Socioeconomic Determinants of Food Expenditure Patterns among Racially Different Low-Income Households: An Empirical Analysis

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This paper examines the impact of selected socioeconomic characteristics on aggregate and group food expenditure patterns of racially different low-income households. A double logarithmic functional form was used to explain responses in household food expenditures to socioeconomic factors. Household income, family size, and Food Stamp Program participation were found to exert a strong positive impact on food expenditures. The general educational level of the homemaker registered no significant impact on household food expenditures. However, the nutritional knowledge of the homemaker increased the efficiency of food purchasing activities.

Recently a number of changes have been made in entitlement programs, including food assistance programs, to reduce the cost of these programs and to control inflation. For example, changes have been made in the eligibility standards for Food Stamp Program (FSP) recipients, and future upward adjustments in benefit levels are being curtailed by tying benefit levels to the rate of inflation. To the extent that FSP benefits are designed to enhance the food purchasing and nutritional status of low-income households, changes in benefit schedules and coverage may affect the food consumption patterns of these households (Longen; Davis; West and Price). Since the effects of FSP participation on food expenditures cannot meaningfully be assessed in isolation from other household socioeconomic characteristics, such variables need to be incorporated into food expenditure analysis. This study attempts to provide such an analysis. The objective of this study was to determine the effects of selected socioeconomic characteristics on the food expenditure patterns of racially different low-income households. The racial groups examined were blacks, hispanics, and whites.

Several empirical studies have shown that increased public investment in food assistance programs has positively influenced food expenditures of low-income households. Consequently, the incidence of hunger and malnutrition among these households has been reduced. Davis and Neenan showed that participation in the FSP and the Expanded Food and Nutrition Education Program (EFNEP) signif-

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icantly increased the food expenditures and improved the nutritional status of the households studied. Scearce and Jensen, Lane, and West and Price have reported similar relationships between food assistance programs, such as FSP and the Food Distribution Program (FDP), and the food and nutrient consumption in low-income households.

In these studies, however, variations in food expenditures among racial groups with (a) different size-age compositions (b) different levels of food program participation, and (c) different rural-urban residential distributions within the same geographical area were not specifically analyzed. Moreover, because of the nature of the data sets, the importance of basic nutritional education or knowledge stocks of the homemaker (other than the role of EFNEP participation) could not be evaluated. In contrast, our study identifies the determinants of food expenditures among the aforementioned subgroups and evaluates the relationships of both general educational level and nutritional knowledge to food expenditures. In view of the recent changes in the benefit schedule and coverage of food assistance programs, such as FSP, and continuation of formalized nutritional education programs, such as EFNEP, the findings from this study may be useful in evaluating present and proposed food and nutrition intervention mechanisms.

Conceptual Framework

Economists have made important contributions to broaden the range of applicability of traditional consumer demand theory by specification of factors not included in the traditional Engel relationship (Agarwals and Drinkwater; Allen and Bowley; Barton; Becker; Houthakker; Lancaster; Phlips; Pollak). Agricultural economists have incorporated some of these factors in empirical analyses of food consumption in low-income households (Adrian and Daniel; Davis and Neenan; Lane; Neenan and Davis: Scearce and Jensen). This study incorporates household sociodemographic characteristics in the demand analysis by relying to some extent on Household Economic Theory (Becker; Lancaster; Schuh).[1] The household is viewed as a single organizational unit in which food expenditure behavior can be explained using the following general functional form:

$$Q_f = F(I, FSP, HS, A, R, L, S) \quad (1)$$

where

Q_f is the household's monthly expenditures on food
I is the monthly money income of the household
FSP reflects participation of the household in the Food Stamp Program
HS measures the number of persons in the household
A is the age of the adult male or female homemaker
R reflects the race of the adult homemaker
L denotes the residential location of the household (urban or rural)
S reflects the stocks of knowledge of the homemaker in terms of general educational attainment (E) and awareness of the nutrient composition of foods and food purchasing and preparation efficiencies (EDNT).

Variables I and FSP reflect the basic economic condition of the household. The quantity and quality of a household's food consumption pattern are highly correlated with the purchasing power of the household (Adrian and Daniel; Davis; Lane; West and Price). It was therefore hypothesized that household money income (I)

[1] A recent paper by Davis critically evaluated some of the theoretical and empirical implications of the traditional and household economic approaches to analysis of econutritional problems among low-income households.

and FSP in-kind income supplement would positively affect food expenditures.

Household size (HS) was included in the model to capture some of the effects of household composition on food expenditures. It was hypothesized that household size would positively impact food expenditures but that there would be some economies of size.

The age composition and the race composition of the household were also hypothesized to have a significant impact on food consumption. To capture this effect, the age (A) and race (R) of the homemaker were included as explanatory variables. Age and race were seen as influencing household food expenditures through their role as proxies for household tastes and preferences. It was assumed that the homemaker (male or female) through playing a primary role in food purchasing and preparation would be the "gatekeeper" for family members' tastes and preferences, or at least influence them. Given this assumption, it was hypothesized that households with older homemakers would exhibit a wider range of food tastes and preferences than their younger counterparts and would, therefore, have higher food costs. This proposition was based on the notion that households with older homemakers probably had a higher ratio of teenagers to preteenagers and, therefore, would tend to spend more on food. Empirical studies have suggested that household food expenditures increase with the addition of children to the household and continue to increase as children get older, peaking when they are teenagers (Davis). Racial characteristics are likely to affect food expenditure patterns because different races apparently have different attitudes toward food in general, particular food items, and food preparation (Davis; Lane; Scearce and Jensen; West and Price). It was therefore hypothesized that variation in food expenditures would exist across racial groups.

We hypothesized that residential location (L) would affect household food expenditures. Urban residents may have a wider choice of food outlets and food items. On the other hand, rural residents may consume more home-produced foods.

Analysis of the effects of the education variable (S) consisted of evaluating the impacts of general education level (E) and the stocks of nutritional knowledge (EDNT) on household food expenditures. The components of nutritional knowledge included information acquired through EFNEP participation and other sources on the nutrient composition of foods and improved methods of shopping and food preparation. Researchers have reported a significant positive effect of general education level on food expenditures of low-income households (Adrian and Daniel; Lane; Scearce and Jensen). Also, EFNEP counseling was found to significantly impact food expenditures (Davis and Neenan). No hypothesis was advanced as to the effect of the stock of general education on food expenditures, but we hypothesized that the nutritional knowledge of the homemaker would negatively affect food expenditures.

Data Base

The total sample consisted of 300 households—152 from urban Miami, Florida, and 148 from rural Sumter County, located in north-central Florida. The sample was partitioned according to residential location to identify the impact of this variable on food expenditure patterns, as hypothesized in the theoretical framework. Sample households were surveyed by trained interviewers during 1979 and 1980. The Miami subsample was drawn from inner-city households, consisting mainly of blacks and hispanics (Cuban Americans). Since the total sample was stratified by low-income status and race, it understandably contained a larger number of black households (58 percent) than would have been obtained by a random

TABLE 1. Summary of Mean Household Values of Selected Socioeconomic Characteristics for the Sample Population, 1980.

Socioeconomic Variable	Cell Count[a] (n)	Total n = 300	Household Category: Urban Black n = 128	Urban Hispanic[a] n = 24	Rural Black n = 48	Rural White n = 100
			Dollars			
Monthly Income (Excluding FSP Income)	300	887.00 (37.7)[b]	881.00 (54.1)	600.00 (57.8)	493.00 (36.5)	1,154.00 (80.1)
Monthly Food Expenditures (Including Food Stamp Purchases and Away From Home Purchases)	300	254.00 (6.97)	224.00 (9.7)	262.00 (26.6)	237.00 (13.5)	294.00 (13.7)
Total Monthly Expenditures	300	646.00 (16.91)	584.00 (20.9)	637.00 (54.4)	528.00 (37.1)	781.00 (34.3)
			Numbers			
Household Size	300	4.78 (0.10)	4.82 (0.17)	4.83 (0.40)	5.15 (0.29)	4.50 (0.12)
Age (Homemaker)	300	41.2 (0.52)	42.1 (0.89)	41.3 (1.74)	42.6 (1.50)	39.7 (0.70)
Educational Level in Years (Homemaker)	276[c]	11.2 (0.10)	11.6 (0.24)	6.9 (0.88)	11.2 (0.20)	11.8 (0.20)
			Percent			
<9th Grade		12.0 (1.96)	10.2 (2.92)	65.0 (10.94)	4.6 (3.18)	5.1 (2.23)
9th–12th Grade		72.1 (2.78)	68.5 (4.49)	30.0 (10.51)	88.6 (4.84)	78.6 (4.17)
>12th Grade		15.9 (2.21)	21.3 (3.96)	5.0 (5.00)	6.8 (3.84)	16.3 (3.75)
FSP Participation	277[c]	28.0 (2.70)	33.0 (4.53)	36.4 (10.50)	53.7 (7.88)	9.1 (2.90)
Nutritional Education (Homemaker)	279[c]	41.0 (2.95)	62.7 (4.63)	78.3 (8.79)	16.7 (5.82)	16.3 (3.75)

[a] Because of the small size of the sample, some cells are extremely small.
[b] Numbers in parentheses are standard errors of mean.
[c] Cell Counts are less than 300 because some households did not respond to the corresponding questions.

sample of household units from the state's population as a whole. Thirty-four percent of the units sampled were white, drawn primarily from rural Sumter County. Eight percent of the sample units were hispanic, all from the urban Miami area.

The small size of the sample and associated small size of cells limits the extent to which the empirical findings are representative of the U.S. population. As such, the findings must be viewed as no more than suggestive of the food consumption patterns of the population sampled and of the larger population.

A general overview of the socioeconomic characteristics and food expenditure patterns of the population sampled is presented in Tables 1 and 2. This presentation provides a perspective for the magnitudes and distribution of the key variables estimated in the empirical model.

Table 1 presents the mean levels of selected socioeconomic variables by race and

TABLE 2. Monthly Food Expenditures As Proportion of Monthly Income, By Selected Socioeconomic Characteristics of the Sample Population, 1980.

Characteristics	Number of Households (n)	Mean Monthly Income[a]	Mean Monthly Food Expenditures[b]	Percentage of Money Income Spent on Food
		Dollars		
All Households	300	887	254	28.6
Race:				
White	100	1,154	295	25.6
Black	176	772	228	29.5
Hispanic	24	600	262	43.7
Location:				
Urban	152	838	233	27.8
Rural	148	940	276	29.4
Household size:				
2–4 Persons	146	853	217	25.4
5–7 Persons	139	912	277	30.5
>7 Persons	15	989	401	40.5
Poverty Income Status:				
<75% of Poverty Level	88	369	224	60.7
75–100% of Poverty Level	47	569	215	37.8
100–125% of Poverty Level	39	750	243	32.4
>125% of Poverty Level	126	1,411	293	20.8
Education of Homemaker:				
<9th Grade	33	650	248	38.2
9th–12th Grade	199	853	257	30.1
>12th Grade	44	1,306	282	21.6
FSP Participation:				
Participant	77	598	251	49.4[c]
Nonparticipant	200	1,003	265	26.4
Nutrition Education:				
Yes	114	866	242	27.9
No	165	939	275	29.3

[a] Excluding FSP income.
[b] Including purchases with FSP coupons and away-from-home purchases.
[c] This money income food expenditure ratio is an "adjusted" ratio, and as such may reflect the overstatement of food expenditures. The numerator comprises all food expenditures, including those made with food stamps. The denominator is total money income and does not include the value of available food stamps. Ideally, the food expenditures of FSP participants should be reduced by the cash value of food stamp coupons. Respondents were willing to divulge food expenditures from money income and food stamp income, but would not divulge the monthly dollar of food stamp income supplements. The components of money income are described in the discussion of the data base.

location. Rural blacks had the lowest income. Income is the pretax summation of monthly earnings for all members of the household plus transfer payments (social security, unemployment compensation, alimony and child support, welfare, pension), private pension, and cash contributions. It does not include the cash value of food stamp coupons because appropriate data were not available. This aspect is addressed later. The prevalence of low-income status was evident from the esti-

mated distribution of income below the 1980 poverty levels (Federal Register). The incidence of poverty was highest among rural black households. Specifically, 83 percent of the rural black households were below the poverty income threshold. In contrast, 25 percent of rural white households fell into this category. The average household size was highest among rural blacks (5.15) and lowest among rural whites (4.50) (Table 1). It should be pointed out that mean household sizes for the sample and subsamples are larger than those of most studies based on national samples (Adrian and Daniel; Salathe and Buse; Scearce and Jensen). However, these sizes are within the ranges reported in studies of localized populations (Davis and Neenan; Neenan and Davis; Lane; West and Price).

Table 2 shows the proportion of monthly money income allocated to food expenditures by selected subgroups. Black and hispanic households had food expenditure-money income ratios higher than those of all households. Households with incomes less than 75 percent of the 1980 poverty threshold allocated 61 percent of their money income to food. Households participating in the FSP allocated a larger proportion of their money income to food than did nonparticipant households.[2] Conversely, households with nutritional knowledge (as defined in the model specification) spent less of their money income on food.

Empirical Model

There is no concensus concerning the most appropriate functional form to use in estimating the relationship postulated in this study. Phlips argues that the appropriateness of a functional form must be addressed within the context of a trade-off between statistical (pragmatic) results and the properties of economic theory. A recent empirical analysis of flexible Engel functions indicated that the double-logarithmic function was superior to widely used "classical" forms and an excellent alternative to the Box-Cox model. This was found to be particularly true for estimates of expenditure elasticities evaluated at sample means, using cross-sectional data (Blaylock and Green).

Experimentation with alternative functional forms (linear, quadratic, semi-logarithmic, double-logarithmic) suggested that the double-logarithmic form provided a more plausible characterization of expenditure relationships among the household types. However, the double-logarithmic demand function is generally incompatible with the classical utility maximization assumption, since it violates the Engel aggregation condition (Hassan and Johnson, p. 22; Phlips). Nonetheless, trade-off considerations pointed in favor of using this functional form. Some of these considerations were (a) plausibility of relationships, (b) ease of estimation, and (c) the ready interpretation afforded by the estimated parameters. An additional consideration related to a particular interest in the structural characteristics of expenditure elasticities evaluated at sample means.

Given these considerations, the empirical model was specified in double-logarithmic form using ordinary least squares:

$$\ln Qf = \alpha + \beta_1 \ln I + \beta_2 \ln HS + \beta_3 FSP + \beta_4 A + \beta_5 E_1 + \beta_6 E_2 + \beta_7 R_1 + \beta_8 R_2 + \beta_9 EDNT + U_t \quad (2)$$

where

$\ln Qf$ = log of the household's monthly food expenditures in dollars (including purchases with food stamps and

[2] This money income food expenditure ratio actually is overstated for FSP participants since it does not reflect the income value of food stamp coupons but does reflect food purchases with food stamp coupons. Because FSP participants refused to divulge information relating to the cash value of coupons (see footnote to Table 2), it was impossible to compute an "adjusted" ratio.

away-from-home purchases)

$\ln I$ = log of the household's monthly income (excluding the monetary value of food stamps)

$\ln HS$ = log of the household size—total number of individuals in the household who depend on the common pool of income

FSP = participation in the Food Stamp Program by one or more members of the household (FSP = 1 if one or more members received food stamps, otherwise FSP = 0)

A = age of the adult homemaker (A = 1 if age is greater than 40, otherwise A = 0)

E = educational attainment of the adult homemaker

E_1 = 1 if school grade is 9–12, otherwise $E_1 = 0$

E_2 = 1 if school grade is less than 9, otherwise $E_2 = 0$

R = race of the adult homemaker

R_1 = 1 if urban black, otherwise $R_1 = 0$

R_2 = 1 if rural black, otherwise $R_2 = 0$

R_3 = 1 if rural white, otherwise $R_3 = 0$

EDNT = nutritional knowledge stocks of the adult homemaker (EDNT = 1 if homemaker has basic nutritional knowledge, otherwise EDNT = 0)

U_t = error term.

Household income and family size were specified in natural logarithms to represent expenditure responses to these variables, particularly the hypothesized responses of size economies. By specifying food expenditures, income, and family size in logarithmic forms, the value of the income and size coefficients in the empirical model can be interpreted as the income elasticity and elasticity of household size for food expenditures, respectively. It should be noted, however, that these empirical estimates of income elasticities (and associated marginal propensities) would tend to have an upward bias, given the specification of the food expenditures and income variables in equation (2).

For reasons given in the discussion of the data base, food expenditures include the coupon value of food stamps, while income values exclude the FSP income transfer. Empirical studies have indicated a strong interaction between the bonus value of food stamp coupons and money income (Davis; Neenan and Davis; Lane; West and Price). To capture this effect, the FSP variable should ideally be specified in value terms, rather than in a binary form, since the latter form does not completely control for this interactive effect. The requirement that a portion of the stamps be purchased by FSP participants had been eliminated by the time of the study. However, for reasons not quite clear, food stamp recipients refused to divulge the dollar value of coupons received. Attempts to estimate the cash value of food stamps from other response information were unsuccessful. Thus FSP participation was specified in binary form.

The age variable for the adult homemaker (A) was specified as a binary variable by segmenting the sample and subsample mean age at 40 years. This appeared appropriate based on the age characteristics of the sample (Table 1) and some empirical evidence that the life-cycle characteristic of interest (the relationship between food expenditures and the age distribution of children) occurs close to this age cohort (Barton; Neenan and Davis).

The binary variable (EDNT) reflecting the adult homemaker's stocks of nutrient knowledge and food purchasing and preparation efficiency was developed from the composite index of the homemaker's

TABLE 3. Statistical Summary of OLS Monthly Food Expenditures Equation,[a] All Households, By Selected Socioeconomic Characteristics, 1980.

Socioeconomic Variable	Total n = 265	Regression Coefficient	Standard Error	t-value
Intercept		2.78	0.321	8.69**
Household Income (ln I)[a]		0.329	0.044	7.43**
Household Size (ln HS)[a]		0.529	0.077	6.86**
Age of Homemaker (A)		0.044	0.051	0.86
Race (R):[b]				
Urban Black		−0.393	0.098	4.03**
Rural Black		−0.254	0.120	2.11*
Rural White		−0.208	0.106	1.97*
Educational Level (E):[c]				
9th–12th Grade		−0.037	0.071	0.52
<9th Grade		−0.179	0.107	1.67
Nutritional Education (EDNT)		−0.105	0.059	1.78*
FSP Participation (FSP)		0.152	0.068	2.23*
R^2 = 0.3929				
F = 16.44**				

[a] Food expenditures, household income and household size are expressed in logarithmic form; therefore, coefficients are elasticities.
[b] Hispanic group omitted.
[c] College level group omitted.
* P < 0.05 (coefficients significant at 95% level).
** P < 0.01 (coefficients significant at 99% level).

exposure to different sources of counseling in food purchasing and preparation. These sources were identified as physicians, EFNEP participation, extension home economists, public health nutritionists, health food stores, weight control programs, and other sources. Homemakers were asked to specify the time dimension of the knowledge contact and the frequency of contact. The response characteristics were then used to segment this binary variable.

Empirical Results

The parameters for the OLS estimations of equation (2) are presented in Tables 3 and 4. Results from the analysis of the entire sample are presented in Table 3 and subgroup marginal propensities and elasticities are reported in Table 4. Since it was hypothesized that race and location would have differential impacts on food consumption patterns and the data were composed of four distinct race-location subgroups (urban black, urban hispanic, rural black, rural white), it was necessary to test whether results from subgroup regressions were significantly different from results from the regression for the entire sample. For this purpose, two statistical hypotheses were tested: (a) a test of homogeneity of the regressions, in which the intercepts were hypothesized to be equal for the entire sample and the subgroups, and (b) a test for equality of the regression coefficients for the subgroups. An F-test indicated that the intercept coefficients for the subgroup estimations were significantly different from those of the entire sample. However, the regression coefficients for the subgroups were not significantly different from those for the entire sample. This was also the case when differences in regression coef-

TABLE 4. Marginal Propensity and Income Elasticity of Food Expenditures, by Selected Sample Groupings, 1980.

Grouping	Marginal Propensity to Spend (MPS)[a]	Food Expenditure Income Elasticity[b]	Standard Error of Income Elasticity	t-Value
Aggregate	0.094	0.329	0.044	7.43*
Race (R):				
White	0.092	0.360	0.067	5.37**
Black	0.090	0.308	0.065	4.74**
Hispanic	0.170	0.390	0.206	1.89***
Region (L):				
Urban	0.064	0.230	0.076	2.94**
Rural	0.117	0.400	0.054	7.38**
FSP Participation (FSP):				
Participants	0.074	0.150	0.055	2.64**
Nonparticipants	0.097	0.390	0.058	6.78**
Educational Level of Homemaker (E):				
<9th Grade	0.127	0.460	0.141	3.28**
9th–12th Grade	0.104	0.280	0.049	5.71**
Family Size (HS):				
2–4 Persons	0.102	0.400	0.076	5.23**
5–7 Persons	0.097	0.320	0.065	4.82**

[a] Product of the estimated subgroup income elasticity and the ratio of subgroup mean household monthly food expenditures and mean monthly money income. Expenditure-income ratios were computed from averages in the sample groupings. See footnotes 2 and 3 of text.

[b] This is the log income (ln I) coefficient for the sample group food expenditure regressions. Since food expenditures are also specified in logarithmic form, the log income coefficient is the income elasticity for the grouping. See footnotes 2 and 3 of text.

* $P < 0.01$ (coefficient significant at 99% level).
** $P < 0.05$ (coefficient significant at 95% level).
*** $P < 0.10$ (coefficient significant at 90% level).

ficients for subgroups were compared. The absence of differences among subgroup regression coefficients may be related to any one or a combination of the following factors: (a) the characteristics of the functional form;[3] (b) the absence of cross-product terms; (c) the small subsample size in some of the groupings. Valuable insights may be gained, however, from income elasticities estimated via separate, subgroup equations. Based on this notion a single functional form (with intercept shifters) was used in the estimations for the entire sample and for the subgroups. Many of the results reported below are generated through separate analyses of the subgroup data. If, in fact, there are no differences in income elasticities across subgroups, then estimated differences in the marginal propensities to spend (MPS), calculated at mean values of subgroup incomes and expenditure may simply reflect differences in these mean income and expenditure values.

Caution should be exercised in attributing a cause and effect relationship between the race-location variable and food expenditures. Multicollinearity obviously exists between race and location, since all sampled white households lived in a rural location while all hispanic households lived in an urban location. This suggests that

the findings cannot isolate the separate effects of race and location as determinants of food expenditures.

Income Determinants

Income had a significant positive impact on monthly food expenditures for the entire sample (Table 3). Given the logarithmic specification of the expenditures and income variables, the value of the income coefficient is the income elasticity for food expenditures. Food expenditure-income elasticity is defined as the additional percentage change in food expenditures resulting from a one percent increase in income, when all other variables are constant. The income elasticity estimate for the entire sample was 0.329. This means that for all households as a group, for every one percent increase in monthly household income, monthly food expenditures would increase by 0.329 percent. This finding is consistent with similar income elasticity estimates of 0.32 reported by Salathe and Buse from their analysis of the 1960–61 BLS Consumer Expenditure Survey data, and by Smallwood and Blaylock from their analysis of the 1977–79 USDA Nationwide Consumption Survey data. However, West and Price reported a lower aggregate income elasticity of 0.04 in their study of low-income black and Mexican-American households. They suggest that their lower estimate might have been related to (a) exclusion of households with very low income, where food expenditures may be more responsive to income, and (b) model specification differences, such as inclusion of food consumed from nonmarket sources (West and Price, p. 727).

In spite of the consistency of our elasticity estimate with two national estimates, our estimate probably has an upward bias. Unlike West and Price's sample, our sample contained a disproportionate number of households with very low incomes, compared to a larger sample in which income levels would have been more randomly distributed. In addition, food stamp coupon value was not included in household income but was included in the household food expenditures. As such, the binary variable FSP probably failed to capture the interaction of food stamp coupon value with money income. This specification would tend to give an upward bias to the income elasticities and associated marginal propensities to spend, as well as the average propensities to spend (APS). The estimated MPS from money income was 0.074 for FSP participants, and 0.097 for nonparticipants (Table 4). These results are consistent with those of previous studies. Neenan and Davis in their study of low-income Florida households estimated a food expenditure money income MPS of 0.060 for FSP participants and 0.135 for nonparticipants.

Although the estimated money MPS for FSP participants was lower than that of nonparticipants, the average propensity to spend (APS) was higher among FSP participants. The money income average propensity to spend (APS) for selected groups is given as the money income-food expenditure ratio in Table 2. The higher APS for food among FSP participants could be related to any one or a combination of the following factors: (a) food expenditures include the value of food stamp coupons, while household income does not; (b) the way that food stamps are distributed as income increases; (c) higher levels of interest in food among FSP participants, which could reflect large average family size among FSP participants and thus greater household expenditures on food; (d) the existence of food wants beyond those met by food coupons; (e) variation in income levels, given the model specification.

In Table 4, the MPS and income elasticity estimates for the entire sample are calculated from the total sample regression and sample means. The MPS and elasticity estimates for the subgroups are

calculated from the subgroup regressions and means. The estimated income elasticity for each sample group is the coefficient of the income variable for that sample group regression.[3] The MPS is calculated by multiplying the estimated group income elasticity by the corresponding ratio between mean monthly food expenditures and mean monthly money income for each group. The MPS is the additional food expenditures resulting from an increase in money income of $1.00, when all other variables are constant.

The MPS for food ranged from a low of 0.064 for urban households to a high of 0.170 for hispanic households. However, as noted earlier, multicollinearity between race and location suggests caution in interpretation of this estimate. Also, hispanic households with the lowest mean income had the highest income elasticity for food for the three races. Hispanics also had the highest income elasticity in West and Price's study. The MPS for the entire sample was 0.094.

Group income-expenditure elasticities ranged from a low of 0.150 for FSP participating households to a high of 0.460 for households with a homemaker having less than a 9th grade education. Indications of the strong interactive effects of food stamp coupons and money income on household food expenditures are to some degree reflected in the characteristics of the subgroup MPS and elasticity estimates reported in Table 4. Specifically, the estimated food expenditure-income elasticity coefficients for FSP participants and nonparticipants were 0.150 and 0.390, respectively. This suggests that food expenditures were relatively more inelastic with respect to money income among FSP participants since a large proportion of their monthly food requirements were purchased with food stamp coupons.

Food stamp coupons could have freed up money income for "other" expenditures. A portion of these "other" expenditures could have been allocated to meeting household food wants in excess of those met by food stamp coupons. In other words, money income allocated for food among FSP participants may have been primarily for residual food wants. This may, in part, explain the differences in money income MPS and APS among FSP participants and nonparticipants. Further, the reader is reminded that our analysis does not demonstrate that there are significant differences in income elasticity estimates across socioeconomic groups.

Household Size and Other Socioeconomic Determinants

Household size was also associated with food expenditure variations in the entire sample (Table 3). The size coefficient (0.529) is positive and significant. Since household size and monthly food expenditures are specified in logarithmic terms, the size coefficient can be interpreted as the percentage increase in food expenditures as household size increases by one percent. Thus a one percent increase in mean household size could result in a 0.529 percent increase in monthly food expenditures. The size coefficient is consistent with the size elasticity estimate (0.568) reported by Smallwood and Blaylock.

The household size coefficient of 0.529 was computed at the total sample mean of 4.78 persons (Table 1). The coefficient suggests economies of size in food expenditures at mean family size, since the con-

[3] The procedure involved in generating these results was first to partition the sample and then to apply the empirical model to the various sample partitions. The income coefficients for the subgroup regressions are the income elasticities since the empirical model specifies expenditures and income in logarithmic form. In the double-logarithmic functional form the income elasticity is constant for all income levels. However, since the income elasticity estimates of the subgroups in Table 4 are derived from subgroup regressions, they vary across subgroups but are constant across the income range within each subgroup.

dition for scale economies would requuire that the household size coefficient (HS) assume a value between zero and 1.[4] The existence of economies of size in food expenditures is further supported by the values of the elasticity and MPS coefficients in Table 4. The food expenditure elasticity coefficient for the 2–4 person household (.400) was higher than that at the sample mean of 4.78 persons (.329) and at the 5–7 person level (.320). This suggests that as household size increased, food expenditures increased at a decreasing rate. This finding is consistent with results reported by West and Price.

All the dummy variables except age and educational level were significant in explaining variations in the level of food expenditures (Table 3). As indicated by the coefficients of the race-location dummy variables in Table 3, substantial food expenditure variation existed among the groups. The negative parameter estimates for blacks (both urban and rural) and whites (rural) indicated that with other variables constant, they spent relatively less on food than hispanics. This suggests that cultural and location differences may be important factors in determining the value of food expenditures. Davis reported similar findings in his review of the empirical literature. However, given the multicollinearity between race and location, caution should be exercised in interpreting these associations.

General educational level of the homemaker (E) showed no significant effect on the level of food expenditures for the entire sample (Table 3). However, the homemaker's nutritional knowledge was significant in explaining expenditure variations among household groups. Specifically, the regression coefficient for the homemaker's stock of nutrition education (EDNT) was negative as hypothesized (Table 3). This suggests that households where the homemaker had some basic knowledge of nutrition spent less on food than did similar households whose homemaker lacked such knowledge. This finding further suggests that the general educational level (in terms of years of schooling) may be a poor proxy for the stocks of knowledge required to achieve efficiencies in food purchasing and consumption. This type of knowledge may be so specialized that it can only be communicated through channels quite different from the traditional educational channels. The negative effect of the EDNT variable on food expenditures suggests that there is an interaction between homemaker's knowledge of the nutrient composition of food and the level of economic literacy with respect to food purchasing and preparation. Such an interaction tends to improve food purchasing efficiency.

FSP participation had a significant positive effect on household food expenditures comprising both money and food stamps, as previously indicated (Table 3). The FSP coefficient had a value of 0.152 and was significant at the 95 percent level. However, as indicated earlier, the form of specification of this variable would tend to underestimate the extent of the dynamic effects of coupon value on food expenditure patterns. In spite of this shortcoming, it is evident that this variable is strongly associated with food expenditure

[4] The mathematical test for scale economies is derived as follows:

$$\ln \hat{Q} = \alpha + \beta \ln HS + \gamma$$ (Where γ is an intercept shifter representing the influence of all other variables.)

$$Q = (e^{\alpha+\gamma})HS^{\beta}$$

$$\frac{\partial Q}{\partial HS} = \beta HS^{\beta-1}e^{\alpha+\gamma}$$

$$\frac{\partial \frac{\partial Q}{\partial HS}}{\partial HS} = \beta(\beta - 1)HS^{\beta-2}e^{\alpha+\gamma}$$

$$= (e^{\alpha+\gamma})\frac{\beta(\beta-1)}{HS^{2-\beta}} \begin{cases} < 0 \text{ for } 0 < \beta < 1 \text{ (Economies)} \\ = 0 \text{ for } \beta = 0 \text{ (Constant)} \\ > 0 \text{ for } \beta < 0 \text{ (Diseconomies)} \end{cases}$$

patterns, as reflected in the discussion on the characteristics of subgroup MPS and income elasticities (Table 4).

Summary and Conclusions

Results of this study indicated that for the sample as a whole, household income, household size, and FSP participation exerted a significant positive impact on household monthly food expenditures. The study also indicated that nutrition education played a key role in increasing the household's food expenditure efficiency and thereby decreasing food expenditures.

In addition, the results suggest that food expenditures were relatively more inelastic with respect to money income among FSP participants. This may have occurred because food stamp coupons provided a large proportion of the food wants of the households. As such, money income was freed up by food stamp coupons for other purchases, some of which may have included residual food wants. This proposition appeared plausible given the lower money income food expenditure elasticities and marginal propensities to spend among food stamp recipients. However, given the specification of the food expenditure and income variables, the dynamic interactive effects of food stamp coupons and money income on food expenditures may not have been fully captured.

The study further indicated that there were economies of size with respect to food expenditures, and that socioeconomic factors had significant effects on household food expenditures. These findings are consistent with the hypothesis that these factors are important determinants of household food expenditure patterns among low-income households. However, the hypothesis that households with older homemakers would spend more on food was not substantiated by the findings.

The findings from this study must be considered as merely suggestive of the socioeconomic factors that are associated with food expenditure patterns in the population sampled. The small size of the sample and the extremely low levels of income of the population sampled also suggest caution in extrapolating the findings to larger populations.

In spite of these caveats, the findings contribute to a growing body of empirical evidence suggesting that sociodemographic characteristics of target populations must be recognized and explicitly programmed into food policy instruments. The study also offers some evidence that food stamp benefits are important in providing an "economic safety net," particularly with respect to food consumption among poor households. As such, great care and planning should be exercised in initiating changes that may significantly reduce program benefits to the deserving poor. However, some changes in program mechanisms may enhance the effectiveness of certain types of food assistance programs in populations similar to the one sampled. The results indicated that nutrition education was associated with increased efficiency of household food expenditures. Current and proposed food assistance reforms, including those for the FSP, do not include nutrition education eligibility requirements. The inclusion of such requirements may be one way of enhancing program effectiveness among food stamp recipients.

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