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How Economic Factors Influence the Nutrient Content of Diets

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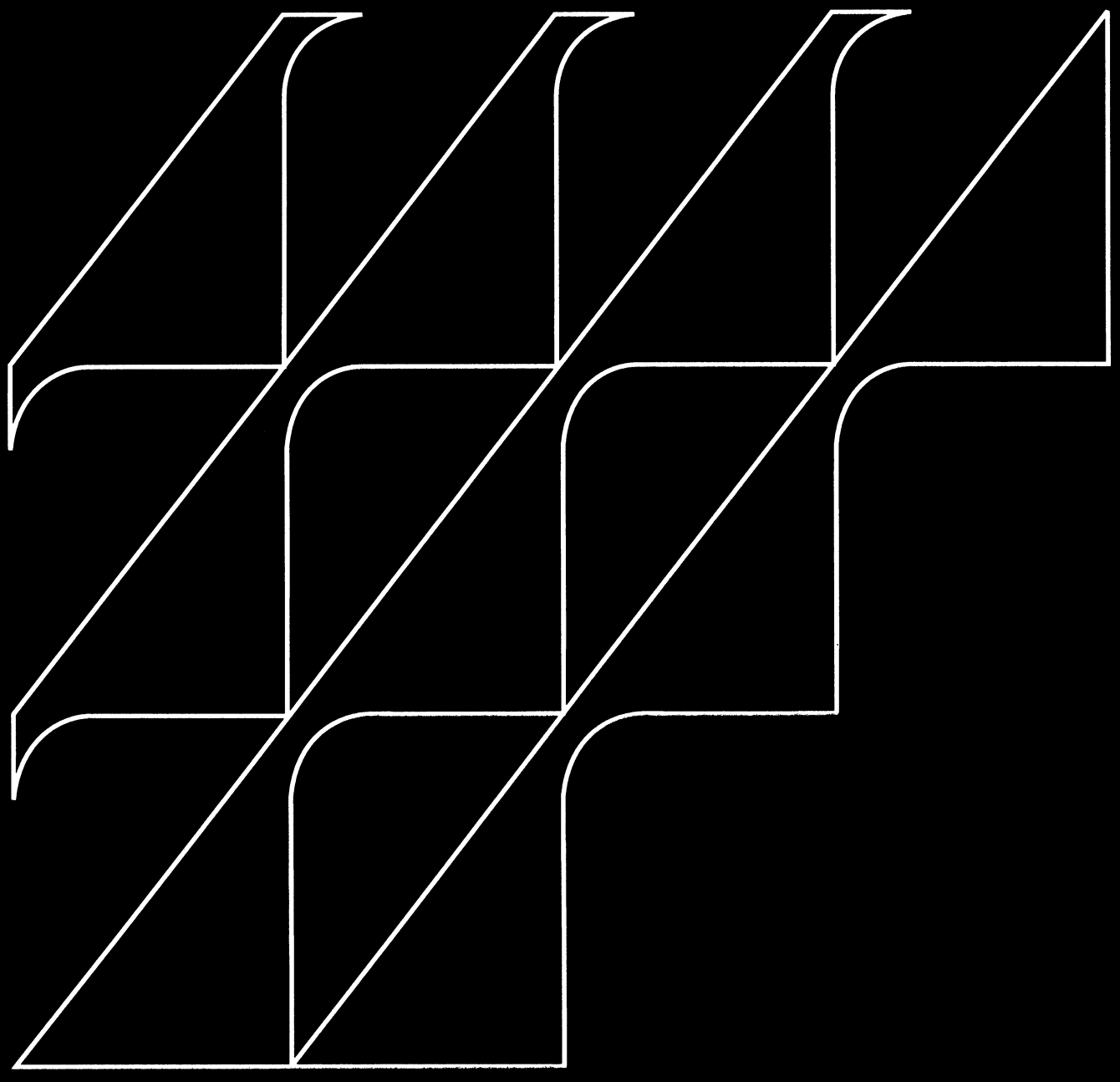

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How Economic Factors Influence the Nutrient Content of Diets. By Kuo S. Huang, Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin No. 1864.

Abstract

Economic factors such as food prices and consumer income affect food choices with consequences for the availability of nutrients. A new research model is developed to estimate how the availability of 28 nutrients would change as consumers alter their food purchases in response to changes in food prices and income through the interdependent food demand relationships.

Keywords: Complete food demand system, nutrient demand elasticities

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Summary

For the past several decades, Federal nutrition education efforts in the United States have focused on providing consumers with information to help them make healthful food choices. While health concerns are important in affecting food choice decisions, economic factors such as food prices and consumer income are also important determinants of food choices, with potential consequences for nutrient availability. A new research model is developed in this study to measure how economic factors influence the aggregate nutrient content of diets. The unique feature of this model is that it incorporates the information of a food demand system, including own- and cross-price and income effects into the measurement of aggregate nutrient responses.

The magnitude of nutrient responses to prices and income depends on both the magnitude of demand responses for individual foods and the nutrient content of these foods. The more important a food is in contributing a particular nutrient in the diet, the larger the nutrient response is for a corresponding price or income change. All foods are classified into 35 food categories. The results show that beef, pork, and chicken provide 34 percent of the total protein and 29 percent of the total fat available in the food supply. Fats and oils contribute an additional 41 percent of total fat. About a third of the saturated fatty acids come from beef, pork, and chicken, while fats and oils contribute only 27 percent, due to the increased use of vegetable oils. Beef, pork, and chicken also contribute about a third of total cholesterol available in the food supply, while eggs (including processed egg products) contribute another third. Wheat flour provides the highest share of iron, 61 percent, while dairy products provide the largest share of calcium, 84 percent.

The estimates of nutrient responses show the aggregate changes in the daily availability of 28 nutrients as consumers altered food purchases in response to changes in 35 food prices and consumer income. A 10-percent decrease in the price of beef or cheese would increase daily availabilities of energy by 9.49 and 11.39 calories, and saturated fatty acids by 0.33 and 0.37 gram, respectively. The same price decrease for beef or eggs would increase cholesterol by 1.49 and 1.09 milligrams, respectively. The same price decrease for fluid milk or evaporated and dry milk would increase calcium availability by 5.56 and 11.78 milligrams, respectively. A 10-percent decrease in the price of beef and wheat flour could increase the daily availability of iron by 0.19 and 0.06 milligram, respectively. The same price changes for oranges or fruit juices would increase daily availability of vitamin C by 1.17 and 1.15 milligrams, respectively.

Likewise, the net effect of changes in food consumption because of a 1-percent increase in per capita income would increase the daily availabilities of energy by 7.82 calories, protein by 0.24 gram, saturated fat by 0.19 gram, cholesterol by 1.24 milligrams, calcium by 2.97 milligrams, iron by 0.03 milligram, vitamin A by 3.06 retinol equivalents (RE), and vitamin C by 0.24 milligram. Therefore, the nutrient effects of increasing consumer income are mixed. Although the low intakes of calcium, iron, and various vitamins could be improved, the consumption of nutrients such as energy, saturated fats, and cholesterol (already consumed in excessive amounts) would be worsened.

In view of food group effects, all foods are further classified into the food groups of grain products, vegetables, fruits, dairy products, meat (including red meat, poultry, fish, eggs, and nuts), fats, and sweeteners. The net effect of a 10-percent price decrease in the meat group would increase daily per capita availability of calcium by 8.89 milligrams and iron by 0.27 milligram; adverse effects include an increase in total fat of 0.52 gram per day and cholesterol of 5.75 milligrams per day. The same price decrease in the dairy group would increase the daily availability of calcium by 24.39 milligrams. A 10-percent price decrease in the fats group would increase the daily availability of total fats by 1.08 grams.

The empirical results highlight the importance of economic factors that affect food choices with consequences for the availability of nutrients. In addition to own-price effects, the cross-price effects reflecting the interdependent demand relationships among the different food categories play a significant role in measuring aggregate nutrient responses. The estimated price and income effects on nutrients provide information to help food policy decisionmakers understand changes in the amount of different nutrients available for consumption and the overall nutritional quality of the diet. Estimates of nutrient income responses can also be a starting point in evaluating possible effects of income changes on dietary quality when the benefits of food stamp recipients are cut or increased.

How Economic Factors Influence the Nutrient Content of Diets

Kuo S. Huang

Introduction

Americans are increasingly concerned about their nutritional and health status. There appears to be a trend toward more healthful diets, as measured by increased consumption of low-fat and nonfat foods and leaner cuts of meat. But a considerable gap still exists between public health recommendations and consumers' actual nutrient intakes. According to the *Third Report on Nutrition Monitoring in the United States* (FASEB, 1995), consumption of a number of nutrients and food components remains a public health issue because of either excessive intake levels (total fat, saturated fatty acids, and cholesterol) or intake levels below recommended levels (calcium and iron). Additional research is needed to improve our understanding of how diet affects health as well as how consumer behavior affects food choices.

Since the release of the *Dietary Goals for the United States* in 1977 and *Dietary Guidelines for Americans*, Federal nutrition education efforts have provided advice to help Americans make more healthful food choices. In addition, the *Food Guide Pyramid* was released in 1992 to help consumers use the *Dietary Guidelines*. All these education efforts assume that consumers make food choices based on health concerns. Economic factors, such as food prices and consumer income, however, are also important influences in the decision to purchase a particular food or how often and how much to purchase. For example, if the price of beef goes up while the price of chicken remains the same, consumers will likely buy less of the relatively more expensive beef and buy more of the relatively less expensive chicken. Consumption of other foods could also be affected. If consumers buy less beef, such as hamburger meat, they might also buy less cheese and fewer hamburger rolls because of their complementary uses in cheeseburgers. Because different foods provide different nutritional profiles, changes in food prices or in consumer income are likely to translate into changes in the foods purchased, thereby affecting the quantities of nutrients available and the nutritional quality of consumer diets.

Given the demand structure for foods and the bundle of nutrient attributes of each food product, it is possible to derive the implied relationship between the overall availability of nutrients and changes in food prices and income. A change in a particular food price or in per capita income affects the quantities demanded of all foods through the interdependent demand relationships and thus changes the total level of nutrients available for consumption. Thus far, only a few studies have incorporated nutritional factors into food demand analyses, but they do not provide a comprehensive framework for studying the effects of economic factors on total nutrient levels. For example, some studies use a cholesterol information index, which is measured by the number

of medical journal articles that disseminate cholesterol information, as a variable in demand equations (Brown and Schrader, 1990; Capps and Schmitz, 1991). Some fit demand equations for specific nutrients as functions of income and sociodemographic variables from household survey data (Adrian and Daniel, 1976; Basiotis and others, 1983; Devaney and Fraker, 1989; Gawn and others, 1993). Others propose a formula to calculate nutrient demand elasticities for use in measuring price and income effects on nutrient availability, but they provide no information on how to derive the formula from an underlying demand model (Pitt, 1983; Sahn, 1988; Gould and others, 1991).

The objective of this study is to broaden the theoretical and methodological base of the research needed to link the determinants of food choices with consequences for nutrient levels. In this report, a new research model is developed that uses demand elasticities from a complete food demand system to estimate elasticities of changes in the availability of nutrients. The model is then applied to estimate how the availability of 28 nutrients would change as consumers alter their food purchases in response to changes in 35 food prices and consumer income. These estimated price and income effects provide important information to help food policy decisionmakers understand changes in the amount of different nutrients available for consumption and the overall nutritional quality of the diet.

The results obtained in this study are an extension of Huang's earlier study (1996) in the following two ways. First, this study provides more detailed measurement of nutrient responses than the earlier study by increasing the number of nutrients studied from 15 to 28. Second, the information on nutrient values for the edible portion of food as purchased is compiled from U.S. Department of Agriculture (1996), *The Online Version of Agriculture Handbook No. 8*. In addition to updated nutritional information, the nutrient values used in this study correspond more closely to the disappearance food quantity data underlying the estimated demand system. The earlier study used nutrient data from Gebhardt and Matthews (1991) on the nutrient content for the edible portion of food as consumed.

Conceptual Framework

Since the change of a food price or income will affect all foods consumed and cause a wide variety of nutrients to change simultaneously, the information from a complete food demand system is needed to translate changes in food prices and consumer income into changes in the levels of nutrients available. The following text is a discussion of how to link the food choice within the context of the classical demand framework to consumers' nutritional status. In addition, since Lancaster's (1966) approach is very much in line with the nutritional analysis of this study, a brief review of his model at the end of this section shows the difference between his approach and the approach implemented here.

A Complete Food Demand System

Let q denote an n-coordinate column vector of quantities demanded for a "representative" consumer, p an n-coordinate column vector of the corresponding prices, $m = p'q$ the consumer's expenditure, which is the product of p and q, and $u(q)$ the utility function, which is assumed quasi-concave in q. The primal function for maximizing consumer utility is the following Lagrangean function with multiplier π:

$$\underset{q,\,\pi}{\text{Maximize}}\ L = u(q) - \pi\,(p'q - m). \tag{1}$$

Defining $u_i(q)$ as the marginal utility of the ith commodity, the necessary conditions for optimum are:

$$u_i(q) = \pi\, p_i \tag{2}$$

and $$p'q = m. \tag{3}$$

A solution of utility maximization represented by equations 2 and 3 gives the ith demand equation in a demand system of n goods as:

$$q_i = f_i(p, m). \tag{4}$$

While the utility structure is unknown, the demand system may be expressed by applying the first-order differential approximation of the conceptual demand relationships as:

$$dq_i = \Sigma_j\, (\partial q_i / \partial p_j)\, dp_j + (\partial q_i / \partial m)\, dm. \tag{5}$$

By expressing the price and income slopes of equation 5 in terms of elasticities, a differential-form demand system is obtained as:

$$dq_i / q_i = \Sigma_j\, e_{ij}\, (dp_j / p_j) + \eta_i\, (dm / m), \tag{6}$$

where $e_{ij} = (\partial q_i / \partial p_j)\, (p_j / q_i)$ is a price elasticity of the ith commodity, with respect to a price change of the jth commodity, and $\eta_i = (\partial q_i / \partial m)\, (m / q_i)$ is an expenditure (or income) elasticity showing the effect of the ith quantity in response to a change in per capita expenditure. This demand model is a general approximation of conceptual demand relationships relating to some small changes from any given point on the n-commodity demand surface. Also, the demand system, unlike the logarithmic form demand system, does not impose any rigid functional form.

To ensure theoretical consistency in applying the differential-form demand model, the following linear parametric constraints provided by the classical demand theory should be applied:

Engel aggregation: $\Sigma_i w_i \eta_i = 1$ (7)

Homogeneity: $\Sigma_j e_{ij} + \eta_i = 0$ (8)

Symmetry: $e_{ji} / w_i + \eta_j = e_{ij} / w_j + \eta_i$, (9)

where $w_i = p_i q_i / m$ is the expenditure share of the ith commodity.

Measuring Nutrient Demand Elasticities

Figure 1 depicts the process of measuring the nutrient demand elasticities. A change in a particular food price or in per capita income will affect the quantities demanded of all foods through the interdependent demand relationships. Subsequently, this would translate into changes in the total level of nutrients available for consumption. Therefore, the nutrient demand elasticities can be measured by directly incorporating all own- and cross-price and income effects of a complete food demand system into the measurement.

To explore the linkage of the demand model to nutrient availability, let a_{ki} be the quantity of the kth nutrient in a total of ℓ nutrients obtained from a unit of the ith food. The total quantity of that nutrient, say ϕ_k, obtained from various foods may be expressed as:

$$\phi_k = \Sigma_i a_{ki} q_i . \quad (10)$$

This is what Lancaster (1966) called the "consumption technology" of consumer behavior. The values of a_{ki}'s for nonfoods will be assigned to zero, and the terms associated with nonfoods will disappear. This equation, including all foods consumed, plays a central role in the transformation of food demand into nutrient availability.

By incorporating equation 5, the measurement of changes in nutrients is obtained as:

$$d\phi_k = \Sigma_i a_{ki} [\Sigma_j (\partial q_i / \partial p_j) dp_j + (\partial q_i / \partial m) dm]. \quad (11)$$

Furthermore, the relative change in nutrient availability can be expressed as a function of the relative changes in food prices and per capita income as follows:

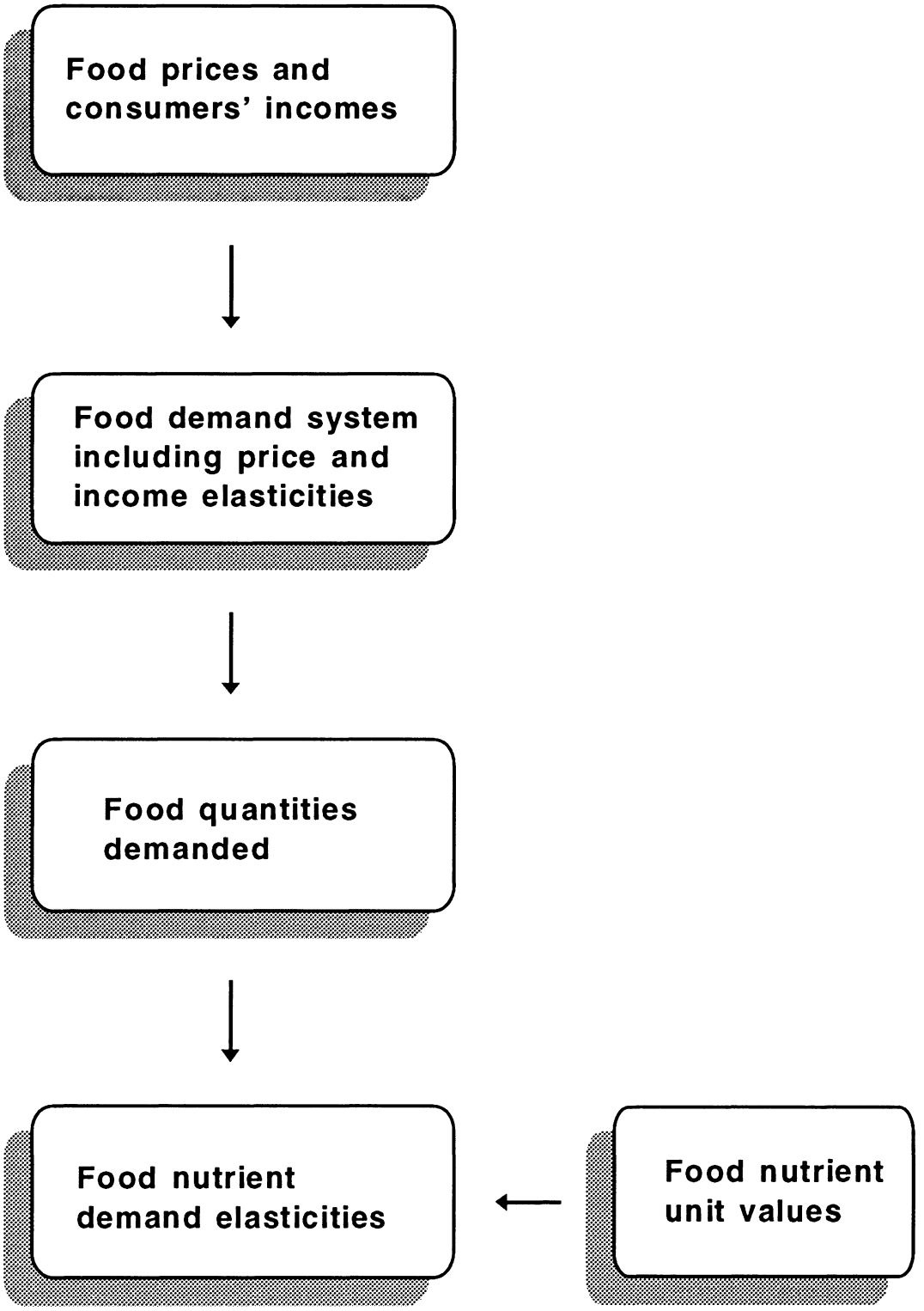
$$d\phi_k / \phi_k = \Sigma_j (\Sigma_i e_{ij} a_{ki} q_i / \phi_k) (dp_j / p_j) + (\Sigma_i \eta_i a_{ki} q_i / \phi_k) (dm / m) \quad (12)$$

$$= \Sigma_j \pi_{kj} (dp_j / p_j) + \rho_k (dm / m), \quad (13)$$

where $\pi_{kj} = \Sigma_i e_{ij} a_{ki} q_i / \phi_k$ is a price elasticity measure relating the effect of a change in the jth food price on the availability of the kth nutrient, and $\rho_k = \Sigma_i \eta_i a_{ki} q_i / \phi_k$ is an income elasticity measure relating the effect of a change in income on the availability of that nutrient.

Figure 1

Measuring food nutrient demand elasticities



Obviously, the measurement of π_{kj} represents the weighted average of all own- and cross-price elasticities (e_{ij}'s) in response to a change in the jth price, with each weight expressed as the share of each food's contribution to the kth nutrient ($a_{ki} q_i / \phi_k$'s). Similarly, the measurement of ρ_k represents the weighted average of all income elasticities (η_i's), with each weight again expressed as the share of each food's contribution to the kth nutrient. Thus the general calculation of a nutrient demand elasticity matrix, say $\boldsymbol{N}$, for the case of ℓ nutrients and n foods can be obtained as a product of multiplying matrix $\boldsymbol{S}$ by matrix $\boldsymbol{D}$ as follows:

$$\boldsymbol{N} = \boldsymbol{S} * \boldsymbol{D}, \tag{14}$$

where $\boldsymbol{N}$ is the $\ell \times (n+1)$ matrix of nutrient demand elasticities in response to changes of food prices and income, $\boldsymbol{S}$ is the $\ell \times n$ matrix with entries of each row indicating a food's share of a particular nutrient, and $\boldsymbol{D}$ is the $n \times (n+1)$ matrix of demand elasticities.

Review of Lancaster's Approach

Lancaster (1966) was the first person to formally incorporate the attributes or characteristics of the products purchased by consumers into demand analysis. According to his theory, given their personal tastes and preferences, consumers aim to attain the attributes that they most desire, not the product itself. He broke away from the traditional approach that goods are the direct objects of utility and, instead, hypothesized that utility is derived from the properties or characteristics of the goods. The consumer's choice problem thus becomes one of maximizing the utility function subject to a budget constraint and a set of transformation equations that link characteristics of the goods to the quantities of goods purchased. The model can be expressed by a maximization of utility $U(z)$ operating on a vector of characteristics (z) as follows:

$$\text{Maximize } U(z) \tag{15}$$

$$\text{Subject to } p' q \leq \text{ m}, \; z = Bq, \text{ and } z, q \geq 0. \tag{16}$$

The budget constraint is defined as $p' q \leq m$ for a price vector (p), a quantity vector (q), and expenditure (m). The equation system $z = B q$ represents a transformation between the amounts of characteristics (z) and commodities (q) with matrix B, the consumption technology of the economy.

In terms of this study, the characteristics (z) may be interpreted as nutrients, and the consumption technology (B) is a structure of nutrient values contained in each unit of food. Accordingly, we may view nutrients as attributes or characteristics of food consumption, and consumers attain the nutrient attributes they most desire by maximizing utility as a function of nutrient attributes, as opposed to food quantities in classical demand theory. The consumer's choice problem is to maximize the utility function subject to a budget constraint and a set of transformation equations that link nutrient availability to food consumption.

Lancaster's conceptual framework to link food choice and nutritional status, however, is rather difficult to implement empirically. To solve the maximization problem, Lancaster suggested transforming the utility function into commodity space and then relating it directly to the budget constraint. To accomplish this procedure, we need to substitute the consumption technology equation into the utility function and rewrite the utility function directly in terms of commodities as $U(z) = U(Bq)$. As Lancaster admitted, the properties of the new utility function depend crucially on the structure of the matrix B, and this together with the constraints $q \geq 0$ and $z = B\,q \geq 0$ is a much more complicated situation than that of conventional utility maximization. In addition to the difficulty in defining a proper functional form for the utility function, it is rather complicated to solve such a nonlinear programming problem for obtaining the nutritional implication of food consumption.

Empirical Application

According to the procedure for estimating nutrient demand elasticities, two sets of input information are required: one is the matrix of food demand elasticities and the other is the matrix of nutrient shares of each food category. In this section, data sources and compiling procedures for obtaining the input information are discussed. Then, the nutrient demand elasticities are calculated and presented.

Data Sources and Compiling Procedures

Regarding the information on food demand elasticities, the estimates of a complete food demand system in Huang (1993) are used. The demand system specified as in equation 6 consists of 1,680 price and expenditure (income) elasticities for 39 food categories and 1 nonfood sector. This demand system was estimated by using the constrained maximum likelihood method, while the parametric constraints of homogeneity, symmetry, and Engel aggregation are imposed at the sample means. In the estimation of the demand system, the price indexes for most food categories are components of the consumer price index covering 1953-90 obtained from the U.S. Department of Labor. Per capita food consumption data are obtained from the U.S. Department of Agriculture's Economic Research Service (ERS) food disappearance series covering the same period (Putnam and Allshouse, 1994). In selecting food items in the disappearance data, food consumption data were matched with the variation of its price index as closely as possible. Per capita total expenditure is computed by dividing the personal consumption expenditures by the civilian population of 50 States as of July 1 each year, using data from the U.S. Department of Commerce.

For this study, some other food and nonfood categories in the demand system, however, are excluded from nutritional analysis because of difficulty or irrelevance in defining nutrient values for these categories. Therefore, the demand elasticities compiled for this study contain 1,260 estimates of own- and cross-price elasticities and income elasticities for 35 food categories. Among demand elasticity estimates, for example, the own-price elasticities for major meat are

beef (-0.6212), pork (-0.7281), and chicken (-0.3723), and their corresponding income elasticities are beef (0.3923), pork (0.6593), and chicken (0.0769). The cross-price elasticities of beef in response to the price changes of pork and chicken are 0.1143 and 0.0183, respectively, indicating substitution. The simulation performance based on the calculated relative root-mean-square errors to sample means indicates that the errors of simulated quantities demanded are less than 5 percent in most cases. The close correspondence between simulated values and sample observations indicates that this demand system is reliable for use in estimating nutrient elasticities. For illustration, the own-price and income elasticities and the errors of simulation over the sample period as measures of fit are presented in appendix table 1.

To calculate the nutrient shares of each food category, per capita food consumption data and information on nutrient value of food per pound are needed. The definition of food categories and the sources of food consumption data are the same as those in Huang's food demand system. Per capita food consumption data are obtained from the ERS food disappearance series for average consumption over 1989-93. The disappearance data represent the quantities of food supplies moving through the U.S. marketing channel available for domestic consumption. The foods are reported mostly in their raw commodity form, such as wheat flour or meat in retail weight equivalent, rather than as finished food products, such as baked goods or roasted chicken. Thus the disappearance data include the weight of the inedible portion of each food, such as the skin and bones in meat and the peel and seeds in some fruits and vegetables. The data are a measure of average food consumption at the aggregate level rather than at the individual or household level.

Information on nutrient values (app. table 2) is compiled from the updated version of *USDA's Agricultural Handbook No. 8* (U.S. Department of Agriculture, 1996) available online in the Internet containing data on the nutrient content of 5,635 food items. The nutrient data are expressed in terms of the nutrient values in the edible portion of 100 grams of food consumed. The following formula adopted in the handbook is used to convert the nutrient values to a form consistent with the food disappearance data, which include inedible material such as bone, skin, and seeds:

$$Y = V * 4.536 * [\,(100 - R) / 100\,], \tag{17}$$

where Y is the nutrient value per pound in the edible portion of food as purchased, V is the nutrient value per 100 grams in the edible portion of food as consumed (obtained from the nutrient data file), and R is the percentage of refuse in foods (varying from more than 50 percent, such as nuts in their shells, to none for many foods, such as butter and fluid milk). The number (4.536) is the conversion factor from 100 grams to 1 pound. For example, to calculate the nutrient values for chicken, the nutrient data file lists "chicken, broilers or fryers, meat and skin, raw " with 32 percent of refuse and containing 215 calories of energy in 100 grams of an edible portion of chicken. Accordingly, the energy content of 1 pound of purchased chicken, as measured by the disappearance data, is calculated as 663 calories per pound from 215*4.536* (1-0.32).

Some food categories consist of more than two foods. The nutrient values for such a food category are calculated as the average of nutrients for each food in the category. For example, the nutrient values for the fluid milk category are calculated as the weighted average of four types of milk with different fat content. Their weights are derived from the average per capita consumption in 1989-93: 3.3-percent-fat milk (44 percent), 2-percent-fat milk (38 percent), 1-percent-fat milk (8 percent), and skim milk (10 percent). The nutrient values for the fish category, on the other hand, are calculated as a simple average of the nutrient values for 11 kinds of fish, because there are no data for the amounts consumed of the different fish.

The values for 28 nutrients in the edible portion of 1 pound of food as purchased are compiled in appendix table 3. Food energy is measured in kilocalories (kcal, commonly referred to simply as calories); protein, fat, carbohydrate, and dietary fiber are measured in grams; vitamin A is measured in retinol equivalents (RE), vitamin E is in alpha-tocopherol equivalents (ATE), vitamin B_{12} and folate in micrograms, and all other nutrients in milligrams. These nutrient unit values and quantities of per capita food consumption over 1989-93 (listed at the bottom of the table) comprise the basic information for computing the share of nutrients for each food category.

Food Consumption in the American Diet

The ERS food disappearance data series shows that consumers are increasingly concerned about their nutritional and health status. In the last two decades, there has been a trend toward consumption of more poultry meat and fish, and less red meat. This trend stems from consumer health concerns about fat from red meat in the diet, while the greater offering of convenience products like cut-up, precooked, and other processed chicken products helped boost consumption of poultry meat. Consumption of dairy products has changed by substituting low-fat and skim milk for whole milk. Consumption of fats and oils has been characterized by a rapid increase in use of vegetable oils. This reflects both consumers' avoidance of much saturated fats and the greatly expanded consumption of fried foods cooked in vegetable oils at food-service outlets. Consumption of fruits, vegetables, and grain products has increased steadily over the years, adding greatly to consumers' intakes of dietary fiber and various vitamins.

The shares of nutrients provided by 35 food categories, required in the estimation of nutrient demand elasticities, are presented in table 1. These nutrient shares are obtained by multiplying the average per capita food consumption over 1989-93 by its unit nutrient values, and then calculating the share that each food category contributes to the overall total for each nutrient. These nutrient shares take into account both the quantities of unit nutrients and foods consumed in all food categories. In the following discussion on nutrient shares and nutrient demand elasticities, the major focus is on nutrients and dietary components of current public health interest. Namely, as indicated in FASEB (1995), there are excessive intakes for food energy, total fat, saturated fatty acids, and cholesterol, while the intake levels for iron and calcium are below recommended values.

Table 1--Nutrient shares, 1989-93

Nutrient	Beef	Pork	Chicken	Turkey	Fish	C.fish	Egg	Cheese	Milk	E.milk	Flour	Rice	Potato	Butter	Margar.	Oils	Apple	Orange
	Percent of each nutrient																	
Energy	7.13	6.20	4.44	0.90	0.46	0.33	1.58	3.95	4.80	2.51	22.72	2.49	1.53	1.28	3.16	18.44	0.42	0.19
Protein	13.99	7.56	12.67	3.84	2.61	1.74	4.38	7.92	9.92	6.22	21.27	1.60	1.32	0.05	0.07	0.00	0.05	0.12
Total fat	11.57	11.37	6.13	0.87	0.27	0.23	2.09	6.29	4.10	1.38	1.19	0.09	0.04	2.84	6.98	40.81	0.05	0.01
Saturated fat	14.25	12.24	5.31	0.75	0.22	0.15	1.97	12.10	7.78	2.55	0.57	0.07	0.03	5.36	3.96	27.32	0.02	0.00
M-unsat. fat	14.19	14.57	7.12	0.88	0.27	0.21	2.24	5.07	3.34	1.20	0.30	0.08	0.00	2.31	9.00	35.87	0.01	0.01
P-unsat. fat	1.78	4.99	5.35	0.88	0.27	0.33	1.17	0.75	0.64	0.18	2.09	0.10	0.07	0.43	8.85	70.20	0.06	0.01
Cholesterol	13.81	9.31	11.79	3.41	1.59	0.55	34.43	7.40	6.43	2.50	0.00	0.00	0.00	2.97	0.00	1.78	0.00	0.00
Carbohydrate	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.26	4.08	2.65	45.01	5.16	3.29	0.00	0.02	0.00	1.04	0.45
Dietary fiber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	48.83	2.58	9.05	0.00	0.00	0.00	5.67	2.81
Calcium	0.64	1.00	0.73	0.28	0.29	0.29	1.67	22.11	35.25	21.81	2.99	0.61	0.44	0.13	0.25	0.00	0.16	0.52
Iron	9.47	2.37	3.98	2.07	0.56	0.52	3.27	1.46	0.85	0.59	61.27	1.15	3.07	0.06	0.00	0.00	0.29	0.08
Magnesium	5.89	3.03	5.84	1.78	1.78	0.95	1.50	3.99	17.20	9.09	19.42	2.41	5.74	0.05	0.09	0.01	0.51	0.57
Phosphorus	8.27	5.60	6.65	2.26	1.98	1.18	4.15	12.57	18.97	11.85	14.79	1.72	1.95	0.09	0.13	0.00	0.11	0.12
Potassium	7.57	4.83	4.52	1.78	1.53	0.65	1.49	1.83	16.28	10.34	7.81	0.91	12.16	0.05	0.13	0.00	0.96	0.85
Sodium	4.75	2.28	4.75	1.26	0.90	2.68	4.40	31.51	14.83	9.68	0.41	0.11	0.38	0.06	0.03	0.00	0.00	0.00
Zinc	25.40	7.58	7.78	3.85	0.73	0.45	3.36	9.24	10.49	6.68	12.78	2.14	2.23	0.02	0.00	0.00	0.10	0.07
Copper	5.99	3.00	2.15	2.05	0.87	0.60	0.89	0.74	0.00	0.89	30.98	4.84	16.45	0.13	0.00	0.00	1.11	0.39
Manganese	0.88	0.00	0.95	0.23	0.64	0.07	0.39	0.32	0.00	0.00	60.19	10.41	7.22	0.00	0.00	0.00	0.49	0.17
Vitamin A	0.00	0.18	2.93	2.03	1.20	0.15	7.04	10.16	14.57	1.73	0.00	0.00	0.00	4.66	12.28	0.00	0.13	0.30
Vitamin C	0.00	0.29	1.45	0.05	0.09	0.00	0.00	0.00	3.81	1.64	0.00	0.00	16.80	0.00	0.02	0.00	1.81	9.50
Thiamin	2.36	12.43	1.70	0.41	0.69	0.06	0.70	0.29	5.10	2.46	62.89	0.57	2.16	0.00	0.00	0.00	0.22	0.47
Riboflavin	4.51	3.95	3.24	1.35	0.55	0.23	6.67	4.71	17.01	11.08	36.65	0.36	1.03	0.10	0.12	0.00	0.21	0.15
Niacin	10.47	7.64	16.95	2.87	2.07	2.51	0.10	0.11	0.97	0.60	44.43	1.32	3.44	0.01	0.01	0.00	0.06	0.13
Pantothenic	4.62	5.08	10.75	3.11	1.71	0.40	7.58	2.76	16.11	10.02	15.77	3.97	4.15	0.11	0.11	0.00	0.30	0.56
Vitamin B-6	15.28	8.83	13.96	4.54	2.22	1.06	2.61	1.74	7.61	3.15	5.21	2.00	9.69	0.00	0.00	0.00	0.65	0.46
Vitamin B-12	35.59	5.60	3.66	5.06	7.01	3.13	5.87	4.88	17.54	8.79	0.00	0.00	0.00	0.13	0.16	0.00	0.00	0.00
Folate	2.75	1.06	1.99	2.11	0.53	0.21	8.02	2.26	7.42	4.07	26.07	0.88	3.98	0.08	0.05	0.00	0.32	1.97
Vitamin E	0.82	0.88	1.14	0.42	0.48	0.41	2.08	0.91	1.51	0.31	0.78	0.17	0.24	0.53	10.70	71.88	0.42	0.18

Continued--

Table 1--Nutrient shares, 1989-93--Continued

Nutrient	Banana	Grape	Grapef.	Lettuce	Tomato	Celery	Onion	Carrot	Juice	C.tomato	C.peas	Cocktl.	Peanut	Sugar	Sweet.	Coffee	Frzn.d.
	Percent of each nutrient																
Energy	0.64	0.14	0.04	0.12	0.11	0.04	0.21	0.12	1.06	0.58	0.04	0.04	0.47	10.24	1.20	0.01	2.41
Protein	0.23	0.05	0.02	0.33	0.14	0.06	0.21	0.10	0.41	0.94	0.08	0.01	0.70	0.00	0.00	0.01	1.38
Total fat	0.06	0.02	0.00	0.04	0.03	0.01	0.02	0.01	0.03	0.08	0.00	0.00	0.81	0.00	0.00	0.00	2.58
Saturated fat	0.07	0.02	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.33	0.00	0.00	0.00	4.84
M-unsat. fat	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.04	0.00	0.00	1.15	0.00	0.00	0.00	2.10
P-unsat. fat	0.06	0.03	0.00	0.07	0.06	0.01	0.03	0.02	0.04	0.11	0.01	0.00	1.03	0.00	0.00	0.00	0.40
Cholesterol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.02
Carbohydrate	1.53	0.35	0.09	0.19	0.22	0.08	0.44	0.28	2.42	1.27	0.07	0.11	0.13	24.97	3.08	0.01	2.67
Dietary fiber	4.84	0.60	0.36	3.95	1.60	1.17	2.83	2.51	1.20	8.90	0.73	0.27	2.09	0.00	0.00	0.00	0.00
Calcium	0.13	0.08	0.04	0.59	0.08	0.30	0.35	0.25	0.61	2.96	0.05	0.02	0.27	0.09	0.10	0.02	4.90
Iron	0.45	0.12	0.02	1.06	0.49	0.20	0.25	0.30	0.65	3.60	0.17	0.04	0.81	0.37	0.14	0.03	0.22
Magnesium	2.84	0.17	0.13	1.24	0.79	0.37	0.77	0.61	2.87	5.23	0.19	0.09	2.04	0.00	0.20	0.22	2.37
Phosphorus	0.30	0.05	0.02	0.43	0.27	0.13	0.39	0.28	0.70	1.28	0.09	0.03	0.71	0.12	0.04	0.01	2.75
Potassium	3.17	0.46	0.19	1.78	1.30	0.78	0.99	1.07	4.69	7.89	0.09	0.10	0.69	0.06	0.08	0.20	2.76
Sodium	0.02	0.01	0.00	0.29	0.15	0.67	0.05	0.33	0.20	14.98	0.65	0.01	0.05	0.10	1.30	0.02	3.14
Zinc	0.34	0.20	0.03	0.59	0.14	0.08	0.31	0.17	0.30	1.38	0.16	0.02	0.77	0.17	0.03	0.02	2.37
Copper	2.26	0.41	0.17	0.73	1.18	0.19	0.86	0.46	3.31	10.93	0.28	0.20	3.04	3.75	0.30	0.00	0.85
Manganese	1.32	1.87	0.00	2.24	0.69	0.33	1.13	0.60	0.73	5.76	0.29	0.21	2.28	0.00	0.53	0.10	0.00
Vitamin A	0.20	0.06	0.05	1.12	1.09	0.11	0.00	28.06	0.48	6.42	0.10	0.10	0.00	0.00	0.00	0.00	4.86
Vitamin C	2.77	0.75	1.75	1.68	4.25	0.73	1.53	1.18	29.80	19.31	0.34	0.11	0.01	0.00	0.00	0.00	0.31
Thiamin	0.30	0.24	0.07	0.57	0.31	0.15	0.34	0.36	1.96	1.73	0.11	0.03	0.67	0.00	0.00	0.00	0.67
Riboflavin	0.85	0.15	0.00	0.27	0.30	0.14	0.16	0.17	0.62	0.82	0.06	0.03	0.15	0.71	0.11	0.00	3.51
Niacin	0.45	0.08	0.04	0.22	0.38	0.09	0.10	0.32	0.43	2.70	0.08	0.05	1.13	0.00	0.01	0.08	0.16
Pantothenic	1.08	0.04	0.18	0.26	0.70	0.27	0.31	0.33	1.77	3.12	0.04	0.04	0.81	0.00	0.05	0.00	3.93
Vitamin B-6	7.55	0.48	0.10	0.86	0.69	0.44	1.26	0.81	1.95	5.15	0.10	0.08	0.52	0.00	0.00	0.00	1.00
Vitamin B-12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.59
Folate	2.12	0.13	0.19	8.77	1.22	1.06	1.66	0.65	12.19	3.87	0.36	0.04	3.00	0.00	0.00	0.01	0.96
Vitamin E	0.35	0.23	0.06	0.51	0.37	0.17	0.13	0.26	0.58	1.92	0.04	0.04	1.48	0.00	0.00	0.00	0.00

Note: The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), Pantothenic acid, C. fish (canned fish), E. milk (evaporated and dry milk), Margar. (margarine), Grapef. (grapefruit), C. tomato (canned tomatoes), C. peas (canned peas), Cocktl. (fruit cocktail), Sweet. (sweeteners), and Frzn. d. (ice cream and other frozen dairy products).
Source: U.S. Department of Agriculture, Economic Research Service.

Excessive intakes of food energy are a continuing public health problem, because 12 percent of U.S. adolescents and 35 percent of U.S. adults are overweight (U.S. Department of Health and Human Services, 1997). Wheat flour, fats and oils, and sugar provide half of the energy in the food supply (table 1). Beef, pork, and chicken provide an additional 18 percent of energy. Beef, pork, and chicken provide a total of 34 percent of protein and 29 percent of total fat, wheat flour and sugar each contribute 45 and 25 percent of carbohydrates, respectively, and fats and oils yield 41 percent of total fat.

Excessive intakes of saturated fatty acids and cholesterol are associated with elevated blood cholesterol levels, a risk factor for coronary heart disease. Beef, pork, and chicken contribute 32 percent of saturated fatty acids. The fats and oils category contributes 41 percent of total fat, but only 27 percent of saturated fatty acids, mainly because of an increased use of vegetable oils (and reduced use of animal fats) in salad and cooking oils and in deep-frying by food-service outlets and restaurants. Egg consumption, including fresh and processed uses, contributes about a third of total cholesterol in the food supply because of eggs' exceptionally high level of cholesterol (1,639 milligrams per pound) (app. table 3). Although per capita shell egg consumption has declined over the years, the total amount of eggs consumed is rather stable because of the increased use of processed eggs mainly as ingredients in foods like cake mixes and other baked goods. Since cholesterol is found only in animal products, most of the remaining cholesterol consumed comes from meat and dairy products, with beef contributing 14 percent; pork, 9 percent; chicken, 12 percent; cheese, 7 percent; and milk, 6 percent.

Low calcium intakes are known to be insufficient to attain adequate adult bone mass and to prevent age-related loss of bone mass. According to FASEB (1995), calcium intakes by adolescent and adult females were consistently below the Recommended Dietary Allowances (RDA). Almost all calcium (84 percent) comes from dairy products, with milk providing 35 percent; cheese, 22 percent; evaporated and dried milk, 22 percent; and frozen dairy products, 5 percent (table 1). The trend in consumption of fluid milk is toward low-fat milk. More than half (56 percent in 1989-93) of all milk consumed is 2-percent fat or less, while the remainder is 3.3-percent fat (whole milk).

Low intake of iron for children 1-2 years of age and adolescent and adult females is also a public health concern. Wheat flour provides the greatest share of iron (61 percent), followed by beef (10 percent) and chicken (4 percent) (table 1). For other important nutrients, a significant amount of vitamin C came from fruit juice (30 percent) and canned tomatoes (19 percent); carrots are exceptionally rich in vitamin A, and contribute 28 percent of total vitamin A in the food supply.

The estimates in table 1 are based on the foods in their raw commodity form rather than as final food products. For example, wheat flour is naturally low in fat, and, in its raw commodity form, provides less than 2 percent of the total fat available for consumption at this aggregate level. Nutrient shares would be considerably different at the consumer level, since preparation methods that incorporate added fats may result in a high fat content when analyzed as final food products such as baked goods. However, because the demand analysis is based on food disappearance

data, which measure average per capita consumption of foods in their commodity form, nutrient values considered in this study must also be based on foods in their commodity form.

Food Prices and Income Affect Nutrients Consumed

Given the nutrient shares of individual food categories in table 1 and a complete set of own- and cross-price and income elasticities obtained from Huang (1993), the nutrient responses can be measured by following the procedure developed in this study. Under the procedure, the change of a nutrient in response to a price change for any particular food category can be estimated as the weighted average of all own- and cross-price elasticities, with each weight expressed as the nutrient share for each food category. Similarly, the change of a nutrient in response to income can be estimated as the weighted average of all income elasticities, with each weight again expressed as the nutrient share for each food category.

The empirical estimates of nutrient demand elasticities are compiled in table 2. These elasticities show how the availability of 28 nutrients would change in response to changes in 35 food prices and per capita income. For example, the net effects of a 10-percent decrease in the price of beef (holding other prices and income the same) would increase protein by 1 percent, saturated fat by 0.66 percent, cholesterol by 0.38 percent, calcium by 0.8 percent, iron by 1.34 percent, vitamin C by 1.2 percent, and vitamin B_{12} by 2.24 percent. Even though no vitamin C is in beef, its price change would affect the availability of that nutrient because a change of beef price would affect not only the consumption of beef but all other foods as well through the cross-commodity effects. In addition, although beef contributes little to total dietary fiber, a 10-percent decrease in the price of beef has a much larger effect (0.67 percent) on the overall availability of dietary fiber than does a 10-percent decrease in the price of wheat flour (0.18 percent), whereas wheat flour contributes about half of the total dietary fiber available. These examples highlight the importance of interdependent demand relationships among the different food categories through cross-price effects.

For easy understanding of nutrient changes, it would be useful to translate the percentage changes in a nutrient or dietary component due to a change in price or income to the absolute amount of nutrient affected. In table 3, the average per capita food consumption data over 1989-93 were divided by 365 days to obtain average daily per capita consumption levels for measuring daily per capita nutrient changes in response to a change in a particular food price or in per capita income. For example, the net effects of changes in food consumption because of a 10-percent decrease in the price of beef would increase the daily availabilities of protein by 0.91 gram, saturated fat by 0.33 gram, cholesterol by 1.49 milligrams, calcium by 7.52 milligrams, iron by 0.19 milligram, vitamin C by 0.82 milligram, and vitamin B_{12} by 0.12 microgram. These estimated nutrient changes in terms of the percentage or the absolute amount of changes are useful information to help food policy decisionmakers to understand how food prices and income changes would affect the overall nutritional quality of U.S. diets.

Table 2--Changes in nutrients in response to a 10-percent decrease in food price or a 1-percent increase in income

Nutrient	Beef	Pork	Chicken	Turkey	Fish	C.fish	Egg	Cheese	Milk	E.milk	Flour	Rice	Potato	Butter	Margar.	Oils	Apple	Orange
								Percentage change										
Energy	0.316	0.073	0.040	-0.046	0.156	-0.025	0.083	0.379	-0.087	0.029	0.253	-0.031	0.103	0.085	0.040	0.215	0.087	0.137
Protein	1.000	0.214	0.342	0.109	0.141	0.027	-0.009	0.348	0.126	0.409	0.343	-0.091	0.021	0.066	0.118	-0.220	-0.014	0.145
Total fat	0.333	0.140	0.067	-0.111	0.148	-0.115	0.014	0.531	-0.333	-0.135	0.215	0.024	0.136	0.178	-0.021	0.549	0.160	0.196
Saturated fat	0.660	0.330	-0.015	-0.178	0.216	-0.069	-0.015	0.745	-0.166	-0.018	0.298	-0.033	0.103	0.320	-0.065	0.450	0.142	0.227
M-unsat. fat	0.480	0.399	0.115	-0.055	0.107	-0.096	-0.019	0.438	-0.397	-0.022	0.224	-0.002	0.130	0.087	-0.009	0.432	0.106	0.141
P-unsat. fat	-0.470	-0.550	0.096	-0.124	0.127	-0.216	0.099	0.409	-0.495	-0.468	0.072	0.157	0.203	0.140	0.010	0.923	0.275	0.249
Cholesterol	0.378	0.286	0.128	0.142	0.093	0.138	0.276	0.334	-0.083	-0.033	0.431	-0.032	-0.022	0.163	-0.017	0.025	0.068	0.118
Carbohydrate	0.082	-0.047	-0.095	-0.020	0.178	0.061	0.178	0.229	0.112	0.104	0.248	-0.064	0.093	-0.017	0.086	-0.013	0.034	0.079
Dietary fiber	0.672	0.239	-0.407	0.044	0.495	0.227	0.229	0.239	-0.307	0.305	0.180	-0.049	0.151	-0.081	0.236	-0.021	0.055	0.198
Calcium	0.801	0.246	-0.297	-0.111	0.404	0.101	-0.239	0.893	0.592	1.254	0.188	-0.108	0.053	0.126	0.192	-0.340	-0.066	0.377
Iron	1.339	0.047	-0.096	0.033	0.298	0.098	0.273	0.310	-0.293	0.140	0.448	-0.122	0.075	0.002	0.191	-0.213	0.076	-0.027
Magnesium	0.735	0.219	-0.134	0.094	0.341	0.149	0.005	0.288	0.225	0.614	-0.044	0.060	0.081	-0.120	0.246	-0.379	-0.023	0.268
Phosphorus	0.823	0.255	0.042	0.016	0.221	0.056	-0.071	0.530	0.319	0.696	0.313	-0.107	0.047	0.110	0.132	-0.228	-0.026	0.221
Potassium	0.755	0.551	-0.396	0.196	0.365	0.193	-0.024	0.269	0.106	0.696	-0.181	0.136	0.146	-0.227	0.382	-0.481	-0.019	0.408
Sodium	1.440	0.455	-0.245	-0.073	0.515	0.279	-0.044	0.792	-0.308	1.510	0.102	-0.200	-0.017	0.340	0.490	-0.600	-0.037	0.398
Zinc	1.636	0.166	0.139	0.131	0.161	-0.020	-0.091	0.370	0.095	0.476	0.311	-0.161	0.030	0.034	0.140	-0.230	-0.026	0.156
Copper	0.693	0.343	-0.361	0.176	0.344	0.222	0.170	0.058	-0.270	0.474	-0.115	0.061	0.195	-0.069	0.426	-0.398	0.081	0.261
Manganese	0.295	-0.185	-0.098	0.022	0.385	0.033	0.157	0.180	-0.083	0.218	0.346	-0.151	0.147	0.046	0.227	-0.101	0.028	-0.014
Vitamin A	-0.771	-0.035	-0.960	0.549	1.300	0.079	0.063	0.810	-1.373	-1.134	1.549	-0.448	-0.192	-0.203	0.352	0.152	-0.347	-0.228
Vitamin C	1.201	1.473	-1.173	0.324	0.230	0.211	0.576	0.400	-0.688	0.680	-0.958	0.369	0.450	-0.300	0.659	-0.747	0.142	1.716
Thiamin	0.791	0.892	-0.177	-0.079	0.246	0.051	0.258	0.389	-0.097	0.114	0.446	-0.116	0.105	-0.019	0.130	-0.203	0.082	0.037
Riboflavin	0.804	0.219	-0.175	0.018	0.296	0.110	0.089	0.477	0.241	0.440	0.288	-0.041	0.058	-0.070	0.135	-0.250	0.003	0.109
Niacin	0.914	0.266	0.453	0.091	0.207	0.095	0.106	0.204	-0.108	0.057	0.284	-0.012	0.044	-0.065	0.170	-0.265	0.046	0.044
Pantothenic	0.232	0.247	0.089	0.224	0.255	0.108	-0.006	0.231	0.278	0.439	-0.085	0.091	0.066	-0.124	0.197	-0.325	-0.027	0.244
Vitamin B-6	0.751	0.434	0.325	0.249	0.239	0.076	-0.068	0.059	0.140	0.456	-0.085	0.125	0.041	-0.265	0.248	-0.259	-0.096	0.318
Vitamin B-12	2.243	-0.278	-0.033	0.163	0.052	0.090	-0.048	0.208	0.369	0.676	0.430	-0.155	-0.020	0.144	0.108	-0.315	-0.099	0.188
Folate	0.817	0.428	-0.477	0.154	0.159	0.057	0.366	0.314	-0.306	0.277	0.070	0.001	0.151	-0.070	0.212	-0.377	0.047	0.353
Vitamin E	-0.334	-0.783	-0.131	-0.116	0.195	-0.171	0.143	0.402	-0.635	-0.313	0.067	0.152	0.222	0.143	0.051	0.922	0.260	0.257

Continued--

Table 2--Changes in nutrients in response to a 10-percent decrease in food price or a 1-percent increase in income--Continued

Nutrient	Banana	Grape	Grapef.	Lettuce	Tomato	Celery	Onion	Carrot	Juice	C.tomato	C.peas	Cocktl.	Peanut	Sugar	Sweet.	Coffee	Frzn.d.	Income
	Percentage change																	
Energy	0.051	0.126	0.090	-0.069	0.087	0.059	0.009	0.024	0.022	-0.018	-0.016	-0.014	-0.078	0.051	0.209	-0.008	-0.159	0.260
Protein	0.086	0.116	0.058	-0.075	-0.055	0.074	0.018	-0.028	-0.023	0.019	0.033	-0.015	0.001	-0.006	0.264	-0.053	-0.191	0.267
Total fat	0.016	0.093	0.131	-0.118	0.246	0.078	0.017	0.019	-0.054	-0.040	-0.038	-0.017	-0.134	-0.056	0.353	-0.019	-0.028	0.374
Saturated fat	-0.046	0.104	0.112	-0.114	0.245	0.069	0.005	-0.009	-0.021	-0.043	-0.053	-0.019	-0.048	-0.118	0.422	-0.071	-0.008	0.385
M-unsat. fat	0.014	0.075	0.093	-0.100	0.161	0.064	0.018	0.017	-0.029	-0.014	-0.033	-0.049	-0.142	-0.051	0.284	-0.017	-0.048	0.363
P-unsat. fat	0.097	0.111	0.217	-0.160	0.394	0.116	0.034	0.065	-0.146	-0.079	-0.031	0.033	-0.249	0.021	0.395	0.050	-0.009	0.380
Cholesterol	-0.013	-0.016	0.053	-0.080	0.010	0.012	-0.023	-0.032	0.082	-0.005	0.006	-0.051	0.020	-0.033	0.037	-0.085	-0.015	0.314
Carbohydrate	0.090	0.169	0.055	-0.016	-0.034	0.036	0.001	0.043	0.118	-0.001	-0.008	-0.010	-0.042	0.187	0.040	0.020	-0.293	0.137
Dietary fiber	0.415	0.274	0.049	-0.036	0.204	0.085	0.041	0.063	0.086	0.138	-0.057	0.023	-0.186	0.156	0.027	0.018	-0.619	0.206
Calcium	0.197	0.242	0.080	-0.201	-0.048	0.162	0.042	-0.193	0.011	0.069	0.087	0.019	0.043	-0.101	0.705	-0.136	-0.141	0.316
Iron	0.045	0.198	0.037	0.054	0.037	0.038	0.005	0.056	-0.013	0.023	-0.018	0.017	-0.099	0.077	0.163	0.004	-0.398	0.212
Magnesium	0.310	0.162	0.080	-0.078	0.014	0.131	0.044	-0.071	0.077	0.100	0.015	-0.008	-0.020	0.040	0.220	-0.014	-0.298	0.268
Phosphorus	0.121	0.153	0.071	-0.116	-0.041	0.105	0.021	-0.077	0.014	0.033	0.054	-0.005	0.026	-0.038	0.391	-0.077	-0.161	0.287
Potassium	0.376	0.191	0.106	-0.089	0.131	0.174	0.053	-0.110	0.203	0.157	0.035	0.001	-0.085	0.006	0.161	0.000	-0.343	0.310
Sodium	0.346	0.355	0.020	-0.074	0.396	0.194	0.050	-0.176	-0.108	0.257	-0.039	0.113	-0.143	-0.163	0.895	-0.214	-0.111	0.422
Zinc	0.079	0.134	0.067	-0.085	0.013	0.085	0.012	-0.067	0.026	0.030	0.050	-0.003	0.011	-0.085	0.249	-0.061	-0.114	0.301
Copper	0.253	0.228	0.084	0.021	0.320	0.131	0.047	-0.082	0.120	0.175	-0.037	0.043	-0.122	0.049	0.018	0.010	-0.287	0.260
Manganese	0.180	0.409	0.084	-0.002	0.065	0.071	-0.006	0.019	-0.018	0.079	-0.019	0.048	-0.088	0.108	0.106	-0.012	-0.301	0.205
Vitamin A	0.871	0.325	-0.518	-0.197	-0.811	-0.177	-0.431	1.453	0.511	0.009	-0.304	0.041	-0.483	-0.025	0.646	0.008	-0.624	0.354
Vitamin C	0.464	0.244	0.308	-0.106	0.729	0.225	0.100	-0.077	1.685	0.280	-0.114	0.012	-0.529	0.161	-0.282	0.083	-0.518	0.351
Thiamin	0.019	0.196	0.061	0.040	-0.054	0.035	-0.001	0.075	0.081	-0.011	-0.015	-0.002	-0.099	0.116	0.137	0.024	-0.433	0.237
Riboflavin	0.093	0.164	0.063	-0.070	-0.122	0.082	0.015	-0.043	0.002	0.008	0.064	-0.020	-0.014	0.048	0.262	-0.020	-0.315	0.240
Niacin	0.089	0.128	0.026	-0.005	-0.088	0.034	0.022	0.024	-0.080	0.020	-0.018	-0.007	-0.069	0.079	0.161	-0.002	-0.362	0.224
Pantothenic	0.190	0.108	0.080	-0.127	-0.047	0.113	0.018	-0.109	0.044	0.062	0.056	-0.029	-0.008	0.056	0.122	-0.013	-0.225	0.255
Vitamin B-6	0.537	0.153	0.100	-0.076	-0.000	0.148	0.088	0.010	0.044	0.130	-0.021	-0.040	-0.104	0.036	0.099	-0.020	-0.348	0.279
Vitamin B-12	0.112	0.042	0.103	-0.087	0.057	0.124	-0.012	-0.036	-0.063	0.064	0.092	-0.049	0.158	-0.144	0.209	-0.040	-0.005	0.325
Folate	0.192	0.080	0.085	0.035	0.120	0.086	0.002	0.029	0.692	0.042	-0.020	-0.009	-0.088	0.148	-0.024	0.014	-0.391	0.263
Vitamin E	0.150	0.151	0.213	-0.149	0.466	0.131	0.036	0.073	-0.118	-0.033	-0.041	0.032	-0.274	0.019	0.407	0.047	-0.009	0.378

Note: The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), Pantothenic acid, C. fish (canned fish), E. milk (evaporated and dry milk), Margar. (margarine), Grapef. (grapefruit), C. tomato (canned tomatoes), C. peas (canned peas), Cocktl. (fruit cocktail), Sweet. (sweeteners), and Frzn. d. (ice cream and other frozen dairy products).
Source: U.S. Department of Agriculture, Economic Research Service.

Table 3--Changes in nutrients in response to a 10-percent decrease in food prices or a 1-percent increase in income

Nutrient	Unit	D.V.	Beef	Pork	Chicken	Turkey	Fish	C.fish	Egg	Cheese	Milk	E.milk	Flour	Rice	Potato	Butter	Margar.	Oils	Apple	Orange
									Daily per capita quantity change											
Energy	Kcal	2000	9.49	2.20	1.21	-1.38	4.70	-0.76	2.48	11.39	-2.62	0.88	7.59	-0.94	3.10	2.54	1.19	6.45	2.60	4.13
Protein	G	50	0.91	0.20	0.31	0.10	0.13	0.02	-0.01	0.32	0.11	0.37	0.31	-0.08	0.02	0.06	0.11	-0.20	-0.01	0.13
Total fat	G	65	0.51	0.21	0.10	-0.17	0.23	-0.18	0.02	0.81	-0.51	-0.21	0.33	0.04	0.21	0.27	-0.03	0.84	0.24	0.30
Saturated fat	G	20	0.33	0.17	-0.01	-0.09	0.11	-0.03	-0.01	0.37	-0.08	-0.01	0.15	-0.02	0.05	0.16	-0.03	0.23	0.07	0.11
M-unsat. fat	G	23	0.26	0.22	0.06	-0.03	0.06	-0.05	-0.01	0.24	-0.22	-0.01	0.12	-0.00	0.07	0.05	-0.01	0.23	0.06	0.08
P-unsat. fat	G	22	-0.18	-0.21	0.04	-0.05	0.05	-0.08	0.04	0.15	-0.19	-0.18	0.03	0.06	0.08	0.05	0.00	0.35	0.10	0.09
Cholesterol	Mg	300	1.49	1.13	0.50	0.56	0.37	0.54	1.09	1.32	-0.33	-0.13	1.70	-0.13	-0.09	0.64	-0.07	0.10	0.27	0.47
Carbohydrate	G	300	0.26	-0.15	-0.30	-0.06	0.56	0.19	0.57	0.73	0.36	0.33	0.79	-0.20	0.29	-0.05	0.27	-0.04	0.11	0.25
Dietary fiber	G	25	0.07	0.02	-0.04	0.00	0.05	0.02	0.02	0.02	-0.03	0.03	0.02	-0.01	0.02	-0.01	0.02	-0.00	0.01	0.02
Calcium	Mg	1000	7.52	2.31	-2.79	-1.04	3.80	0.95	-2.25	8.38	5.56	11.78	1.77	-1.01	0.50	1.19	1.80	-3.20	-0.62	3.54
Iron	Mg	18	0.19	0.01	-0.01	0.00	0.04	0.01	0.04	0.04	-0.04	0.02	0.06	-0.02	0.01	0.00	0.03	-0.03	0.01	-0.00
Magnesium	Mg	400	1.56	0.47	-0.28	0.20	0.72	0.32	0.01	0.61	0.48	1.30	-0.09	0.13	0.17	-0.25	0.52	-0.80	-0.05	0.57
Phosphorus	Mg	1000	11.27	3.49	0.58	0.22	3.03	0.76	-0.98	7.25	4.37	9.52	4.28	-1.46	0.64	1.50	1.81	-3.12	-0.35	3.02
Potassium	Mg	3500	19.56	14.29	-10.27	5.07	9.46	5.01	-0.61	6.96	2.76	18.06	-4.69	3.52	3.77	-5.88	9.90	-12.46	-0.50	10.59
Sodium	Mg	2400	13.16	4.16	-2.24	-0.67	4.71	2.55	-0.40	7.24	-2.81	13.80	0.93	-1.83	-0.15	3.11	4.48	-5.48	-0.34	3.64
Zinc	Mg	15	0.17	0.02	0.01	0.01	0.02	-0.00	-0.01	0.04	0.01	0.05	0.03	-0.02	0.00	0.00	0.01	-0.02	-0.00	0.02
Copper	Mg	2	0.01	0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	0.00
Manganese	Mg	400	0.01	-0.00	-0.00	0.00	0.01	0.00	0.00	0.00	-0.00	0.00	0.01	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00
Vitamin A	RE	1500	-6.67	-0.31	-8.30	4.75	11.24	0.68	0.55	7.00	-11.87	-9.80	13.40	-3.87	-1.66	-1.75	3.04	1.31	-3.00	-1.97
Vitamin C	Mg	60	0.82	1.00	-0.80	0.22	0.16	0.14	0.39	0.27	-0.47	0.46	-0.65	0.25	0.31	-0.20	0.45	-0.51	0.10	1.17
Thiamin	Mg	1.5	0.02	0.02	-0.00	-0.00	0.01	0.00	0.01	0.01	-0.00	0.00	0.01	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00
Riboflavin	Mg	1.7	0.02	0.01	-0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	-0.00	0.00	-0.00	0.00	-0.01	0.00	0.00
Niacin	Mg	20	0.23	0.07	0.11	0.02	0.05	0.02	0.03	0.05	-0.03	0.01	0.07	-0.00	0.01	-0.02	0.04	-0.07	0.01	0.01
Pantothenic	Mg	10	0.01	0.01	0.00	0.01	0.01	0.01	-0.00	0.01	0.01	0.02	-0.00	0.00	0.00	-0.01	0.01	-0.02	-0.00	0.01
Vitamin B-6	Mg	2	0.01	0.01	0.01	0.00	0.00	0.00	-0.00	0.00	0.00	0.01	-0.00	0.00	0.00	-0.00	0.00	-0.00	-0.00	0.01
Vitamin B-12	Mcg	6	0.12	-0.02	-0.00	0.01	0.00	0.00	-0.00	0.01	0.02	0.04	0.02	-0.01	-0.00	0.01	0.01	-0.02	-0.01	0.01
Folate	Mcg	400	1.53	0.80	-0.89	0.29	0.30	0.11	0.68	0.59	-0.57	0.52	0.13	0.00	0.28	-0.13	0.40	-0.70	0.09	0.66
Vitamin E	ATE	20	-0.05	-0.12	-0.02	-0.02	0.03	-0.03	0.02	0.06	-0.10	-0.05	0.01	0.02	0.04	0.02	0.01	0.15	0.04	0.04

Continued --

Table 3--Changes in nutrients in response to a 10-percent decrease in food prices or a 1-percent increase in income--Continued

Nutrient	Unit	D.V.	Banana	Grape	Grapef.	Lettuce	Tomato	Celery	Onion	Carrot	Juice	C.tomato	C.peas	Cocktl.	Peanut	Sugar	Sweet.	Coffee	Frzn.d.	Income
			Daily per capita quantity change																	
Energy	Kcal	2000	1.52	3.77	2.69	-2.07	2.61	1.76	0.28	0.72	0.66	-0.55	-0.48	-0.43	-2.33	1.54	6.28	-0.23	-4.77	7.82
Protein	G	50	0.08	0.11	0.05	-0.07	-0.05	0.07	0.02	-0.03	-0.02	0.02	0.03	-0.01	0.00	-0.01	0.24	-0.05	-0.17	0.24
Total fat	G	65	0.02	0.14	0.20	-0.18	0.38	0.12	0.03	0.03	-0.08	-0.06	-0.06	-0.03	-0.20	-0.09	0.54	-0.03	-0.04	0.57
Saturated fat	G	20	-0.02	0.05	0.06	-0.06	0.12	0.03	0.00	-0.00	-0.01	-0.02	-0.03	-0.01	-0.02	-0.06	0.21	-0.04	-0.00	0.19
M-unsat. fat	G	23	0.01	0.04	0.05	-0.05	0.09	0.03	0.01	0.01	-0.02	-0.01	-0.02	-0.03	-0.08	-0.03	0.15	-0.01	-0.03	0.20
P-unsat. fat	G	22	0.04	0.04	0.08	-0.06	0.15	0.04	0.01	0.02	-0.06	-0.03	-0.01	0.01	-0.09	0.01	0.15	0.02	-0.00	0.14
Cholesterol	Mg	300	-0.05	-0.06	0.21	-0.31	0.04	0.05	-0.09	-0.13	0.32	-0.02	0.03	-0.20	0.08	-0.13	0.15	-0.33	-0.06	1.24
Carbohydrate	G	300	0.28	0.54	0.17	-0.05	-0.11	0.11	0.00	0.14	0.37	-0.00	-0.03	-0.03	-0.13	0.59	0.13	0.06	-0.93	0.43
Dietary fiber	G	25	0.04	0.03	0.01	-0.00	0.02	0.01	0.00	0.01	0.01	0.01	-0.01	0.00	-0.02	0.02	0.00	0.00	-0.06	0.02
Calcium	Mg	1000	1.85	2.27	0.75	-1.88	-0.45	1.52	0.40	-1.81	0.11	0.64	0.82	0.18	0.40	-0.95	6.62	-1.28	-1.32	2.97
Iron	Mg	18	0.01	0.03	0.01	0.01	0.01	0.01	0.00	0.01	-0.00	0.00	-0.00	0.00	-0.01	0.01	0.02	0.00	-0.06	0.03
Magnesium	Mg	400	0.66	0.34	0.17	-0.16	0.03	0.28	0.09	-0.15	0.16	0.21	0.03	-0.02	-0.04	0.08	0.47	-0.03	-0.63	0.57
Phosphorus	Mg	1000	1.66	2.09	0.98	-1.59	-0.56	1.44	0.29	-1.05	0.20	0.45	0.75	-0.07	0.36	-0.52	5.35	-1.06	-2.21	3.92
Potassium	Mg	3500	9.74	4.96	2.74	-2.31	3.39	4.52	1.36	-2.84	5.25	4.06	0.91	0.03	-2.19	0.17	4.16	0.00	-8.89	8.04
Sodium	Mg	2400	3.16	3.25	0.19	-0.68	3.62	1.77	0.46	-1.61	-0.99	2.35	-0.36	1.03	-1.31	-1.49	8.19	-1.96	-1.02	3.86
Zinc	Mg	15	0.01	0.01	0.01	-0.01	0.00	0.01	0.00	-0.01	0.00	0.00	0.01	-0.00	0.00	-0.01	0.03	-0.01	-0.01	0.03
Copper	Mg	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	0.00	-0.00	0.00
Manganese	Mg	400	0.00	0.01	0.00	-0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	-0.00	-0.01	0.00
Vitamin A	RE	1500	7.54	2.81	-4.48	-1.70	-7.01	-1.53	-3.73	12.57	4.42	0.08	-2.63	0.35	-4.18	-0.22	5.58	0.07	-5.40	3.06
Vitamin C	Mg	60	0.32	0.17	0.21	-0.07	0.50	0.15	0.07	-0.05	1.15	0.19	-0.08	0.01	-0.36	0.11	-0.19	0.06	-0.35	0.24
Thiamin	Mg	1.5	0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00	-0.01	0.01
Riboflavin	Mg	1.7	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	-0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.01	-0.00	-0.01	0.01
Niacin	Mg	20	0.02	0.03	0.01	-0.00	-0.02	0.01	0.01	0.01	-0.02	0.00	-0.00	-0.00	-0.02	0.02	0.04	-0.00	-0.09	0.06
Pantothenic	Mg	10	0.01	0.01	0.00	-0.01	-0.00	0.01	0.00	-0.01	0.00	0.00	0.00	-0.00	-0.00	0.00	0.01	-0.00	-0.01	0.01
Vitamin B-6	Mg	2	0.01	0.00	0.00	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	-0.00	0.00	0.00	-0.00	-0.01	0.00
Vitamin B-12	Mcg	6	0.01	0.00	0.01	-0.00	0.00	0.01	-0.00	-0.00	-0.00	0.00	0.01	-0.00	0.01	-0.01	0.01	-0.00	-0.00	0.02
Folate	Mcg	400	0.36	0.15	0.16	0.07	0.23	0.16	0.00	0.05	1.29	0.08	-0.04	-0.02	-0.16	0.28	-0.04	0.03	-0.73	0.49
Vitamin E	ATE	20	0.02	0.02	0.03	-0.02	0.07	0.02	0.01	0.01	-0.02	-0.01	-0.01	0.01	-0.04	0.00	0.06	0.01	-0.00	0.06

Note: The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), Pantothenic acid, D.V. (daily value), C. fish (canned fish), E. milk (evaporated and dry milk), Margar. (margarine), Grapef. (grapefruit), C. tomato (canned tomatoes), C. peas (canned peas), Cocktl. (fruit cocktail), Sweet. (sweeteners), and Frzn. d.(ice cream and other frozen dairy products). The units are Kcal (kilocalories), G (grams), Mg (milligrams), RE (retinol equivalent), Mcg (micrograms), and ATE (alpha-tocopherol equivalent).

Source: U.S. Department of Agriculture, Economic Research Service.

In terms of potential public concern about health effects, some significant estimates in tables 2 and 3 show that the largest increases in daily per capita food energy (0.32 and 0.38 percent, the equivalent of 9.49 and 11.39 calories) would occur with a 10-percent decrease in the price of beef or cheese. Price decreases for beef and cheese would also substantially increase the daily availability of saturated fatty acids by 0.66 and 0.75 percent, the equivalent of 0.33 and 0.37 gram. A 10-percent decrease in the price of beef or eggs would increase daily availability of cholesterol by 0.38 and 0.28 percent, the equivalent of 1.49 and 1.09 milligrams, respectively. The same price decrease for fluid milk or evaporated and dry milk would increase the daily availability of calcium by 0.59 and 1.25 percent, equivalent to 5.56 and 11.78 milligrams of calcium, respectively. A 10-percent decline in prices of beef and wheat flour would increase the daily availability of iron by 1.34 and 0.45 percent, the equivalent of 0.19 and 0.06 milligram, respectively. A 10-percent price drop in oranges or fruit juices would increase vitamin C daily availability by 1.72 and 1.69 percent, the equivalent of 1.17 and 1.15 milligrams, respectively. The same price decrease in carrots would increase daily availability of vitamin A by 1.45 percent, 12.57 retinol equivalents.

Likewise, the net effects of changes in food consumption caused by a 1-percent increase in income are listed in the last column of tables 2 and 3. According to the estimates, the change in income would increase energy by 0.26 percent, protein by 0.27 percent, saturated fats by 0.39 percent, cholesterol by 0.31 percent, calcium by 0.32 percent, iron by 0.21 percent, vitamin A by 0.35 percent, and vitamin C by 0.35 percent. Table 3 translates the percentage increases into daily per capita increases: energy, 7.82 calories; protein, 0.24 gram; saturated fat, 0.19 gram; cholesterol, 1.24 milligrams; calcium, 2.97 milligrams; iron, 0.03 milligram; vitamin A, 3.06 retinol equivalents; and vitamin C, 0.24 milligram. Because income changes affect all nutrients in the same direction, those insufficient intakes of nutrients (calcium, iron, and various vitamins) could be improved with increased incomes. For already excessive intakes of nutrients (energy, saturated fats, and cholesterol), however, the situation would be worsened with increased incomes. Therefore, the net nutritional effect of increasing consumer income is mixed.

To place the magnitude of nutrient changes in context, table 3 also provides the daily values used by the Food and Drug Administration for nutrition-labeling purposes (Kurtzweil, 1993). These daily values reflect the daily intake levels recommended for individuals consuming 2,000 calories per day. For some nutrients, such as fat, saturated fat, and cholesterol, the daily values are considerably lower than the levels consumed. For most other nutrients, the daily values are typically higher than the average levels consumed. A comparison of the nutrient quantity changes with the daily values shows that the magnitudes of nutrient quantity changes are relatively small and, therefore, unlikely to be of nutritional significance. The nutrient effects, however, could exacerbate existing nutritional problems if carried out over prolonged periods of time.

Implications for Food Groups

For food policy and program analyses, it is sometimes useful to observe the aggregate nutrient contribution of major food groups. In this study, all foods are classified into seven food groups:

(1) the grain group includes wheat flour and rice; (2) the vegetable group includes potatoes and fresh and processed vegetables; (3) the fruit group includes fresh and processed fruits and fruit juices; (4) the dairy group includes milk in the form of fluid milk, evaporated and dry milk, cheese, and frozen dairy products; (5) the meat group includes red meat, poultry, fish, eggs, dry beans, and nuts; (6) the fats group includes butter, margarine, lard, and salad and cooking oils; and (7) the sweeteners group includes sugars and corn sweeteners.

Nutrient values are applied to the quantities of food to compute the share each food group contributes to each nutrient's total (table 4). The table makes it clear that no single food group can provide all the nutrients and other healthful substances that people need. Energy is provided mainly by the grain, meat, and fats groups, with each group contributing slightly less than a quarter of the total energy available. Major sources of protein are the meat group (48 percent), and dairy and grain groups (about 25 percent each). Total fat comes mostly from the fats group (51 percent) and meat group (33 percent), with the meat group providing 35 percent of total saturated fat and most of the cholesterol (75 percent).

Over 50 percent of the dietary fiber comes from the grain group, with an additional 46 percent provided by the vegetable and fruit groups. Major sources of vitamin A are the vegetable group (37 percent) and dairy group (31 percent), while the fruit and vegetable groups contribute 92 percent of total vitamin C. The largest share of folate (a B-vitamin) comes from the grain group, although the vegetable, fruit, dairy, and meat groups also contribute considerable amounts of folate. Vitamin E comes mainly from the fats group (83 percent), while the dairy group is the major source of calcium, contributing 84 percent of the total. The grain and meat groups contribute about 62 and 23 percent, respectively, of iron. The estimates in table 4 may differ from numbers in Putnam and Allshouse (1994) because of differences in the food groups. For example, their meat group includes only red meat, poultry, and fish, but not eggs, dry beans, and nuts, as in this study.

Table 5 shows the percentage change in the availability of 28 nutrients in response to a 10-percent decrease in the price of any one food group (holding the prices of other food groups constant) or in response to a 1-percent increase in consumer income. These estimated nutrient responses for the total group price effect on nutrients are obtained by summing the individual nutrient responses (table 2) for food categories in a related food group. All the prices of food commodities within a food group are implicitly assumed to change at the same rate as the group price. For example, a 10-percent decrease in the price of the meat group would mean that the prices of beef, poultry, fish, eggs, dry beans, and nuts all decrease by 10 percent.

The estimates in table 5 show, for example, that a 10-percent decrease in the price of the meat group would increase daily per capita availability of protein by 1.82 percent, saturated fat by 0.88 percent, cholesterol by 1.46 percent, and iron by 1.89 percent. Interestingly, although the meat group contributes little to the total availability of fiber, calcium, or vitamin C, a 10-percent reduction in the price of the meat group would also increase overall daily per capita availability of fiber by 1.31 percent, calcium by 0.95 percent, and vitamin C by 2.31 percent. On the other hand,

Table 4--Nutrient shares, by food group, 1989-93

Nutrient	Grains	Veget.	Fruit	Dairy	Meat	Fats	Sweet.
			Percent of each nutrient				
Energy	25.22	2.74	2.53	13.67	21.52	22.88	11.44
Protein	22.87	3.18	0.89	25.45	47.48	0.12	0.01
Total fat	1.28	0.23	0.18	14.36	33.33	50.63	0.00
Saturated fat	0.65	0.11	0.11	27.28	35.22	36.64	0.00
M-unsat. fat	0.38	0.06	0.03	11.71	40.63	47.19	0.00
P-unsat. fat	2.19	0.38	0.19	1.97	15.80	79.47	0.00
Cholesterol	0.00	0.00	0.00	20.35	74.90	4.75	0.00
Carbohydrate	50.17	5.85	5.98	9.66	0.26	0.02	28.06
Dietary fiber	51.42	30.73	15.76	0.00	2.09	0.00	0.00
Calcium	3.60	5.01	1.57	84.08	5.15	0.38	0.21
Iron	62.42	9.15	1.66	3.12	23.05	0.06	0.54
Magnesium	21.84	14.93	7.18	32.66	22.81	0.15	0.42
Phosphorus	16.51	4.82	1.34	46.14	30.81	0.22	0.16
Potassium	8.72	26.07	10.41	31.21	23.08	0.18	0.34
Sodium	0.52	17.49	0.25	59.16	21.06	0.10	1.41
Zinc	14.92	5.06	1.07	28.79	49.92	0.02	0.22
Copper	35.83	31.07	7.85	2.48	18.59	0.13	4.05
Manganese	70.60	18.25	4.78	0.32	5.42	0.00	0.63
Vitamin A	0.00	36.89	1.31	31.32	13.53	16.94	0.00
Vitamin C	0.00	45.82	46.51	5.76	1.89	0.02	0.00
Thiamin	63.46	5.73	3.27	8.52	19.01	0.00	0.00
Riboflavin	37.02	2.96	2.01	36.32	20.65	0.21	0.82
Niacin	45.76	7.33	1.24	1.84	43.72	0.02	0.09
Pantothenic	19.74	9.17	3.95	32.81	34.05	0.22	0.05
Vitamin B-6	7.21	19.00	11.27	13.49	49.02	0.00	0.00
Vitamin B-12	0.00	0.00	0.00	33.80	65.91	0.29	0.00
Folate	26.95	21.56	16.97	14.70	19.69	0.13	0.01
Vitamin E	0.95	3.63	1.86	2.74	7.71	83.11	0.00

Note: Food groups are Grains (wheat flour and rice), Veget. (fresh and processed vegetables, including potatoes), Fruit (fresh and processed fruits), Dairy (milk, cheese, and frozen dairy products), Meat (meat, poultry, fish, eggs, dry beans, and nuts), Fats (fats and oils), and Sweet. (sugars and corn sweeteners). The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), and Pantothenic acid.
Source: U.S. Department of Agriculture, Economic Research Service.

Table 5--Changes in nutrient availability in response to a 10-percent decrease in food price or a 1-percent increase in income

Nutrient	Grains	Veget.	Fruit	Dairy	Meat	Fats	Sweet.	Income
				Percentage change				
Energy	0.22	0.18	0.50	0.16	0.52	0.34	0.25	0.26
Protein	0.25	0.01	0.35	0.69	1.82	-0.04	0.21	0.27
Total fat	0.24	0.30	0.53	0.03	0.34	0.70	0.28	0.37
Saturated fat	0.27	0.20	0.50	0.55	0.88	0.71	0.23	0.38
M-unsat. fat	0.22	0.24	0.35	-0.03	0.79	0.51	0.22	0.36
P-unsat. fat	0.23	0.54	0.84	-0.56	-1.29	1.07	0.47	0.38
Cholesterol	0.40	-0.13	0.24	0.20	1.46	0.17	-0.08	0.31
Carbohydrate	0.18	0.11	0.53	0.15	0.29	0.06	0.25	0.14
Dietary fiber	0.13	0.59	1.10	-0.38	1.31	0.13	0.20	0.21
Calcium	0.08	-0.03	0.86	2.60	0.95	-0.02	0.47	0.32
Iron	0.33	0.27	0.33	-0.24	1.89	-0.02	0.24	0.21
Magnesium	0.02	0.24	0.87	0.83	1.39	-0.25	0.25	0.27
Phosphorus	0.21	0.03	0.55	1.38	1.37	0.01	0.28	0.29
Potassium	-0.05	0.50	1.27	0.73	1.56	-0.33	0.17	0.31
Sodium	-0.10	0.59	1.09	1.88	2.18	0.23	0.52	0.42
Zinc	0.15	0.07	0.43	0.83	2.13	-0.06	0.10	0.30
Copper	-0.05	0.77	1.07	-0.03	1.46	-0.04	0.08	0.26
Manganese	0.20	0.35	0.72	0.01	0.52	0.17	0.20	0.20
Vitamin A	1.10	-0.65	0.66	-2.32	-0.26	0.30	0.63	0.35
Vitamin C	-0.59	1.49	4.57	-0.13	2.31	-0.39	-0.04	0.35
Thiamin	0.33	0.17	0.47	-0.03	1.88	-0.09	0.28	0.24
Riboflavin	0.25	-0.01	0.41	0.84	1.35	-0.19	0.29	0.24
Niacin	0.27	0.03	0.25	-0.21	2.06	-0.16	0.24	0.22
Pantothenic	0.01	0.03	0.61	0.72	1.14	-0.25	0.16	0.26
Vitamin B-6	0.04	0.32	1.02	0.31	1.90	-0.28	0.12	0.28
Vitamin B-12	0.28	0.18	0.23	1.25	2.35	-0.06	0.02	0.33
Folate	0.07	0.44	1.44	-0.11	1.42	-0.24	0.14	0.26
Vitamin E	0.22	0.71	0.94	-0.56	-1.47	1.12	0.47	0.38

Note: Food groups are Grains (wheat flour and rice), Veget. (fresh and processed vegetables, including potatoes), Fruit (fresh and processed fruits), Dairy (milk, cheese, and frozen dairy products), Meat (meat, poultry, fish, eggs, dry beans, and nuts), Fats (fats and oils), and Sweet. (sugars and corn sweeteners). The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), and Pantothenic acid.

Source: U.S. Department of Agriculture, Economic Research Service.

it would reduce overall availability of vitamin E. These results highlight the interdependence among the different food groups through cross-price effects.

Proponents of price manipulations as a means of influencing consumption levels of particular foods or nutrients, such as subsidizing fruits and vegetables to increase their consumption or taxing fats to reduce their consumption, should be aware of the interdependent nature of food choices and the ramifications for different nutrients. For example, a price decrease for fruits or vegetables, while encouraging their consumption, would also increase availability of total fat. A price decrease for vegetables would also result in an unanticipated reduction in overall availability of vitamin A. Although the magnitudes of these changes are relatively small, they could possibly exacerbate existing nutritional problems if carried out over prolonged periods of time.

Table 6 translates the percentage changes of nutrients in table 5 into quantity changes of nutrients on a per-person, per-day basis. A 10-percent decrease in the price of the meat group would increase daily per capita availability of energy by 15.6 calories, total fat by 0.52 gram, saturated fat by 0.44 gram, cholesterol by 5.75 milligrams, calcium by 8.89 milligrams, iron by 0.27 milligram, vitamin C by 1.58 milligrams, and folate by 2.65 micrograms. This same price decrease would also reduce daily per capita availability of vitamin A by 2.24 retinol equivalents and of vitamin E by 0.23 alpha-tocopherol equivalent. A 10-percent price decrease in the dairy group would increase the daily availability of calcium by 24.39 milligrams. A 10-percent price decrease in the fats group would increase the daily availability of total fats by 1.08 grams.

Figure 2 depicts the complexity of the effect of an income or price change on overall dietary quality. For example, whereas a 10-percent lower price for the meat group would increase the levels of calcium and iron (a nutritional improvement, given that these components are consumed in insufficient amounts), the lower price would also increase the levels of total fat and cholesterol levels (a dietary deterioration, given that these components are consumed in excessive amounts). Similarly, increased consumer income would increase nutrients (calcium and iron) consumed in low amounts. It would, however, increase other nutrients (fat, saturated fats, and cholesterol) already being consumed in excessive amounts.

Table 6--Changes in nutrient availability in response to a 10-percent decrease in food prices or a 1-percent increase in income

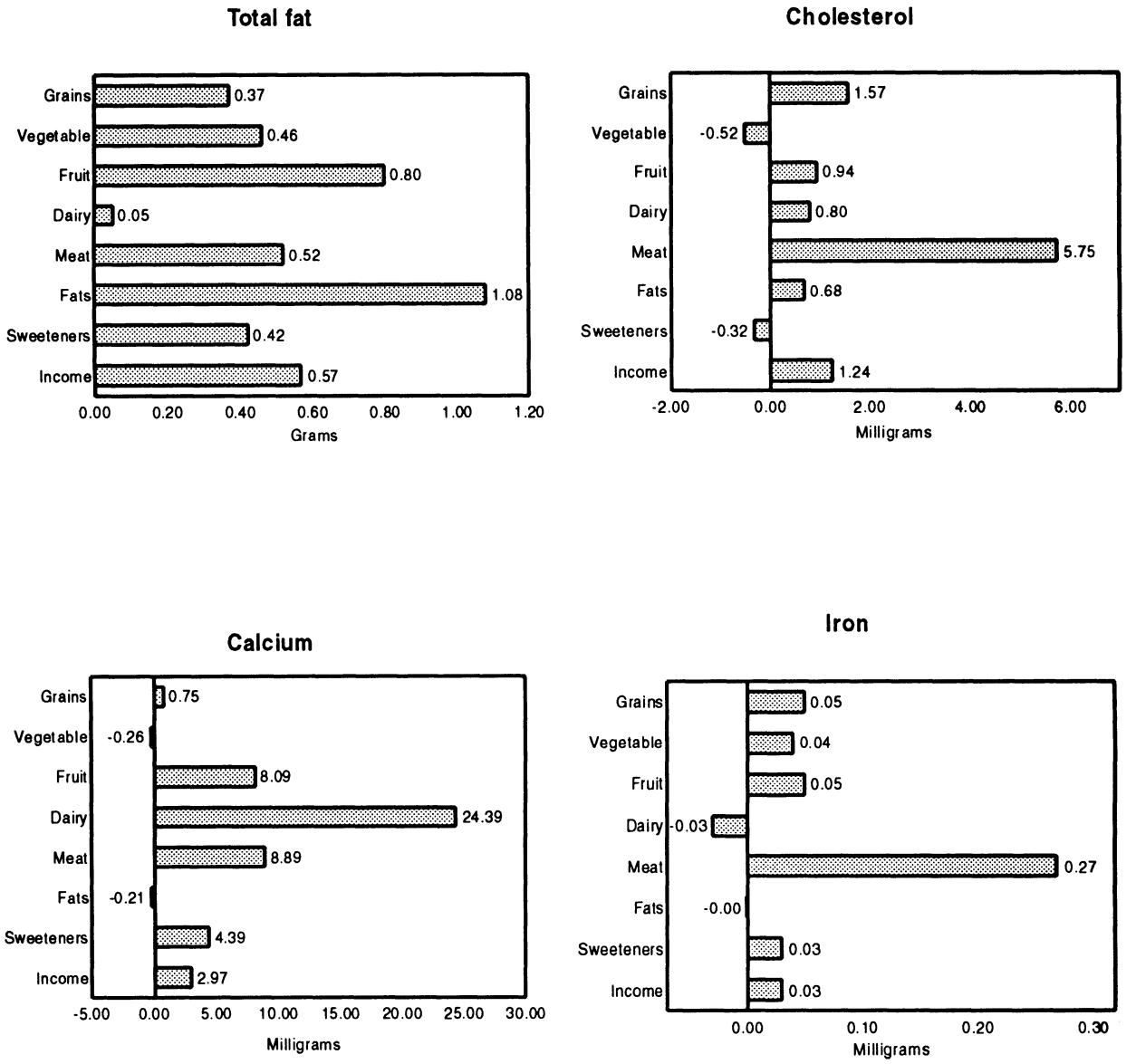
Nutrient	Unit	D.V.	Grains	Veget.	Fruit	Dairy	Meat	Fats	Sweet.	Income
			Daily per capita quantity change							
Energy	Kcal	2000	6.65	5.37	14.95	4.87	15.61	10.19	7.59	7.82
Protein	G	50	0.23	0.01	0.32	0.63	1.66	-0.03	0.19	0.24
Total fat	G	65	0.37	0.46	0.80	0.05	0.52	1.08	0.42	0.57
Sat. fat	G	20	0.13	0.10	0.25	0.28	0.44	0.36	0.12	0.19
M-unsat.fat	G	23	0.12	0.13	0.19	-0.02	0.43	0.28	0.12	0.20
P-unsat.fat	G	22	0.09	0.20	0.31	-0.21	-0.48	0.40	0.17	0.14
Cholesterol	Mg	300	1.57	-0.52	0.94	0.80	5.75	0.68	-0.32	1.24
Carbohydrate	G	300	0.59	0.36	1.70	0.48	0.94	0.18	0.78	0.43
Dietary fiber	G	25	0.01	0.06	0.11	-0.04	0.14	0.01	0.02	0.02
Calcium	Mg	1000	0.75	-0.26	8.09	24.39	8.89	-0.21	4.39	2.97
Iron	Mg	18	0.05	0.04	0.05	-0.03	0.27	-0.00	0.03	0.03
Magnesium	Mg	400	0.03	0.50	1.84	1.76	2.95	-0.54	0.52	0.57
Phosphorus	Mg	1000	2.82	0.37	7.53	18.94	18.73	0.20	3.77	3.92
Potassium	Mg	3500	-1.18	12.86	32.80	18.89	40.31	-8.45	4.33	8.04
Sodium	Mg	2400	-0.89	5.40	9.93	17.22	19.97	2.11	4.74	3.86
Zinc	Mg	15	0.02	0.01	0.04	0.09	0.22	-0.01	0.01	0.03
Copper	Mg	2	-0.00	0.01	0.01	-0.00	0.01	-0.00	0.00	0.00
Manganese	Mg	400	0.00	0.01	0.02	0.00	0.01	0.00	0.00	0.00
Vitamin A	RE	1500	9.52	-5.62	5.67	-20.07	-2.24	2.60	5.43	3.06
Vitamin C	Mg	60	-0.40	1.01	3.11	-0.09	1.58	-0.26	-0.03	0.24
Thiamin	Mg	1.5	0.01	0.00	0.01	-0.00	0.04	-0.00	0.01	0.01
Riboflavin	Mg	1.7	0.01	-0.00	0.01	0.02	0.03	-0.00	0.01	0.01
Niacin	Mg	20	0.07	0.01	0.06	-0.05	0.51	-0.04	0.06	0.06
Pantothenic	Mg	10	0.00	0.00	0.03	0.04	0.06	-0.01	0.01	0.01
Vitamin B-6	Mg	2	0.00	0.01	0.02	0.00	0.03	-0.00	0.00	0.00
Vitamin B-12	Mcg	6	0.02	0.01	0.01	0.07	0.13	-0.00	0.00	0.02
Folate	Mcg	400	0.13	0.83	2.69	-0.20	2.65	-0.44	0.26	0.49
Vitamin E	ATE	20	0.03	0.11	0.15	-0.09	-0.23	0.18	0.08	0.06

Note: Food groups are Grains (wheat flour and rice), Veget. (fresh and processed vegetables, including potatoes), Fruit (fresh and processed fruits), Dairy (milk, cheese, and frozen dairy products), Meat (meat, poultry, fish, eggs, dry beans, and nuts), Fats (fats and oils), and Sweet. (sugars and corn sweeteners). The notations are D.V. (daily value), M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), and Pantothenic acid. The units are Kcal (kilocalories), G (grams), Mg (milligrams), RE (retinol equivalent), Mcg (micrograms), and ATE (alpha-tocopherol equivalent).
Source: U.S. Department of Agriculture, Economic Research Service.

Figure 2

Changes in selected nutrients, by food group, per capita per day

(Effects of price decrease of 10 percent and income increase of 1 percent)



Note: Meat group includes red meat, poultry, fish, eggs, dry beans, and nuts.

Source: U.S. Department of Agriculture, Economic Research Service.

Conclusions

Consumers respond to changes in food prices and income by adjusting their food choices to maximize their utility levels as perceived in a classical demand framework. The adjusted food choices are then translated into changes in nutrient levels. This study develops a new research model to measure how economic factors influence aggregate nutrient availability. The unique feature of this model is that it incorporates the information of a food demand system including own- and cross-price elasticities and income elasticities into the measurement of aggregate nutrient responses. The empirical results show that changes in the availability of all nutrients vary depending on how food price and income changes manifest themselves through the interdependent food demand relationships.

The nutrient elasticity estimates provide useful information for studying possible food program effects on the overall availability of nutrients. One way to accomplish this task would be to simulate alternative food policy scenarios and explore the effects of food prices and income changes on the amounts of foods and nutrients available for consumption. In addition, the estimates of nutrient income effects can be a starting point in evaluating possible effects of income changes on dietary quality when the benefits of U.S. food stamp recipients are cut or increased. It should be noted, however, that the estimates in this study represent an average person's nutrient change, and adjustments might be needed to reflect differences in behavior across different population groups. Adjustments would also be needed when studying food stamp benefits to take into account the case that food spending from food stamps may be different than food spending out of money income.

In addition, note that these nutrient responses were estimated at the aggregate level, based on foods in their commodity forms, and may not be accurate reflections of the nutrient changes that would occur at the consumer level. The food disappearance data commonly used by demand analysts are unable to take into account food preparation methods, which can heavily influence the final nutrient content of foods. For example, whether the chicken is fried or roasted and whether the skin is eaten considerably affects the final nutritional characteristics of the chicken consumed. Similarly, although grain products are naturally low in fat, preparation methods that incorporate added fats result in a high fat content for many grain food products, such as baked goods. Also, the food disappearance data are slow in measuring and reflecting changes in the nutrient composition of the commodities themselves, such as for lean meat and increasing availability of low-fat cheeses, and, therefore, may not accurately reflect the nutrient contribution of each food group to each nutrient's total. Therefore, to develop a consumer-based comprehensive food demand and nutrition study, further collaborative research between economists and nutritionists is needed to improve the availability of data on prices, quantities, and nutritional profiles for final food products.

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Appendix:

Demand Elasticities and Nutrient Values Used in this Study

For estimation of nutrient demand elasticities in response to changes of food prices and income, this study uses the results of Huang's (1993) complete food demand system to represent the matrix of demand elasticities. This demand system is specified in equation 6 of the text as:

$$q_i = \Sigma_j \; e_{ij} p_j + \delta_i m + \alpha_i \qquad i, j = 1,2,..,n,$$

where variables q_i , p_i , and m are the relative changes in per capita quantity, price, and per capita expenditure. The parameters α_i , e_{ij}, and δ_i are constant, price, and expenditure (income) elasticities, respectively.

All demand elasticities can be presented in a matrix form of order n x (n+2) for the n-commodity case as:

Food		Price and income		Constant
category	p_1	p_2 . . . . p_n	m	
q_1	e_{11}	e_{12} . . . . e_{1n}	δ_1	α_1
q_2	e_{21}	e_{22} . . . . e_{2n}	δ_2	α_2
.				
.				
q_n	e_{n1}	e_{n2} . . . . e_{nn}	δ_n	α_n

The demand elasticity matrix contains 1,260 estimates of own- and cross-price elasticities and income elasticities for 35 food categories. A portion of demand elasticities relating to own-price and income elasticities is presented in appendix table 1. In the table, most own-price elasticities of major food categories in such food groups as meat and other animal proteins, fresh fruits, fresh vegetables, and processed fruits and vegetables have statistically significant estimates with an expected negative sign. The estimates for rice and fresh and frozen fish, however, are positive but not statistically significant. This poor estimate for fish is partly because of difficulty in defining prices and quantities for such a wide variety of fish species, and partly because large amounts of fish are consumed away from home and influenced by menu prices instead of the price of raw fish. The income elasticities of beef, pork, eggs, cheese, evaporated and dry milk, salad and cooking oils, tomatoes, celery, canned tomatoes, and coffee are positive and statistically significant. Although some income elasticity estimates for such foods as turkey are negative, this may not imply that the goods are inferior, because the estimates are not statistically significant. The simulation performance, based on the calculated relative root-mean-square errors to sample means in the last column of the table, indicates that the errors of simulated quantities demanded are less than 5 percent in most cases.

Appendix table 1--Own-price and income elasticities of a demand system used in this study

Food item	Own-price elasticity	Income elasticity	Root-mean-square error of each demand equation
			Percent
Beef	-0.6212 (0.0572)	0.3923 (0.1240)	2.77
Pork	-0.7281 (0.0424)	0.6593 (0.1461)	3.28
Chicken	-0.3723 (0.0560)	0.0769 (0.1884)	3.88
Turkey	-0.5345 (0.1217)	-0.1267 (0.3449)	6.23
Fish	0.1212 (0.1606)	0.4290 (0.3076)	4.50
C. fish	-0.3715 (0.1486)	0.3942 (0.3621)	4.28
Eggs	-0.1103 (0.0172)	0.2865 (0.0816)	2.53
Cheese	-0.2472 (0.0833)	0.4181 (0.1934)	3.75
Milk	-0.0431 (0.1259)	0.1193 (0.0718)	1.38
E. milk	-0.2764 (0.5383)	0.5151 (0.2584)	2.61
Flour	-0.0777 (0.1037)	0.1314 (0.1172)	1.54
Rice	0.0661 (0.1232)	0.1475 (0.4537)	7.21
Potato	-0.0983 (0.0531)	0.1100 (0.3235)	5.34
Butter	-0.2428 (0.1613)	0.5386 (0.3659)	4.12
Margarine	-0.0087 (0.1470)	-0.3355 (0.2494)	3.05
Oils	-0.1393 (0.0650)	0.4938 (0.1713)	2.53
Apple	-0.1902 (0.1295)	-0.3617 (0.4206)	7.38
Orange	-0.8486 (0.1154)	-0.1646 (0.4765)	7.34
Banana	-0.4985 (0.1337)	0.0940 (0.3658)	4.68
Grape	-1.1795 (0.1591)	0.5613 (0.5710)	7.99
Grapefruit	-0.4546 (0.1246)	-0.4896 (0.5712)	9.06
Lettuce	-0.0904 (0.0873)	0.3720 (0.2803)	4.46
Tomato	-0.6220 (0.0845)	0.9184 (0.1906)	3.26
Celery	-0.0775 (0.0638)	0.7250 (0.2283)	2.85
Onion	-0.2066 (0.0474)	0.0783 (0.3184)	4.53
Carrot	-0.5339 (0.2014)	0.6750 (0.5309)	7.15
Juice	-0.5575 (0.1081)	0.3664 (0.5539)	8.05
C. tomato	-0.1688 (0.0885)	0.8684 (0.2654)	3.71
C. peas	-0.5335 (0.1580)	0.6282 (0.3599)	5.16
Cocktail	-0.7400 (0.3536)	0.7172 (0.5848)	6.03
Peanut	-0.1685 (0.0778)	0.0992 (0.2551)	3.56
Sugar	-0.0368 (0.0220)	0.0059 (0.1761)	2.68
Sweetener	-0.0522 (0.0938)	0.4190 (0.2659)	4.28
Coffee	-0.1761 (0.0289)	0.8176 (0.2153)	4.02
Frzn. d.	-0.0784 (0.0955)	0.2534 (0.1366)	1.39

Note: The figures in parentheses are the standard errors of estimates. The notations are C. fish (canned fish), E. milk (evaporated and dry milk), Oils (salad and cooking oils), C. tomato (canned tomatoes), C. peas (canned peas), Cocktail (fruit cocktail), and Frzn. d.(frozen dairy products).

Source: Compiled from Huang (1993).

The information on nutrient values is compiled from the U.S. Department of Agriculture (1996), *USDA's Nutrient Data Base for Standard Reference Release 11* (SR11) issued in October 1996. The SR11 is the updated version of the USDA's *Agricultural Handbook No. 8* available on the Internet containing data on the nutrient content of 5,635 food items. This study estimates the available nutrient values closely related to the food disappearance data used in the food demand system. The information thus obtained directly from the SR11 is compiled in appendix table 2, showing the nutrient values in the edible portion of 100 grams of food as consumed. By applying the formula in equation 17, the information on the nutrient values in the edible portion of 1 pound of food as purchased is then obtained and compiled in appendix table 3.

The following list is the 35 food categories defined in this study and their food labels appearing in the SR 11. In the case of two foods or more in a food category, either an average or a weighted average of these foods is calculated with weights listed in parentheses.

01. Beef: carcass, separable lean and fat, choice, raw
02. Pork: carcass, separable lean and fat, raw
03. Chicken: chicken, broilers or fryers, meat and skin, raw
04. Turkey: all classes, meat, skin, giblets and neck, raw

05. Fresh fish: average of :
    - 5a Finfish, butterfish, raw
    - 5b Finfish, catfish, channel, wild, raw
    - 5c Finfish, flatfish, (flounder and sole species), raw
    - 5d Finfish, haddock, raw
    - 5e Finfish, salmon, pink, raw
    - 5f Finfish, sea bass, mixed species, raw
    - 5g Finfish, snapper, mixed species, raw
    - 5h Finfish, swordfish, raw
    - 5i Finfish, trout, mixed species, raw
    - 5j Finfish, tuna, fresh, bluefin, raw
    - 5k Finfish, whiting, mixed species, raw

06. Canned fish: weighted average of :
    - 6a Finfish, tuna, light, canned in oil, drained solids (21.25 %)
    - 6b Finfish, tuna, light, canned in water, drained solids (21.25 %)
    - 6c Finfish, tuna, white, canned in oil, drained solids (21.25 %)
    - 6d Finfish, tuna, white, canned in water, drained solids (21.25 %)
    - 6e Finfish, salmon, pink, canned, drained solids (10 %)
    - 6f Finfish, sardine, Pacific, canned in tomato sauce, drained solids (5 %)

07. Eggs: whole, raw, fresh

08. Cheese: weighted average :
    8a Cheese, cheddar (56 %)
    8b Cheese, pasteurized process, American with sodium phosphate (22 %)
    8c Cheese, pasteurized process, American without sodium phosphate (22 %)

09. Fluid milk: weighted average of :
    9a Milk, whole fluid, 3.3% fat (44 %)
    9b Milk, lowfat, fluid, 2% fat, with added vitamin A (38 %)
    9c Milk, lowfat, fluid, 1% fat, with added vitamin A (8 %)
    9d Milk, skim, fluid, with added vitamin A (10 %)

10. Evaporated & dry milk: weighted average of :
    10a Milk, canned, evaporated, whole, without added vitamin A (71 %)
    10b Milk, dry, skim, nonfat solids, instant, without added vitamin A (29 %)

11. Wheat flour: wheat flour, white, all-purpose, enriched, bleached
12. Rice: rice, white, long-grain, regular, raw, unenriched
13. Potatoes: raw, flesh and skin
14. Butter: butter, regular without salt
15. Margarine: margarine, regular, unspecified oils, without added salt

16. Oils and fats: average of :
    16a Oil, soybean, salad, or cooking
    16b Oil, vegetable, corn, salad, or cooking
    16c Oil, peanut, salad, or cooking
    16d Oil, vegetable, cottonseed, salad, or cooking
    16e Shortening, household lard, and vegetable oil

17. Apples: raw with skin
18. Oranges: all commercial varieties
19. Bananas: raw

20. Grapes: average of :
    20a Grapes, American type (slip skin), raw
    20b Grapes, European type (adherent skin), raw

21. Grapefruits: pink, red, and white, all areas
22. Lettuce: iceberg, including crisp head types, raw
23. Tomatoes: red, ripe, raw, year-round average
24. Celery: raw
25. Onions: raw
26. Carrots: raw

27. Fruit juice: weighted average of :
    27a Orange juice, frozen concentrate, unsweetened, diluted with 3-volume water (74 %)
    27b Apple juice, frozen concentrate, unsweetened, diluted with 3-volume water (26 %)

28. Canned tomatoes: red, ripe, canned, whole, regular pack
29. Canned peas: canned, solids and liquid, regular pack
30. Canned fruit cocktails: fruit cocktails, canned, juice pack, solids and liquid

31. Peanuts and tree nuts: weighted average of :
    31a Peanuts, all types, raw (80 %)
    31b Nuts, walnuts, black, dried (6 %)
    31c Nuts, pistachio nuts, dried (6 %)
    31d Nuts, almonds, dried, unblanced (8 %)

32. Sugar: granulated type

33. Sweeteners: average of :
    33a Syrups, corn, dark
    33b Syrups, corn, light
    33c Syrups, corn, high-fructose

34. Coffee: coffee brewed, prepared with tap water
35. Ice cream and other frozen dairy: frozen desserts, ice cream, vanilla

Appendix table 2--Nutrient values in the edible portion of 100 grams of food as consumed

Food item		Refuse	Energy	Protein	Total fat	Saturate fat	M-unsat. fat	P-unsat. fat	Choles-terol	Carbo-hydrate	Dietary fiber	Calcium	Iron	Magnes-sium	Phos-phorus	Potas-sium
		%	Kcal	Grams					Mg	Grams		Milligrams				
1	Beef	13	291	17.3	24.1	9.8	10.5	0.9	74	0.0	0.0	8	1.8	17.0	154	267
2	Pork	22	376	13.9	35.1	12.4	15.9	3.8	74	0.0	0.0	19	0.7	13.0	155	253
3	Chicken	32	215	18.6	15.1	4.3	6.2	3.2	75	0.0	0.0	11	0.9	20.0	147	189
4	Turkey	21	157	20.4	7.8	2.2	2.8	1.9	78	0.1	0.0	15	1.7	22.0	180	269
5a	Butterfish	0	146	17.3	8.0	3.4	3.4	0.6	65	0.0	0.0	22	0.5	25.0	240	375
5b	Catfish	0	95	16.4	2.8	0.7	0.8	0.9	58	0.0	0.0	14	0.3	23.0	209	358
5c	Flatfish	0	91	18.8	1.2	0.3	0.2	0.3	48	0.0	0.0	18	0.4	31.0	184	361
5d	Haddock	0	87	18.9	0.7	0.1	0.1	0.2	57	0.0	0.0	33	1.1	39.0	188	311
5e	Salmon	0	116	19.9	3.5	0.6	0.9	1.4	52	0.0	0.0	13	0.8	26.0	230	323
5f	Sea bass	0	97	18.4	2.0	0.5	0.4	0.7	41	0.0	0.0	10	0.3	41.0	194	256
5g	Snapper	0	100	20.5	1.3	0.3	0.3	0.5	37	0.0	0.0	32	0.2	32.0	198	417
5h	Swordfish	0	121	19.8	4.0	1.1	1.5	0.9	39	0.0	0.0	4	0.8	27.0	263	288
5i	Trout	0	148	20.8	6.6	1.1	3.3	1.5	58	0.0	0.0	43	1.5	22.0	245	361
5j	Tuna	0	144	23.3	4.9	1.3	1.6	1.4	38	0.0	0.0	8	1.0	50.0	254	252
5k	Whiting	0	90	18.3	1.3	0.2	0.3	0.4	67	0.0	0.0	48	0.3	21.0	222	249
6a	Tuna, canned	0	198	29.1	8.2	1.5	2.9	2.9	18	0.0	0.0	13	1.4	31.0	311	207
6b	Tuna, canned	0	116	25.5	0.8	0.2	0.2	0.3	30	0.0	0.0	11	1.5	27.0	163	237
6c	Tuna, canned	0	186	26.5	8.1	1.7	2.5	3.4	31	0.0	0.0	4	0.7	34.0	267	333
6d	Tuna, canned	0	128	23.6	3.0	0.8	0.8	1.1	42	0.0	0.0	14	1.0	33.0	217	237
6e	Salmon, canned	0	139	19.8	6.1	1.5	1.8	2.0	55	0.0	0.0	213	0.8	34.0	329	326
6f	Sardine, canned	0	178	16.4	12.0	3.1	5.5	2.4	61	0.0	0.0	240	2.3	34.0	366	341
7	Egg	15	149	12.5	10.0	3.1	3.8	1.4	425	1.2	0.0	49	1.4	10.0	178	121
8a	Cheese, cheddar	0	403	24.9	33.1	21.1	9.4	0.9	105	1.3	0.0	721	0.7	27.8	512	98
8b	Cheese, pasteurized	0	375	22.2	31.3	19.7	9.0	1.0	94	1.6	0.0	616	0.4	22.3	745	162
8c	Cheese, pasteurized	0	328	19.6	24.6	15.4	7.2	0.7	64	7.3	0.0	574	0.8	30.6	459	279
9a	Milk, 3.3% fat	0	61	3.3	3.3	2.1	1.0	0.1	14	4.7	0.0	119	0.1	13.4	93	152
9b	Milk, 2% fat	0	50	3.3	1.9	1.2	0.6	0.1	8	4.8	0.0	122	0.1	13.7	95	154
9c	Milk, 1% fat	0	42	3.3	1.1	0.7	0.3	0.0	4	4.8	0.0	123	0.1	13.8	96	156
9d	Milk, skim	0	35	3.4	0.2	0.1	0.0	0.0	2	4.9	0.0	123	0.0	11.4	101	166
10a	Milk, evaporated	0	134	6.8	7.6	4.6	2.3	0.2	29	10.0	0.0	261	0.2	24.2	203	303
10b	Milk, dry	0	358	35.1	0.7	0.5	0.2	0.0	18	52.2	0.0	1231	0.3	117.0	985	1705
11	Wheat flour	0	364	10.3	1.0	0.2	0.1	0.4	0	76.3	2.7	15	4.6	22.0	108	108
12	Rice	0	365	7.1	0.7	0.2	0.2	0.2	0	80.0	1.3	28	0.8	25.0	115	115
13	Potatoes	0	79	2.1	0.1	0.0	0.0	0.0	0	18.0	1.6	7	0.8	21.0	46	543

Continued--

Appendix table 2--Nutrient values in the edible portion of 100 grams of food as consumed--Continued

Food item	Refuse	Energy	Protein	Total fat	Saturate fat	M-unsat. fat	P-unsat. fat	Choles-terol	Carbo-hydrate	Dietary fiber	Calcium	Iron	Magnes-ium	Phos-phorus	Potas-sium
	%	Kcal	Grams					Mg	Grams		Milligrams				
14 Butter	0	717	0.9	81.1	50.5	23.4	3.0	219	0.1	0.0	24	0.2	2.0	23	26
15 Margarine	0	714	0.5	80.3	15.0	36.7	25.0	0	0.5	0.0	17	0.0	1.5	13	25
16a Oil, soybean	0	884	0.0	100.0	14.4	23.3	57.9	0	0.0	0.0	0	0.0	0.0	0	0
16b Oil, corn	0	884	0.0	100.0	12.7	24.2	58.7	0	0.0	0.0	0	0.0	0.0	0	0
16c Oil, peanut	0	884	0.0	100.0	16.9	46.2	32.0	0	0.0	0.0	0	0.0	0.0	0	0
16d Oil, cottonseed	0	884	0.0	100.0	25.9	17.8	51.9	0	0.0	0.0	0	0.0	0.0	0	0
16e Shortening	0	900	0.0	100.0	40.3	44.4	10.9	56	0.0	0.0	0	0.0	0.0	0	0
17 Apples	8	59	0.2	0.4	0.1	0.0	0.1	0	15.3	2.7	7	0.2	5.0	7	115
18 Oranges	27	47	0.9	0.1	0.0	0.0	0.0	0	11.8	2.4	40	0.1	10.0	14	181
19 Bananas	35	92	1.0	0.5	0.2	0.0	0.1	0	23.4	2.4	6	0.3	29.0	20	396
20a Grapes	42	63	0.6	0.4	0.1	0.0	0.1	0	17.2	1.0	14	0.3	5.0	10	191
20b Grapes	11	71	0.7	0.6	0.2	0.0	0.2	0	17.8	1.0	11	0.3	6.0	13	185
21 Grapefruit	51	32	0.6	0.1	0.0	0.0	0.0	0	8.1	1.1	12	0.1	8.0	8	139
22 Lettuce	5	12	1.0	0.2	0.0	0.0	0.1	0	2.1	1.4	19	0.5	9.0	20	158
23 Tomatoes	9	21	0.9	0.3	0.0	0.1	0.1	0	4.6	1.1	5	0.5	11.0	24	222
24 Celery	11	16	0.8	0.1	0.0	0.0	0.1	0	3.7	1.7	40	0.4	11.0	25	287
25 Onions	10	38	1.2	0.2	0.0	0.0	0.1	0	8.6	1.8	20	0.2	10.0	33	157
26 Carrots	11	43	1.0	0.2	0.0	0.0	0.1	0	10.1	3.0	27	0.5	15.0	44	323
27a Orange juice	0	45	0.7	0.1	0.0	0.0	0.0	0	10.8	0.2	9	0.1	10.0	16	190
27b Apple juice	0	47	0.1	0.1	0.0	0.0	0.0	0	11.5	0.1	6	0.3	5.0	7	126
28 Tomatoes,canned	0	19	0.9	0.1	0.0	0.0	0.1	0	4.4	1.0	30	0.6	12.0	19	221
29 Peas, canned	0	53	3.2	0.3	0.1	0.0	0.1	0	9.8	3.2	18	1.0	17.0	53	100
30 Fruit cocktail	0	46	0.5	0.0	0.0	0.0	0.0	0	11.9	1.0	8	0.2	7.0	14	95
31a Peanuts	0	567	25.8	49.2	6.8	24.4	15.6	0	16.1	8.5	92	4.6	168.0	376	705
31b Walnuts	76	607	24.4	56.6	3.6	12.7	37.5	0	12.1	5.0	58	3.1	202.0	464	524
31c Pistachio	50	577	20.6	48.4	6.1	32.7	7.3	0	24.8	10.8	135	6.8	158.0	503	1093
31d Almonds	60	589	20.0	52.2	4.9	33.9	11.0	0	20.4	10.9	266	3.7	296.0	520	732
32 Sugars	0	387	0.0	0.0	0.0	0.0	0.0	0	99.9	0.0	1	0.1	0.0	2	2
33a Syrups, dark	0	282	0.0	0.0	0.0	0.0	0.0	0	76.6	0.0	18	0.4	8.0	11	44
33b Syrups, light	0	282	0.0	0.0	0.0	0.0	0.0	0	76.6	0.0	3	0.1	2.0	2	4
33c Syrups, h-fructose	0	281	0.0	0.0	0.0	0.0	0.0	0	76.0	0.0	0	0.0	0.0	0	0
34 Coffee	0	2	0.1	0.0	0.0	0.0	0.0	0	0.4	0.0	2	0.1	5.0	1	54
35 Ice cream	0	201	3.5	11.0	6.8	3.2	0.4	44	23.6	0.0	128	0.1	14.0	105	199

Continued--

Appendix table 2--Nutrient values in the edible portion of 100 grams of food as consumed--Continued

Food item		Sodium	Zinc	Copper	Manganese	Vitamin A	Vitamin C	Thiamin	Riboflavin	Niacin	Pantothenic	Vitamin B-6	Vitamin B-12	Folate	Vitamin E
		- - - - Milligrams - - - -				RE	- - - - - - - - - Milligrams - - - - - - - - -						- Micrograms -		ATE
1	Beef	59	3.6	0.1	0.0	0	0.0	0.1	0.2	3.5	0.3	0.3	2.7	7.0	0.2
2	Pork	42	1.6	0.1	0.0	3	0.4	0.6	0.2	3.8	0.5	0.3	0.6	4.0	0.3
3	Chicken	70	1.3	0.0	0.0	41	1.6	0.1	0.1	6.8	0.9	0.4	0.3	6.0	0.3
4	Turkey	67	2.3	0.1	0.0	102	0.2	0.1	0.2	4.1	1.0	0.4	1.6	23.0	0.4
5a	Butterfish	89	0.8	0.1	0.0	30	0.0	0.1	0.2	4.5	0.8	0.3	1.9	15.0	0.0
5b	Catfish	43	0.5	0.0	0.0	15	0.7	0.2	0.1	1.9	0.8	0.1	2.2	10.0	0.6
5c	Flatfish	81	0.5	0.0	0.0	10	1.7	0.1	0.1	2.9	0.5	0.2	1.5	8.0	1.9
5d	Haddock	68	0.4	0.0	0.0	17	0.0	0.0	0.0	3.8	0.1	0.3	1.2	11.5	0.4
5e	Salmon	67	0.6	0.1	0.0	35	0.0	0.2	0.1	7.0	0.8	0.2	3.0	4.0	1.0
5f	Sea bass	68	0.4	0.0	0.0	55	0.0	0.1	0.1	1.6	0.8	0.4	0.3	5.0	0.5
5g	Snapper	64	0.4	0.0	0.0	30	1.6	0.0	0.0	0.3	0.8	0.4	3.0	5.0	0.5
5h	Swordfish	90	1.2	0.1	0.0	36	1.1	0.0	0.1	9.7	0.4	0.3	1.8	2.0	0.5
5i	Trout	52	0.7	0.2	0.9	17	0.5	0.4	0.3	4.5	1.9	0.2	7.8	13.3	0.2
5j	Tuna	39	0.6	0.1	0.0	655	0.0	0.2	0.3	8.7	1.1	0.5	9.4	1.9	1.0
5k	Whiting	72	0.9	0.0	0.1	30	0.0	0.1	0.0	1.3	0.2	0.2	2.3	13.0	0.3
6a	Tuna, canned	354	0.9	0.1	0.0	23	0.0	0.0	0.1	12.4	0.4	0.1	2.2	5.3	1.2
6b	Tuna, canned	338	0.8	0.1	0.0	17	0.0	0.0	0.1	13.3	0.2	0.4	3.0	4.0	0.5
6c	Tuna, canned	396	0.5	0.1	0.0	24	0.0	0.0	0.1	11.7	0.4	0.4	2.2	4.6	0.0
6d	Tuna, canned	377	0.5	0.0	0.0	6	0.0	0.0	0.0	5.8	0.1	0.2	1.2	2.0	1.6
6e	Salmon, canned	554	0.9	0.1	0.0	17	0.0	0.0	0.2	6.5	0.6	0.3	4.4	15.4	1.4
6f	Sardine, canned	414	1.4	0.3	0.2	70	1.0	0.0	0.2	0.4	0.7	0.1	9.0	24.3	3.7
7	Egg	126	1.1	0.0	0.0	191	0.0	0.1	0.5	0.1	1.3	0.1	1.0	47.0	1.1
8a	Cheese, cheddar	621	3.1	0.0	0.0	303	0.0	0.0	0.4	0.1	0.4	0.1	0.8	18.2	0.4
8b	Cheese, pasteurized	1430	3.0	0.0	0.0	290	0.0	0.0	0.4	0.1	0.5	0.1	0.7	7.8	0.5
8c	Cheese, pasteurized	1189	3.0	0.0	0.0	219	0.0	0.0	0.4	0.1	0.6	0.1	1.1	7.3	0.7
9a	Milk, 3.3% fat	49	0.4	0.0	0.0	31	0.9	0.0	0.2	0.1	0.3	0.0	0.4	5.0	0.1
9b	Milk, 2% fat	50	0.4	0.0	0.0	57	1.0	0.0	0.2	0.1	0.3	0.0	0.4	5.1	0.1
9c	Milk, 1% fat	51	0.4	0.0	0.0	59	1.0	0.0	0.2	0.1	0.3	0.0	0.4	5.1	0.0
9d	Milk, skim	52	0.4	0.0	0.0	61	1.0	0.0	0.1	0.1	0.3	0.0	0.4	5.2	0.0
10a	Milk, evaporated	106	0.8	0.0	0.0	54	1.9	0.0	0.3	0.2	0.6	0.1	0.2	7.9	0.2
10b	Milk, dry	549	4.4	0.0	0.0	5	5.6	0.4	1.7	0.9	3.2	0.3	4.0	50.0	0.0
11	Wheat flour	2	0.7	0.1	0.7	0	0.0	0.8	0.5	5.9	0.4	0.0	0.0	26.0	0.1
12	Rice	5	1.1	0.2	1.1	0	0.0	0.1	0.0	1.6	1.0	0.2	0.0	8.0	0.1
13	Potatoes	6	0.4	0.3	0.3	0	19.7	0.1	0.0	1.5	0.4	0.3	0.0	12.8	0.1

Continued--

Appendix table 2--Nutrient values in the edible portion of 100 grams of food as consumed--Continued

Food item	Sodium	Zinc	Copper	Manganese	Vitamin A	Vitamin C	Thiamin	Riboflavin	Niacin	Pantothenic	Vitamin B-6	Vitamin B-12	Folate	Vitamin E
	Milligrams				RE	Milligrams						Micrograms		ATE
14 Butter	11	0.1	0.0	0.0	754	0.0	0.0	0.0	0.0	0.1	0.0	0.1	2.8	1.6
15 Margarine	2	0.0	0.0	0.0	799	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.7	12.8
16a Oil, soybean	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2
16b Oil, corn	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.1
16c Oil, peanut	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9
16d Oil, cottonseed	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.3
16e Shortening	0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
17 Apples	0	0.0	0.0	0.0	5	5.7	0.0	0.0	0.1	0.1	0.0	0.0	2.8	0.3
18 Oranges	0	0.1	0.0	0.0	21	53.2	0.1	0.0	0.3	0.3	0.1	0.0	30.3	0.2
19 Bananas	1	0.2	0.1	0.2	8	9.1	0.0	0.1	0.5	0.3	0.6	0.0	19.1	0.3
20a Grapes	2	0.0	0.0	0.7	10	4.0	0.1	0.1	0.3	0.0	0.1	0.0	3.9	0.3
20b Grapes	2	0.5	0.1	0.6	7	10.8	0.1	0.1	0.3	0.0	0.1	0.0	3.9	0.7
21 Grapefruit	0	0.1	0.0	0.0	12	34.4	0.0	0.0	0.3	0.3	0.0	0.0	10.2	0.3
22 Lettuce	9	0.2	0.0	0.2	33	3.9	0.0	0.0	0.2	0.0	0.0	0.0	56.0	0.3
23 Tomatoes	9	0.1	0.1	0.1	62	19.1	0.1	0.0	0.6	0.2	0.1	0.0	15.0	0.4
24 Celery	87	0.1	0.0	0.1	13	7.0	0.0	0.0	0.3	0.2	0.1	0.0	28.0	0.4
25 Onions	3	0.2	0.1	0.1	0	6.4	0.0	0.0	0.1	0.1	0.1	0.0	19.0	0.1
26 Carrots	35	0.2	0.0	0.1	2813	9.3	0.1	0.1	0.9	0.2	0.1	0.0	14.0	0.5
27a Orange juice	1	0.1	0.0	0.0	8	38.9	0.1	0.0	0.2	0.2	0.0	0.0	43.8	0.2
27b Apple juice	7	0.0	0.0	0.1	0	0.6	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.0
28 Tomatoes,canned	148	0.2	0.1	0.1	60	14.2	0.0	0.0	0.7	0.2	0.1	0.0	7.8	0.3
29 Peas, canned	250	0.7	0.1	0.3	38	9.8	0.1	0.1	0.8	0.1	0.1	0.0	28.5	0.3
30 Fruit cocktail	4	0.1	0.1	0.1	31	2.7	0.0	0.0	0.4	0.1	0.1	0.0	2.5	0.2
31a Peanuts	18	3.3	1.1	1.9	0	0.0	0.6	0.1	12.1	1.8	0.3	0.0	239.8	9.1
31b Walnuts	1	3.4	1.0	4.3	30	3.2	0.2	0.1	0.7	0.6	0.6	0.0	65.5	2.6
31c Pistachio	6	1.3	1.2	0.3	23	7.2	0.8	0.2	1.1	1.2	0.3	0.0	58.0	5.2
31d Almonds	11	2.9	0.9	2.3	0	0.6	0.2	0.8	3.4	0.5	0.1	0.0	58.7	24.0
32 Sugars	1	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33a Syrups, dark	155	0.0	0.1	0.1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33b Syrups, light	121	0.0	0.0	0.1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33c Syrups, h-fructose	2	0.0	0.0	0.1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34 Coffee	2	0.0	0.0	0.0	0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0
35 Ice cream	80	0.7	0.0	0.0	117	0.6	0.0	0.2	0.1	0.6	0.0	0.4	5.0	0.0

Note: The notations are M-unsat. fat (monounsaturated fat), and P-unsat. fat (polyunsaturated fat). The units are % (percent), Kcal (kilocalories), Mg (milligrams), RE (retinol equivalent), and ATE (alpha-tocopherol equivalent).
Source: Compiled from USDA's Nutrient Data Base for Standard Reference Release 11 (USDA-SR11), October 1996.

Appendix table 3--Nutrient values in the edible portion of 1 pound of food as purchased

Nutrient	Unit	Beef	Pork	Chicken	Turkey	Fish	C.fish	Egg	Cheese	Milk	E.milk	Flour	Rice	Potato	Butter	Margar.	Oils	Apple	Orange
Energy	Kcal	1148	1330	663	563	509	709	574	1725	239	904	1651	1656	358	3252	3239	4024	246	156
Protein	G	68.4	49.2	57.4	73.0	87.6	113.7	48.2	104.9	15.0	68.1	46.9	32.3	9.4	3.9	2.3	0.0	0.8	3.1
Total fat	G	94.9	124.1	46.6	27.8	15.0	24.8	38.6	139.9	10.4	25.3	4.4	3.0	0.5	367.9	364.2	453.6	1.5	0.4
Saturated fat	G	38.5	44.0	13.3	7.9	4.0	5.5	12.0	88.6	6.5	15.4	0.7	0.8	0.1	229.0	68.0	100.0	0.2	0.0
M-unsat. fat	G	41.3	56.4	19.2	9.9	5.3	8.2	14.7	40.0	3.0	7.8	0.4	0.9	0.0	106.3	166.5	141.4	0.1	0.1
P-unsat. fat	G	3.6	13.4	10.0	6.9	3.7	8.9	5.3	4.1	0.4	0.8	1.9	0.8	0.2	13.7	113.4	191.8	0.4	0.1
Cholesterol	Mg	292	262	231	280	231	155	1639	424	42	118	0	0	0	993	0	51	0	0
Carbohydrate	G	0.0	0.0	0.0	0.3	0.0	0.0	4.7	12.1	21.5	101.0	346.1	362.7	81.6	0.3	2.3	0.0	63.6	38.9
Dietary fiber	G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	5.9	7.3	0.0	0.0	0.0	11.3	7.9
Calcium	Mg	32	67	34	54	101	192	189	3019	549	2459	68	127	32	107	79	0	29	132
Iron	Mg	7.2	2.4	2.8	6.1	2.9	5.3	5.6	3.0	0.2	1.0	21.0	3.6	3.4	0.7	0.0	0.0	0.8	0.3
Magnesium	Mg	67.1	46.0	61.7	78.8	139.0	143.6	38.6	123.3	60.6	231.8	99.8	113.4	95.3	9.1	6.8	0.1	20.9	33.1
Phosphorus	Mg	608	548	453	645	1001	1156	686	2502	431	1948	490	522	209	103	60	0	29	46
Potassium	Mg	1054	895	583	964	1464	1203	467	690	700	3219	490	522	2463	118	112	0	480	599
Sodium	Mg	233	149	216	240	302	1757	486	4190	225	1063	9	23	27	50	10	0	0	0
Zinc	Mg	14.1	5.6	4.0	8.3	2.8	3.3	4.2	13.9	1.8	8.3	3.2	4.9	1.8	0.2	0.0	0.0	0.2	0.2
Copper	Mg	0.3	0.2	0.1	0.4	0.3	0.4	0.1	0.1	0.0	0.1	0.7	1.0	1.2	0.1	0.0	0.0	0.2	0.1
Manganese	Mg	0.1	0.0	0.1	0.1	0.5	0.1	0.1	0.1	0.0	0.0	3.1	4.9	1.2	0.0	0.0	0.0	0.2	0.1
Vitamin A	RE	0	11	126	366	383	91	736	1278	209	180	0	0	0	3420	3624	0	21	70
Vitamin C	Mg	0.0	1.4	4.9	0.7	2.3	0.2	0.0	0.0	4.3	13.4	0.0	0.0	89.4	0.0	0.4	0.0	23.8	176.2
Thiamin	Mg	0.3	2.1	0.2	0.2	0.6	0.1	0.2	0.1	0.2	0.7	3.6	0.3	0.4	0.0	0.0	0.0	0.1	0.3
Riboflavin	Mg	0.6	0.7	0.4	0.7	0.5	0.4	2.0	1.7	0.7	3.3	2.2	0.2	0.2	0.2	0.1	0.0	0.1	0.1
Niacin	Mg	14.0	13.6	21.0	14.9	19.0	44.7	0.3	0.4	0.4	1.8	26.8	7.3	6.7	0.2	0.1	0.0	0.3	0.9
Pantothenic	Mg	1.3	1.9	2.8	3.4	3.3	1.5	4.8	2.1	1.4	6.3	2.0	4.6	1.7	0.5	0.2	0.0	0.3	0.8
Vitamin B-6	Mg	1.3	1.0	1.1	1.5	1.3	1.2	0.5	0.4	0.2	0.6	0.2	0.7	1.2	0.0	0.0	0.0	0.2	0.2
Vitamin B-12	Mcg	10.5	2.2	1.0	5.8	14.2	12.3	3.9	3.9	1.6	5.8	0.0	0.0	0.0	0.6	0.3	0.0	0.0	0.0
Folate	Mcg	27.6	14.2	18.5	82.4	36.6	27.8	181.2	61.3	23.0	91.2	117.9	36.3	58.1	12.7	3.1	0.0	11.7	100.3
Vitamin E	ATE	0.7	1.0	0.9	1.4	2.8	4.7	4.0	2.1	0.4	0.6	0.3	0.6	0.3	7.2	58.1	83.2	1.3	0.8
Food quantity	Lb	68.0	51.1	73.4	17.5	9.9	5.1	30.2	25.1	220	30.4	150.8	16.5	46.7	4.3	10.7	50.2	18.9	13.4

Continued--

Appendix table 3--Nutrient values in the edible portion of 1 pound of food as purchased--Continued

Nutrient	Unit	Banana	Grape	Grapef.	Lettuce	Tomato	Celery	Onion	Carrot	Juice	C.tomato	C.peas	Cocktl.	Peanut	Sugar	Sweet.	Coffee	Frzn.d.
Energy	Kcal	271	226	71	52	87	65	155	174	206	86	240	209	2261	1755	1278	9	912
Protein	G	3.0	2.2	1.4	4.4	3.5	3.0	4.7	4.2	2.4	4.2	14.5	2.1	100.9	0.0	0.0	0.5	15.9
Total fat	G	1.4	1.6	0.2	0.8	1.4	0.6	0.7	0.8	0.3	0.6	1.4	0.0	196.5	0.0	0.0	0.0	49.9
Saturated fat	G	0.5	0.5	0.0	0.1	0.2	0.1	0.1	0.1	0.0	0.1	0.2	0.0	26.6	0.0	0.0	0.0	30.8
M-unsat. fat	G	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.0	98.8	0.0	0.0	0.0	14.4
P-unsat. fat	G	0.3	0.5	0.1	0.4	0.6	0.3	0.3	0.3	0.1	0.2	0.6	0.0	61.5	0.0	0.0	0.0	1.9
Cholesterol	Mg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200
Carbohydrate	G	69.1	58.4	18.0	9.0	19.2	14.7	35.2	40.9	49.8	19.8	44.2	53.8	65.7	453.1	346.6	1.8	107.0
Dietary fiber	G	7.1	3.3	2.4	6.0	4.5	6.9	7.3	12.1	0.8	4.5	14.5	4.5	34.2	0.0	0.0	0.0	0.0
Calcium	Mg	18	41	27	82	21	161	82	109	37	136	82	36	395	5	32	9	581
Iron	Mg	0.9	0.9	0.2	2.2	1.9	1.6	0.9	2.0	0.6	2.5	4.6	1.0	18.3	0.3	0.7	0.2	0.4
Magnesium	Mg	85.5	18.7	17.8	38.8	45.4	44.4	40.8	60.6	39.5	54.4	77.1	31.8	687.3	0.0	15.1	22.7	63.5
Phosphorus	Mg	59	39	18	86	99	101	135	178	62	86	240	64	1539	9	20	5	476
Potassium	Mg	1168	625	309	681	916	1159	641	1304	786	1002	454	431	2848	9	73	245	903
Sodium	Mg	3	7	0	39	37	351	12	141	12	671	1134	18	68	5	420	9	363
Zinc	Mg	0.5	1.1	0.2	0.9	0.4	0.5	0.8	0.8	0.2	0.7	3.2	0.4	12.7	0.1	0.1	0.1	3.1
Copper	Mg	0.3	0.2	0.1	0.1	0.3	0.1	0.2	0.2	0.2	0.5	0.5	0.3	4.5	0.2	0.1	0.0	0.1
Manganese	Mg	0.4	2.1	0.0	0.7	0.4	0.4	0.6	0.6	0.1	0.6	1.2	0.7	7.7	0.0	0.4	0.1	0.0
Vitamin A	RE	24	27	27	142	256	52	0	11356	27	272	172	141	5	0	0	0	531
Vitamin C	Mg	26.8	27.1	76.5	16.8	78.8	28.3	26.1	37.5	131.3	64.4	44.5	12.2	1.3	0.0	0.0	0.0	2.7
Thiamin	Mg	0.1	0.3	0.1	0.2	0.2	0.2	0.2	0.4	0.3	0.2	0.5	0.1	2.5	0.0	0.0	0.0	0.2
Riboflavin	Mg	0.3	0.2	0.0	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.3	0.1	0.6	0.1	0.1	0.0	1.1
Niacin	Mg	1.6	1.0	0.6	0.8	2.6	1.3	0.6	3.7	0.7	3.3	3.8	1.8	44.5	0.0	0.1	1.0	0.5
Pantothenic	Mg	0.8	0.1	0.6	0.2	1.0	0.8	0.4	0.8	0.6	0.8	0.4	0.3	6.7	0.0	0.1	0.0	2.6
Vitamin B-6	Mg	1.7	0.4	0.1	0.2	0.3	0.4	0.5	0.6	0.2	0.4	0.3	0.2	1.3	0.0	0.0	0.0	0.2
Vitamin B-12	Mcg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Folate	Mcg	56.3	13.0	22.7	241.3	61.9	113.0	77.6	56.5	147.4	35.4	129.3	11.3	890.9	0.0	0.0	0.5	22.7
Vitamin E	ATE	0.8	1.9	0.6	1.2	1.6	1.5	0.5	1.9	0.6	1.5	1.2	0.9	37.5	0.0	0.0	0.0	0.0
Food quantity	Lb	25.7	6.9	5.7	24.8	13.4	6.4	14.6	7.8	56.4	74.5	1.9	2.3	2.3	63.9	10.3	7.6	28.9

Note: The notations are M-unsat. fat (monounsaturated fat), P-unsat. fat (polyunsaturated fat), Pantothenic acid, C. fish (canned fish), E. milk (evaporated and dry milk), Margar. (margarine), Grapef. (grapefruit), C. tomato (canned tomatoes), C. peas (canned peas), Cocktl. (fruit cocktail), Sweet. (sweeteners), and Frzn. d. (ice cream and other frozen dairy products). The units are Kcal (Kilocalories), G (grams), Mg (milligrams), Mcg (micrograms), RE (retinol equivalent), ATE (alpha-tocopherol equivalent), and Lb (pounds). Food quantity is based on average per capita food consumption in 1989-93.

Source: U.S. Department of Agriculture, Economic Research Service.