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FOOD STAMP PROGRAM EFFECTS ON AVAILABILITY OF FOOD NUTRIENTS FOR LOW INCOME FAMILIES IN THE SOUTHERN REGION OF THE UNITED STATES

W. Keith Scearce and Robert B. Jensen

The food stamp program, as enacted into law in 1964, was intended to improve the diet of low income households, but whether the program resulted in a nutritional improvement remains a controversial question. Several studies have evaluated the nutritional impact of the food stamp program on participant households. In general, the study findings do not conclusively resolve the question of nutritional improvement for participant families. Studies of California families showed some nutritional improvements among food stamp recipients in comparison with nonrecipients [7, 8]. A study in Pennsylvania showed no nutritional improvements, except in temporary periods of cash shortage [9].

Proponents of the food stamp program have argued that the stamps have a positive impact on the diet of low income families. The primary objective of this article is to report empirical estimates of the effects of the food stamp program on the amount of selected nutrients purchased by low income families in the southern region of the United States.[1] A secondary objective is to analyze the effects of other socioeconomic factors on the availability of nutrients for low income families in the South.

THEORETICAL CONSIDERATIONS

The relationship between expenditures for (or consumption of) commodities and changes in income is embodied in economic theory in the Engle curve relationship derived from an income-consumption function. The theory of consumer behavior is based on the assumption that a consumer allocates expenditures on commodities so as to maximize utility subject to a budget constraint [10]. Normally the utility function is specified as:

$$U = f(q_1, q_2, q_3, \ldots q_N). \tag{1}$$

If the consumer has a specified money income of M, the expenditure of the consumer can be specified as:

$$\sum_{i=1}^{N} p_i q_i = M. \tag{2}$$

The relationship of U, P_i, q_i and M in the theory of consumer behavior can be written in the form of a classical programming problem where the constraints are of the equality type.

$$\text{Maximize } U = f(q_1, q_2, \ldots q_N)$$

subject to

$$\sum_{i=1}^{N} P_i q_i = M.$$

Tintner [13] added a parameter a_k to the utility function where a_k is an expenditure for advertising and Bassmann [2] added more parameters to the utility function. The utility of Tintner-Bassmann's type can be written as:

$$U = f(q_1 q_2 \ldots q_n; a_1, a_2, \ldots a_m), \tag{3}$$

or $U = f(q, A)$ in matrix form.

Suvannant [12] used the Tintner-Bassmann type model to specify the effect of changes in income on the consumption of nutrients. In this framework a_k is defined as X_{oj} where:

$$X_{oj} = \sum_{i=1}^{N} X_{ij} q_i \tag{4}$$

and

X_{ij} = the quantity of the j^{th} nutrient in one unit of the i^{th} food item (j = 1, 2, 3 . . . m, m + 1, m + 2 . . . m + n)

q_i = the quantity of the i^{th} food consumed

X_{oj} = the total quantity of the j^{th} nutrient obtained by the consumer from all food items

The expected effect of an income change on the elements X_{oj} was also specified by Suvannant.

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[1]Low income families in the southern region of the U.S. were selected from respondents in the 1972-1973 Consumer Expenditure Survey. States in the southern region are: MD, WV, VA, KY, NC, SC, TN, GA, AL, FL, MS, AR, LA, OK, and TX.

Differentiating equation 4 with respect to income yields

$$(5) \qquad \frac{\delta X^{*}oj}{\delta M} = \frac{\delta}{\delta M}\left(\sum_{i=1}^{N} X_{ij}\, q_i^{*}\right)$$

$$= \sum_{i=1}^{N} X_{ij}\, \frac{\delta q_i^{*}}{\delta M}$$

where

$\frac{\delta q_i^{*}}{\delta M}$ = the change in q_i with respect to a change in income

if $\frac{\delta q_i^{*}}{\delta M} > 0$ the i^{th} product is a "normal" or "superior" good

if $\frac{\delta q_i^{*}}{\delta M} < 0$ the i^{th} product is an "inferior" good

Because $X_{ij} \geq 0$ in general the $\sum_{i=1}^{N} X_{ij} \frac{\delta q_i}{\delta M} \geq 0$, implying that $\frac{\delta X oj}{\delta M} < 0$ which means that as income increases the amount of nutrient X_{oj} should increase. It will be rare but possible that $\sum_{i=1}^{N} X_{ij} \frac{\delta q_i^{*}}{\delta M} < 0$, then $\frac{\delta X oj}{\delta M} < 0$ which means that even though income increases the total amount of nutrient X_{oj} consumed will decrease. The latter case will occur only if the j^{th} nutrient is mostly available in inferior goods. As an example of the latter case, the amount of yeast consumed should decrease as the consumer's income increases because less bread is being consumed at higher income levels.

Because of the income transfer aspect of the food stamp program, the authors hypothesized that the program would increase the total expenditures for food of low income families. Also, the program should change the set of food items purchased and normally would increase $\sum_{i=1}^{N} q_i^{*}$ which would increase X_{oj}.

Several other socioeconomic characteristics of families such as family size, race, or education of the homemaker, as well as participation in the food stamp program, can act to shift the Engel curve [6, 7, 9]. Therefore, the economic model should include some of these other socioeconomic factors.

Families are assumed to allocate available income among many alternative and competing goods and services so as to maximize satisfaction. Income is the primary economic factor that affects the amount of food purchases and the nature of the food mix purchased by the household. Therefore, income will affect the amount of nutrients purchased. On the basis of Adrian and Daniel's work [1], the authors hypothesized that as income increases all nutrients purchased by the family would increase. Adrian and Daniel found a positive relationship between income and calcium, iron, vitamin A, thiamine, riboflavin, niacin, vitamin C, protein, fats, and food energy. Carbohydrate consumption was negatively related to changes in household disposable income in all regions except in the southern region where it was positively related to changes in income. Because the authors' study is confined to the southern region, a positive relationship between income and all nutrients was hypothesized [1].

The authors hypothesized that as the number of members in the family increases the family would increase the amount of nutrients available to the household. This increase allows all members of the family to be adequately nourished. If the available nutrients did not increase with an increase in family size, the available nutrients would have to be redistributed among all family members. This situation enhances the chances of malnourishment in the family.

The degree of urbanization (urban or rural environment) is a factor that can relate to several variables, some of which are (1) accessibility to diverse types of stores providing a wide variety of foods, (2) differences in the social, cultural, and economic environment such as occupational opportunities and education, and (3) the amount of information available to the family [1].

On the basis of previous research it was hypothesized that the rural households would demand more of each nutrient than is demanded by urban families because the rural families generally utilize more body energy than families in an urban area. Rural areas have a higher concentration of farm families with a greater physiological need for body energy than urban families [1].

The ethnic origin of the family can affect the nature of the food mix purchased and, hence, the amount of nutrients available to the family. The importance of this variable is complicated by the interrelationship of race with other socioeconomic characteristics of the family. Therefore, no *a priori* hypothesis was specified about the impact of race on the availability of nutrients to the family.

The female homemaker, if present, usually does the food shopping for the family. A higher degree of educational attainment by the homemaker would generally indicate an ability to relate food purchases to nutrients available for the family. Therefore, a higher degree of educational attainment by the homemaker was hypothesized to have a positive impact on the nutrients purchased by the family.

Three criteria developed by Adrian and Daniel were used to identify the stages of the family life cycle: (1) the average age of children, (2) the homemaker's capacity for childbirth, and (3) presence or absence of the housewife. The family unit concept disaggregates the family units into stages through which families pass [1].

The average age of children in the family reflects changes in demand for nutrients as children grow and develop. The homemaker's capacity for childbirth is represented by her age. A class composed of households with the homemaker under 40 years of age and with no children represent a family unit which has the capacity to change by having children. A class in which the mother is over 40 years of age with no children represents a family unit that is no longer in the child-bearing stage.

In households where the mother is not present the father must purchase groceries for the family. This type of family is expected to purchase fewer nutrients than families in other stages because of the general lack of information by men in the United States about housework [1].

DATA AND SAMPLE

The low income families analyzed in the study were selected from respondents to the 1972-1973 Consumer Expenditure Survey completed in June 1974 by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor. The survey contains detailed information on family expenditures, income, and other socioeconomic and demographic characteristics of the families. Carlson [3] gives background on the design and uses of the survey.

From the information provided in the Consumer Expenditure Survey, 216 food stamp participant families were selected for the analysis. Table 1 reports the mean monthly income of the food stamp participant families in the BLS Survey. Also reported are the standard deviation and the calculated value of two standard deviations above the mean gross family income values, and the maximum net monthly income allowed a family of a given size by the national food stamp coupon issuance schedule in 1974. Because the coupon issuance schedule allows for certain deductions from the gross family income, certain families were observed to have more gross income than allowed by the maximum of the coupon issuance schedule. The maximum net income allowed from the coupon issuance schedule is approximately 75 percent of the calculated value of two standard deviations above the mean gross monthly income of the sampled BLS participant families.

Selected families that met a specified low income criterion and did not accept the food stamps were chosen as a control group for the purposes of the analysis. A family was chosen for the control group only if the gross family income was less than 133 percent of the maximum net value allowed by the coupon issuance schedule reported in Table 1.[2] By this criterion,

TABLE 1. MEAN MONTHLY GROSS INCOME AVAILABLE TO FAMILIES THAT PARTICIPATE IN THE FOOD STAMP PROGRAM ARRAYED BY NUMBER OF MEMBERS IN THE FAMILY

Number of Family Members	Mean Monthly Income	Standard Deviation	Value of Two Standard Deviations[a]	Maximum Income Allowed[b]
	N = 216			
1	105.63	59.21	225	210
2	199.96	128.44	456	290
3	302.45	247.86	796	420
4	333.56	293.51	919	540
5	360.22	227.30	814	630
6	352.89	210.99	772	720
7[c]	407.06	271.64	949	810

[a]The calculated value of two standard deviations above the mean monthly income.
[b]The maximum net monthly income allowed for a family to be eligible for food stamps in 1974.
[c]Seven or more members of the family.

1,144 families were chosen to represent low income families with a high probability of being eligible for the food stamp program but not participating in the program. The reason for these families' nonparticipation in the food stamp program is not known. Coe [4] suggests that families do not participate because of noneconomic factors such as lack of information and administrative practices of the government. Table 2 reports the income distribution of the participant and nonparticipant households arrayed by number of persons in the family.

The information provided by BLS contained 185 coded food items purchased for home consumption. Many of these items were aggregated expenditures (such as refrigerated bakery products and total cereal and bakery products) that provided little information for the analysis. Therefore, 70 food items were

[2]The sample selection procedure may have eliminated certain nonparticipant families from consideration who had gross incomes below the maximum gross income levels reported by participant families. However, the authors believed that at the upper limit of the income schedule the chances of selecting a family that was not eligible for the program was greatly increased.

TABLE 2. ELIGIBLE HOUSEHOLDS ARRAYED BY PARTICIPATION IN THE FOOD STAMP PROGRAM, SELECTED ANNUAL INCOME CATEGORIES, AND FAMILY SIZE FOR THE HOUSEHOLDS IN THE SOUTHERN REGION OF THE UNITED STATES

Annual Income Ranges	Number of Members in the Households							
	1	2	3	4	5	6	7	Total
	Number of Food Stamp Participant Households							
Less than $2,000	47	16	7	5	2	2	2	81
$2,000 - 3,999	7	28	10	10	11	6	12	84
$4,000 - 5,999	-	3	3	4	6	4	7	27
$6,000 - 7,999	-	-	4	-	1	-	5	10
$8,000 - 9,999	-	1	-	2	1	1	2	7
$10,000 - 12,000	-	-	2	1	2	1	1	7
Total	54	48	26	22	23	14	29	216
	Number of Nonparticipant Households							
Less than $2,000	168	125	49	34	28	15	2	421
$2,000 - 3,999	128	105	25	20	9	4	7	298
$4,000 - 5,999	-	63	45	22	15	14	15	174
$6,000 - 7,999	-	-	35	40	26	13	9	123
$8,000 - 9,999	-	-	-	24	38	6	12	80
$10,000 - 12,000	-	-	-	-	10	15	23	48
Total	296	293	154	140	126	67	68	1,144

selected to represent a market basket of at-home foods consumed. Details of the selected food items are given elsewhere [11, pp. 114-118]. Three criteria were used in selecting items to be included in the market basket: (1) the food items had to be the commonly purchased, (2) an effort was made to include all individual items that 5 percent or more of the families purchased, and (3) a monthly regional average price of the food item had to be obtainable. Some food items could not be included in the market basket because estimated regional average prices were not obtainable.

To accomplish the objectives of the study, the authors assumed that a regional monthly average retail price of a selected food item could provide a reasonable proxy for the price paid by the families in the sample. Regional average prices were calculated from monthly BLS reports. The representative price was used to convert expenditures on an individual food item into a weekly quantity of food available to the family for the week [11, pp. 208-227].[3]

To derive values of selected nutrients available to each family, the quantity of each food item was multiplied by the amount of nutrients in the food item and summed over all 70 foods. The nutritive value of a given quantity of food was obtained from the USDA's Handbook 8 [14].

It should be pointed out that the calculated amount of each nutrient is not the total amount consumed by the family. The values that were calculated are the amounts of nutrients purchased by the family from the selected market basket of foods.

STATISTICAL MODEL

Hassan [5] discusses three criteria that govern the choice of the functional form of an economic model: (1) the existence of an initial level of income below which the commodity is not bought, (2) the existence of a satiety level which provides an upper limit to the expenditure on the commodity, and (3) whether or not the adding-up criterion is satisfied (i.e., the sum of the parts should equal the total).

The double logarithmic function gives an income elasticity that is directly computed and constant throughout the range of the curve. The function has an upward curvature if the elasticity is greater than one, and a negative curvature if the elasticity is negative. The function does not have a satiety level nor does it satisfy the adding-up criterion. The function always passes through the origin, which implies that some quantity of nutrient is purchased for every income level. Because of the ease of interpretation of the income elasticity and the theoretical nature of the function to be estimated, the authors believed that a double logarithmic function would be the appropriate functional form for the statistical model.

The regression model used to isolate the effects of food stamp participation as well as other socioeconomic factors on the availability of the purchased food nutrients is:

$$Y_i^* = \alpha^* + \beta_1 I^* + \beta_2 S^* + \beta_3 P + \beta_5 R + \beta_6 E_1 + \beta_7 E_2 + \beta_8 E_3 + \beta_9 E_4 + \beta_{10} L_1 + \beta_{11} L_2 + \beta_{13} L_5 + \beta_{14} L_6 + \beta_{15} L_7$$

where

Y_i^* = log of the quantity of nutrient i available to the family from a market basket of 70 foods (i = 1 = calories of food energy; 2 = grams of protein; 3 = milligrams

[3]Conversion of the expenditures for the food item i into a quantity of i available to the family involved dividing the expenditure for i by the monthly average price of i in the southern region. Although the authors recognized that there is some price variation across the southern region in a given time, they believed that this method did not skew the results.

of calcium; 4 = milligrams of iron; 5 = international units of vitamin A; 6 = milligrams of vitamin B1; 7 = milligrams of vitamin B2; 8 = milligrams of niacin; 9 = milligrams of vitamin C)

α^* = log of intercept

I^* = log of income

S^* = log of family size

P = a dummy variable representing participation of the family in the food stamp program

U = degree of urbanization (the zero-one analysis of covariance technique was used; U = 1 if urban, 0 if nonurban)

R = race of the household members (R = 1 if black, 0 if nonblack)

E1 - E4 = education of the homemaker; education classes were coded by using the zero-one format:

E1 = 1 if homemaker had completed some high school, 0 otherwise

E2 = 1 if homemaker had graduated from high school, 0 otherwise

E3 = 1 if homemaker had completed some college, 0 otherwise

E4 = 1 if homemaker had graduated from college, 0 otherwise

A zero value of all variables E1 through E4 was assigned to a homemaker with less than a high school education.

L1 - L7 = stages of the household in the family life cycle; the seven discrete family cycle stages were represented by using the zero-one dummy variable format:[4]

L1 = 1 if no children present and housewife 40 years old or younger (Stage 1), 0 otherwise

L2 = 1 if housewife present and average age of children under six years (Stage 2), 0 otherwise

L3 = 1 if housewife present and average age of children ranged from six to less than 12 years (Stage 3), 0 otherwise

L4 = 1 if housewife present and average age of children ranged from 12 to 17 years (Stage 4), 0 otherwise

L5 = 1 if housewife present and average age of children over 17 years (Stage 5), 0 otherwise

L6 = 1 if no children present and housewife over 40 years of age (Stage 6), 0 otherwise

L7 = 1 if housewife absent (Stage 7), 0 otherwise

[4]The development of the family unit variable follows that of Adrian and Daniel [1].

The classification Stage 3 was omitted to avoid singularity.

The third stage is expected to be a stage of high nutrient consumption. Stages in which the homemaker is not present or in which children are not present are expected to have a negative sign (i.e., β_{10}, β_{14}, and β_{15} are expected to be negative). Families in Stage 4 with the children between the ages of 12 and 17 are expected to purchase a greater amount of nutrients than families in Stage 3. Therefore, it is hypothesized that $\beta_{12}>0$. Insufficient information is available to specify *a priori* hypotheses about the sign of the coefficients estimated for Stages 2 and 5.

RESULTS

The primary research objective was to examine whether families that participate in the food stamp program purchase greater amounts of nutrients than families with similar socioeconmic characteristics that do not participate in the program. The estimated coefficients for each of the dependent and independent variables of the nine equations, the standard error of the estimated coefficients, and the level of significance of the coefficients are shown in Table 3. A one-tail t-statistic is used to report the level of significance for the independent variables of log of income, log of family size, food stamp participation, urbanization, education of the homemaker, and Stages 1, 4, 6, and 7 of the life cycle variables. The *a priori* hypothesized sign for each of the variables is discussed in the preceding section. No *a priori* hypothesis was made for the sign for the race variable and life cycle Stages 2 and 5; therefore, a two-tail t-statistic is used to report the level of significance for these variables. The estimated coefficients for the log of income variable in the nine equations are all positive with the exception of vitamin B2. The coefficient for vitamin B2 is negative but not significantly different from zero. The family size elasticities are positive and five of the estimated nine are greater than one.

All of the estimated beta coefficients for participation in the food stamp program by a family are positive except for vitamin B2. The null hypothesis that food stamp participation has no effect on the purchase of the selected nutrient could not be rejected for vitamin B2, niacin, and vitamin C. The authors conclude from this analysis that participation in the food stamp program, if all other factors are constant, significantly increases the amount of six of the nine nutrients examined.

TABLE 3. RESULTS OF MODEL I, ENGEL CURVES OF SELECTED NUTRIENTS AVAILABLE TO LOW INCOME FAMILIES IN THE SOUTHERN REGION OF THE UNITED STATES IN 1973-1974

Independent Variables	Food Energy (calories)	Protein (Grams)	Calcium (Milligrams)	Iron (Milligrams)	Vitamin A (I.U.)	Vitamin B1 (Milligrams)	Vitamin B2 (Milligrams)	Niacin (Milligrams)	Vitamin C (Milligrams)
					N = 1360				
Intercept	5.7462[e] (.6628)	3.2444[e] (.4837)	5.3204[e] (.6874)	1.6931[e] (.3954)	4.5716[e] (.8155)	.4120[c] (.2811)	2.2071[e] (.5888)	2.8221[e] (.6092)	2.1037[e] (.5825)
Log of Income	.4418[e] (.1111)	.3166[e] (.0811)	.3687[e] (.1153)	.3036[e] (.0663)	.5773[e] (.1367)	.1593[e] (.0471)	-.0069 (.0987)	.2230[d] (.1021)	.2851[e] (.0977)
Log of Family Size	1.1399[e] (.2127)	1.0787[e] (.1552)	1.1583[e] (.2206)	.9754[e] (.1269)	1.2859[e] (.2617)	.9684[e] (.0902)	.8932[e] (.1889)	.9798[e] (.1955)	1.1531[e] (.1869)
Food Stamp Participation	.2877[c] (.1964)	.2502[d] (.1433)	.3630[d] (.2037)	.2435[d] (.1171)	.3651[c] (.2416)	.1709[d] (.0833)	-.0138 (.1744)	.1052 (.1805)	.1295 (.1726)
Urbanization									
Urban	-.2614[d] (.1513)	-.0958 (.1104)	-.1653[b] (.1569)	-.0843 (.0902)	-.0516 (.1861)	-.0803[b] (.0641)	.0467 (.1344)	-.0759 (.1390)	.0505 (.1329)
Rural[a]									
Race									
Black	.0587 (.1516)	.0090 (.1106)	-.2693[c] (.1572)	-.0069 (.0904)	-.2299[b] (.1865)	.0358 (.0643)	-.1851[b] (.1347)	.0380 (.1393)	-.1198[b] (.1332)
Non-Black[a]									
Education									
Some Grade School[a]									
Some High School	-.0715 (.2103)	0.0963 (.1535)	-.0566 (.2181)	-.0981 (.1254)	.0515 (.2588)	-.1374[c] (.0892)	-.0192 (.1868)	-.0639 (.1933)	-.1122 (.1848)
High School Graduate	.2683[c] (.2137)	.1613[b] (.1560)	.3622[c] (.2217)	.0756 (.1275)	.4863[d] (.2630)	.0162 (.0906)	.1693 (.1899)	.1155 (.1964)	.4731[e] (.1878)
Some College	-.3515[b] (.3335)	-.1645 (.2434)	-.0095 (.3459)	-.2675[c] (.1989)	-.0886 (.4103)	-.1050 (.1414)	.5446[d] (.2962)	.1129[b] (.3065)	.1687 (.2931)
College Graduate	.1428 (.4922)	.3045 (.3592)	.5675 (.5105)	.1186 (.2936)	.5985 (.6056)	.0656 (.2087)	.6028[c] (.4372)	.4489 (.4523)	.6134[c] (.4326)
Life Cycle									
Stage 1	.0184 (.3741)	.0532 (.2730)	-.3611[b] (.3880)	.2855[c] (.2232)	-.0597 (.4603)	.2551[d] (.1586)	-.2493 (.3323)	.0952 (.3439)	.3657 (.3288)
Stage 2	-.4455[d] (.2503)	-.3265[d] (.1826)	-.3328[c] (.2596)	-.3681[e] (.1493)	-.3233 (.3079)	-.2261[d] (.1061)	-.1024 (.2223)	-.3263[c] (.2300)	-.1881 (.2199)
Stage 3[a]									
Stage 4	.0838 (.2529)	.1351 (.1846)	.1918 (.2623)	.1878 (.1509)	.3113[b] (.3112)	.2522[e] (.1072)	.5670[e] (.2246)	.5559[e] (.2324)	.2859[c] (.2223)
Stage 5	.0558 (.2924)	.0381 (.2134)	.0206 (.3033)	.0300 (.1744)	.2741 (.3598)	.0408 (.1240)	-.0475 (.2598)	.1509 (.2688)	.0678 (.2570)
Stage 6	.7588[e] (.2750)	.6503[e] (.2007)	.6630[e] (.2852)	.6676[e] (.1640)	1.0056[e] (.3384)	.5604[e] (.1166)	.3235[c] (.2443)	.7119[e] (.2527)	.7123[e] (.2417)
Stage 7	-.4791 (.4409)	-.1316 (.3217)	-.0876 (.4572)	-.2422 (.2630)	-.0622 (.5424)	.0159 (.1869)	-.0077 (.3916)	-.2972 (.4052)	.2488 (.3874)
R^2	.1511	.1825	.1401	.2095	.1268	.2719	.0916	.1111	.1511

Note: Standard errors of the estimated regression coefficients are in parentheses.

[a]Omitted to avoid singularity.

[b]Significant at .20 level.

[c]Significant at .10 level.

[d]Significant at .05 level.

[e]Significant at .01 level.

The amount of income of the family and other socioeconomic factors also affect the amount of nutrients purchased. A base family unit with 2.8 members and a monthly income of $400 was chosen to evaluate the effect of food stamp participation on the purchase of the nutrients. Using the Recommended Dietary Allowance (RDA) as established by the National Center for Health Statistics of the U.S. Department of Health, Education, and Welfare as a base criterion, the authors conclude that food stamp participants purchase 31 percent more food energy, 27 percent more protein, 43 percent more calcium, 26 percent more iron, 38 percent more vitamin A, and 18 percent more vitamin B1 than nonparticipant households.

Results indicate that urban low income families have a lower level of purchased nutrients than rural low income families. In general, the beta coefficients for the urban variable have a negative sign for the low income population. Only food energy, calcium, and vitamin B1 are significant and each beta coefficient is negative.

The sign of the black race variable differs among equations. The coefficients for calcium, vitamin A, vitamin B2, and vitamin C are significantly less for the black families than the families in the omitted category.

The level of education of the homemaker in the low income families affected the purchase of nutrients in a positive manner. The omitted category is the housewife having some grade school. Note that if the housewife has completed high school the purchased amounts of food energy, calcium, and vitamin C are significantly increased. Also, the coefficients for vitamin B2 and vitamin C significantly increase if the housewife from the low income family has a college education. These results indicate that higher levels of education of the housewife in low income families will significantly increase the amounts of food energy, calcium, and vitamin C purchased by the household.

CONCLUSIONS

A regression model that incorporated the participation of the family in the food stamp program with other socioeconomic characteristics of the family made possible the separation of the various components having an effect on the amount of nutrients purchased by the family. With all other factors held constant, the analysis indicates that the food stamp participant families purchased a greater amount of food energy, protein, calcium, iron, vitamin A, and vitamin B1 than low income families with similar socioeconomic characteristics that do not participate in the program.

One limitation of the study is that a market basket of food items was used to estimate the nutrient levels rather than the total amount of all foods consumed. This limitation resulted in most of the calculated nutrients being lower than the recommended dietary allowance as established by the National Center for Health Statistics. However, food stamp participant families in the southern region of the United States purchased 31 percent more food energy, 27 percent more protein, 43 percent more calcium, 26 percent more iron, 38 percent more vitamin A, and 18 percent more vitamin B1 than families with similar socioeconomic characteristics that did not participate in the food stamp program. These results are consistent with results reported by Lane [7] for a California study.

The increase in the purchase of the six nutrients by the food stamp families supports the conclusion that the food stamp program has a positive impact on the diet of participant families in the southern region. Without the food stamp program, participant families would have less food energy, protein, calcium, iron, vitamin A, and vitamin B1 available for consumption.

REFERENCES

[1] Adrian, John and Raymond Daniel. "Impact of Socio-Economic Factors on Consumption of Selected Food Nutrients in the United States," *American Journal of Agricultural Economics,* Volume 58, February 1976, pp. 31-38.

[2] Bassmann, R. L. "A Theory of Demand with Variable Consumer Preferences," Ph.D. dissertation, Iowa State University, 1955.

[3] Carlson, Michael D. "The 1972-73 Consumer Expenditure Survey," *Monthly Labor Review,* Bureau of Labor Statistics, U.S. Department of Labor, December 1974.

[4] Coe, Richard. "Participation in the Food Stamp Program Among the Poverty Population," in *Five Thousand American Families—Patterns of Economic Progress,* Volume 4. Ann Arbor: Institute for Social Research, 1976.

[5] Hassan, Zuhair A. and S. R. Johnson. *Urban Food Consumption Patterns in Canada,* Agriculture Canada Economics Branch, Publication No. 77/1, January 1977.

[6] Hoover, Dale M. and James K. Whittaker. *Regression Analysis of North Carolina Nutrition Survey Data: Some Problems and Tentative Findings,* North Carolina State University, December 1972.

[7] Lane, Sylvia. "Food Distribution and Food Stamp Program Effects on Food Consumption and Nutritional 'Achievement' of Low Income Persons in Kerns County California," *American Journal of Agricultural Economics,* Volume 60, February, 1978, pp. 108-116.

[8] Logan, S. H. and D. B. Deloach. *The Food Stamp Program: Del Norte and Humboldt Counties, California.* University of California, Agricultural Experiment Station, Davis, California, 1973.

[9] Madden, J. Patrick and Marion D. Yoder. *Program Evaluation: Food Stamps and Commodity Distribution in Rural Areas of Central Pennsylvania*, Pennsylvania State University, Agricultural Experiment Station, Bulletin 780, June 1972.
[10] Samuelson, Paul A. *Foundations of Economic Analysis*, Cambridge, Massachusetts: Harvard Press, 1947.
[11] Scearce, W. Keith. "An Economic Analysis of the Effect of the Food Stamp Program on the Availability of Selected Food Nutrients for Families in the Southern Region of the United States," unpublished Ph.D. dissertation, Virginia Polytechnic Institute and State University, March 1978.
[12] Suvannant, Veraphal. "Measurement of Quantities and Price of Product Qualities," Ph.D. dissertation, Iowa State University, 1973.
[13] Tintner, G. "Complementarity and Shifts in Demand," *Metroeconomica*, Volume 4, 1952.
[14] Watt, Bernice K. and Annabel Merrill. *Composition of Foods: Raw, Processed, Prepared*, U.S.D.A. Agricultural Research Service, Agricultural Handbook 8, 1963.