)	-.1758*** (.0527)	-.0811*** (.0250)	.0455** (.0201)	-.0109 (.0291)	
Nonmetropolitan	-.0492 (.0938)	-.1083*** (.0211)	-.5074*** (.0585)	-.0396 (.0256)	.0296 (.0209)	-.0086 (.0304)	
Black	-.3811** (.1620)	.0860*** (.0268)	.5152*** (.0651)	.1091*** (.0320)	-.1893*** (.0292)	-.2498*** (.0493)	
Nonwhite/nonblack	-.4547 (.3015)	.0866* (.0461)	.4195*** (.1090)	.1051* (.0555)	-.1523*** (.0489)	-.1399* (.0715)	
Log income	.1482** (.0682)	.1132*** (.0145)	.0810** (.0397)	.0550*** (.0177)	.1368*** (.0144)	.0936*** (.0213)	
Summer quarter	-.2609** (.1100)	-.0145 (.0230)	.0056 (.0650)	-.0082 (.0282)	-.0315 (.0225)	-.0418 (.0342)	
Fall quarter	-.0995 (.0980)	.0465** (.0221)	.2304*** (.0605)	-.0137 (.0273)	-.0097 (.0216)	.0864*** (.0314)	
Winter quarter	-.0235 (.0966)	.0547** (.0224)	.2212*** (.0612)	.0431 (.0274)	-.0384* (.0220)	.0426 (.0323)	
Family size (inverse)	-.3863* (.1989)	.2313*** (.0399)	.2340** (.1056)	.0328 (.0490)	-.1128*** (.0399)	-.1793*** (.0596)	
Guest meals	.0794*** (.0262)	.0366*** (.0073)	.0219 (.0190)	.0222** (.0089)	.0301*** (.0069)	.0178* (.0103)	
Proportion age 0-2	.4084 (.4190)	.2247** (.0907)	-.2314 (.2502)	.5208*** (.1074)	.1625* (.0890)	.4135*** (.1231)	
Proportion age 3-12	.3951 (.2459)	.0649 (.0540)	.1241 (.1458)	-.0301 (.0661)	.1139** (.0532)	.1080 (.0782)	
Proportion age 13-19	.2857 (.2567)	.0392 (.0565)	.0633 (.1539)	-.1039 (.0698)	.1142** (.0555)	-.0078 (.0850)	
Proportion age 20-39	-.2089 (.1373)	-.0077 (.0274)	-.0254 (.0731)	-.0515 (.0339)	.0147 (.0269)	.0411 (.0404)	
Proportion age 65 and over	.1592 (.1363)	-.0098 (.0290)	-.0246 (.0778)	-.0065 (.0355)	.0223 (.0291)	.1755*** (.0425)	
Food stamp program participation	-.2983 (.2039)	-.0070 (.0332)	.0975 (.0823)	.0157 (.0402)	-.0907** (.0359)	-.0506 (.0546)	
Summary statistics:							
Mean square error	.0073	.3135	.1586	.1140	.0907	.0175	
Probability of purchase at means	.0149	.6172	.1227	.3021	.3509	.0873	
Observed nonlimit values (proportion)	.0181	.6918	.1509	.3170	.3657	.0980	
Income elasticity (total)	.3652	.1697	.1228	.1131	.3219	.3178	

See footnotes at end of table.

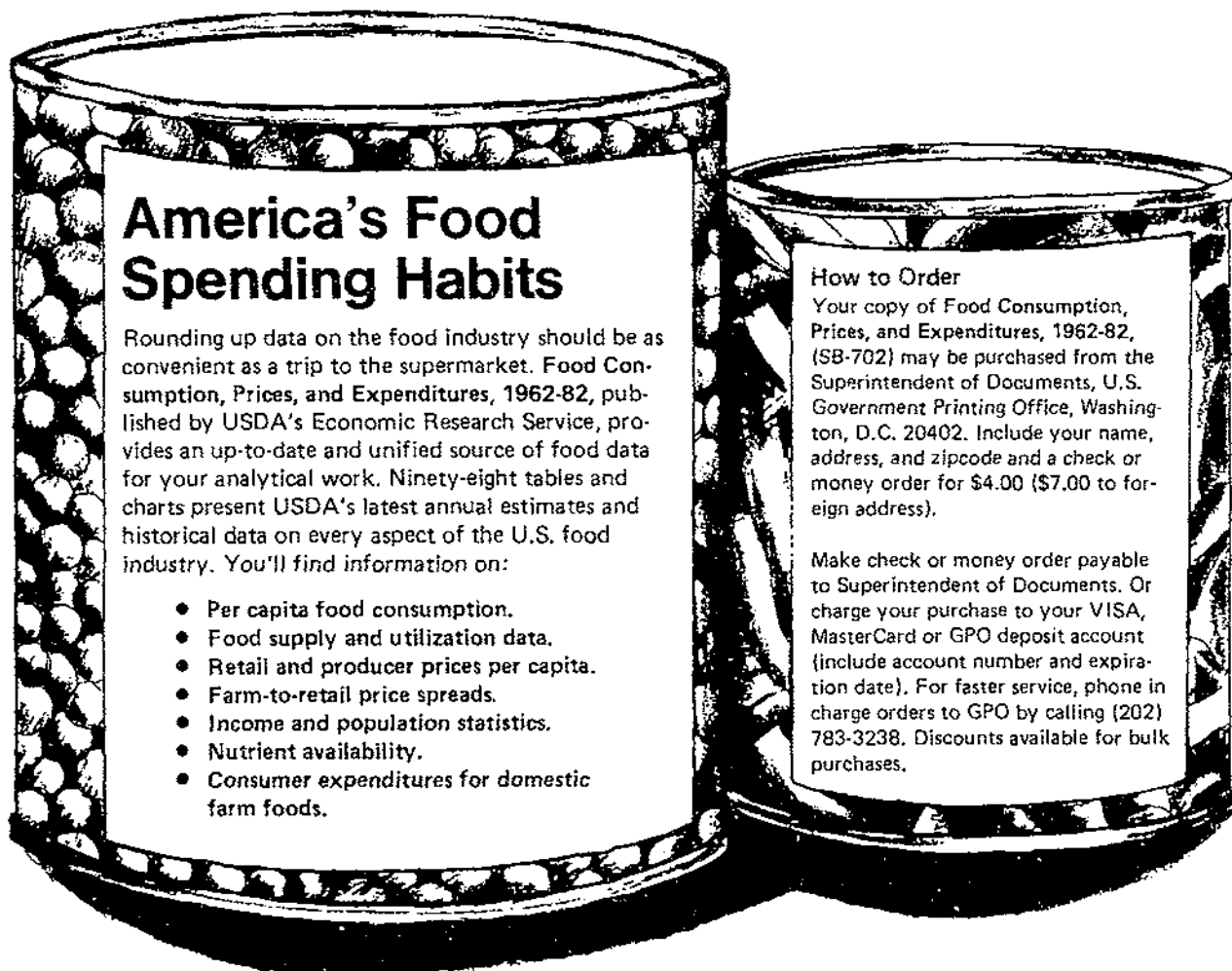
Continued—

Appendix table 9—Tobit model for vegetables, fruits, and potatoes: Parameter estimates and summary statistics—Continued<sup>1</sup>

Independent variables	Potatoes, including sweet					
	Total	Fresh	Canned	Frozen	Dehydrated	Chips, sticks, and salads
Constant	0.2157*** (.0346)	0.2402*** (.0262)	-0.6182*** (.1026)	-0.5580*** (.0754)	-0.6549*** (.0906)	-0.5449*** (.0542)
North Central	.0311*** (.0105)	-.0151* (.0079)	.0217 (.0305)	.0316 (.0206)	.0584** (.0256)	.0993*** (.0158)
South	.0063 (.0100)	.0159** (.0075)	.0106 (.0293)	-.0981*** (.0215)	-.0690** (.0270)	.0047 (.0156)
West	-.0440*** (.0114)	-.0522*** (.0086)	-.0014 (.0338)	-.0579** (.0236)	.0242 (.0281)	.0119 (.0175)
Suburban	.0181* (.0094)	-.0123* (.0071)	-.0031 (.0274)	.0264 (.0196)	.0257 (.0238)	.0755*** (.0145)
Nonmetropolitan	-.0182* (.0097)	-.0208*** (.0073)	-.0409 (.0287)	-.0482** (.0212)	-.0342 (.0255)	.0310** (.0151)
Black	-.0060 (.0124)	.0303*** (.0092)	.0315 (.0345)	-.1245*** (.0306)	-.1569*** (.0390)	-.1128*** (.0206)
Nonwhite/nonblack	-.0462** (.0214)	.0305* (.0160)	-.1828** (.0774)	-.2561*** (.0597)	-.1490** (.0634)	-.1578*** (.0356)
Log income	.0014 (.0066)	-.0148*** (.0050)	-.0221 (.0195)	.0264* (.0144)	-.0088 (.0172)	.0444*** (.0103)
Summer quarter	-.0198* (.0106)	-.0174** (.0080)	-.0912*** (.0325)	-.0362 (.0222)	-.0689** (.0276)	.0228 (.0161)
Fall quarter	.0005 (.0102)	.0114 (.0077)	.0188 (.0287)	-.0313 (.0214)	-.0473* (.0261)	-.0180 (.0158)
Winter quarter	.0291*** (.0103)	.0248*** (.0077)	.0011 (.0293)	-.0149 (.0214)	.0063 (.0253)	.0270* (.0158)
Family size (inverse)	-.0634*** (.0185)	-.1086*** (.0141)	-.2035*** (.0611)	-.2043*** (.0441)	-.0665 (.0510)	-.1146*** (.0303)
Guest meals	.0452*** (.0034)	.0269*** (.0025)	.0141 (.0097)	.0033 (.0078)	.0046 (.0093)	.0397*** (.0049)
Proportion age 0-2	-.0625 (.0417)	-.1026*** (.0315)	.7299*** (.0972)	.1293 (.0837)	.1850* (.1011)	.1113* (.0616)
Proportion age 3-12	-.0015 (.0247)	-.0838*** (.0186)	-.0263 (.0719)	.1364*** (.0514)	.1356** (.0628)	.2756*** (.0373)
Proportion age 13-19	.0267 (.0258)	-.1053*** (.0196)	-.0035 (.0768)	.2406*** (.0531)	.1294* (.0663)	.3008*** (.0390)
Proportion age 20-39	.0374*** (.0127)	-.0814*** (.0097)	-.0235 (.0415)	.0793*** (.0273)	.0446 (.0345)	.2084*** (.0194)
Proportion age 65 and over	-.0221* (.0134)	.0251** (.0100)	.0230 (.0429)	-.1170*** (.0350)	.0378 (.0376)	-.1779*** (.0244)
Food stamp program participation	.0404*** (.0151)	.0516*** (.0112)	.0301 (.0411)	-.1165*** (.0389)	.0467 (.0390)	-.0786*** (.0256)
Summary statistics:						
Mean square error	.0817	.0346	.0024	.0070	.0030	.0324
Probability of purchase at means	.7446	.6407	.0357	.0828	.0426	.2749
Observed nonlimit values (proportion)	.7913	.6709	.0413	.0989	.0480	.3027
Income elasticity (total)	.0037	-.0622	-.1242	.1346	-.0511	.1694

<sup>1</sup>Income elasticities are evaluated at the sample means reported in table 3. \*\*\* denotes significance at the 0.01 level, \*\* denotes significance at the 0.05 level, and \* denotes significance at the 0.10 level. Numbers in parentheses are standard errors for the parameter estimates.

Source: 1977-78 USDA Nationwide Food Consumption Survey.



## America's Food Spending Habits

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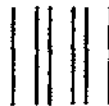
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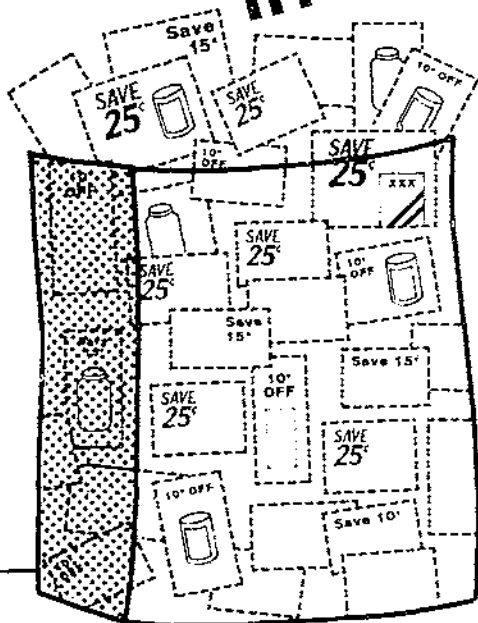
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