IMPACT OF FOOD STAMP AND NUTRITION EDUCATION PROGRAMS ON FOOD GROUP EXPENDITURE AND NUTRIENT INTAKE OF LOW INCOME HOUSEHOLDS

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Few researchers have attempted to assess the impact of the Food Stamp Program (FSP) on both food expenditures and nutritional status [1, 3, 6]. Even fewer have evaluated the joint impact of income supplement programs, such as the FSP, and nutrition education programs, such as the Expanded Food and Nutrition Education Program (EFNEP), on the nutritional status of participating households [4, 10]. The purpose of this article is to (1) identify selected food group and corresponding nutrient intake responses associated with participation in the FSP and EFNEP, (2) simulate the nutritional impact of alternative policy mechanisms with joint FSP and EFNEP participation, and (3) explore policy implications for food and nutrition program planning.

Ordinary least squares (OLS) procedure was used to identify food nutrient intake responses associated with participation in the 1976 version of the FSP and the EFNEP. Responses were assessed in terms of impact on four alternative food group expenditure patterns (meat and protein, dairy product, fruit and vegetable, and bread and grain product) and their associated nutrient intake levels for protein, vitamin A, vitamin C, calcium, and iron.

DATA BASE

Cross-sectional food expenditures and dietary data were obtained from 1976 EFNEP records and by sample survey procedures described in detail in [8]. The study area is in a high-poverty-incidence rural county in central Florida [8, 9]. The average annual family income of EFNEP households that concurrently participated in the FSP was $3,600, compared with $4,200 for EFNEP households that were eligible for food stamps but were not FSP participants. EFNEP/FSP households had an average family size of 5.10 persons, compared with 3.79 persons for EFNEP/non-FSP households [8].

Each EFNEP participant's six-month record included income, food expenditure, and demographic information. Also included was information on food program status and a "24-hour dietary recall." In a survey administered simultaneously with the Spring 1976 food recall questionnaire, households were asked to disaggregate total monthly food expenditures into food group expenditures for meat products, grain and cereal products, fruits and vegetables, dairy products, and "miscellaneous" [8]. These food group expenditure data and the 24-hour dietary recall information were used to compute nutrient intake levels based on the Nutrient Adequacy Ratios (NARs).[1] If the NARS exceeded 200 percent they were truncated to 2.0, as described by Madden and Yoder [6].[2]

EMPIRICAL MODEL

A complete model specification is given in the Appendix. It consists of 36 equations—16 for four food group expenditure levels among the four program participation categories and 20 for the five estimated nutrient levels among the four program participation categories. Two basic sets of estimating equations are used. One set of equations provides estimates of each of the food expenditure levels for the four food groups. These food group expenditure levels are designated FGE_m in the model. The other set of equations provides estimates of the Nutrient Adequacy Ratios for five selected nutrients (protein, calcium, iron, vitamin A, vitamin C) among four program participation groups. These Nutrient Adequacy Ratios are

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[1]Nutrient Adequacy Ratio (NAR) is the percentage of the Recommended Dietary Allowance (RDA) met by a family's nutrient intake for a given nutrient. RDA is the level of nutrient intake recommended by the Food and Nutrition Board of the National Research Council.

[2]The 24-hour dietary recall of the EFNEP generally represents a recall of the number of servings of various food groups reported by the homemaker. The Madden and Yoder study [6] was more precise in that it included data on various specific types of food consumed by the entire family. However, a recent study by Madden et al. [5] raises serious questions about the validity of the 24-hour dietary recall in supplying accurate information of food intake levels.

designated NAR_{ij} in the model. Definition and rationale for selection of the independent variables are given in [8]. Both sets of equations (FGE_m and NAR_{ij}) are estimated by OLS procedure with continuous and dummy variables.

The four program participation categories (js) and their respective sample sizes are: (1) FS EFNEP = 50, consisting of households that concurrently participated in the FSP and EFNEP, (2) FS non-EFNEP = 34, households using food stamps that had not yet participated in EFNEP, (3) non-FS EFNEP = 73, households that had not used food stamps but had been EFNEP participants, and (4) non-FS non-EFNEP = 71, households that had not participated in either the FSP or the EFNEP. Nutrient Adequacy Ratios (NARs) were estimated for the FS EFNEP group by all variables specified in the model (Appendix). For the FS non-EFNEP group, the αMP variable and vector ϕ'LNE were deleted. The αB, αBHI, and αBFS variables were deleted for the non-FS EFNEP group. For the non-FS non-EFNEP group, αB, αBHI, αBFS, αMP, and vector ϕ'LNE were deleted.[3] Total monthly food expenditures (TFE) are included as explanatory variables in the FGE_m and NAR_{ij} equations to reflect price changes that would alter budget outlay for each food group.

RESULTS

Food Group Expenditure

Food group mean monthly expenditures were affected by participation in the FSP and the EFNEP (Table 1). Table 2 is a summary of the marginal propensities to spend from both non-bonus income (MPS_I) and bonus stamps (MPS_B) in all participation strata.[4] MPS_Is and MPS_Bs were calculated at group mean monthly income of $330, bonus value of $123, and family size of four. A summary of selected regression results for food group expenditures (FGEs) and Nutrient Adequacy Ratios (NARs) is given in Appendix Table 1. Statistical significance is determined at the .10 level and t-ratio of 1.6.

Meat and Protein Products (FGEI). The marginal propensity to spend bonus dollars (MPS_B) for meat products was not significantly different from zero among FS EFNEP households. However, bonus dollars had a significant impact (MPS_B = .12) on this food group expenditure level among FS non-EFNEP households. Non-bonus dollars had no significant impact on meat expenditures among FS EFNEP households, but had a positive impact on expenditures among the other three household categories (Table 2).

TABLE 1. GROUP MEANS FOR MONTHLY FOOD GROUP EXPENDITURES, BY RACE AND PROGRAM PARTICIPATION GROUP, 1976

Program Status/ Race[a]	Mean Monthly Food Group Expenditures							
	FGE1 (Meats and Protein Products)		FGE2 (Dairy Products)		FGE3 (Fruit and Vegetable Products)		FGE4 (Bread and Grain Products)	
	Dollar Expenditure	% Group Share[b]	Dollar Expenditure	% Group Share	Dollar Expenditure	%Group Share	Dollar Expenditure	% Group Share
White (n=56								
FS EFNEP (n=13)	60.62	38.4	20.30	12.2	41.62	25.3	32.69	16.8
FS non-EFNEP (n=8)	88.25	41.7	40.38	20.0	34.62	16.5	30.25	14.9
non-FS EFNEP (n=7)	64.86	43.6	25.14	17.5	25.10	18.4	18.80	15.3
Nonwhite (n=172)								
FS EFNEP (n=37)	80.27	42.7	34.60	17.9	33.30	18.9	23.14	12.1
FS non-EFNEP (n=26)	64.19	38.7	22.12	13.7	33.30	18.9	30.07	17.3
non-FS EFNEP (n=66)	44.36	43.3	13.72	13.1	22.54	22.8	14.15	12.8
non-FS non-EFNEP (n=43)	54.85	43.1	17.30	13.6	23.61	19.6	18.67	15.1

[a]Complete program status definition is given in the model section of the text.

[b]Mean percentage of total food expenditure allocated to the particular food group.

[3]See "Model Specification" section of the Appendix of definition of these variables.

[4]MPS_I and MPS_B represent marginal propensities to spend non-bonus income and bonus stamps, respectively. MPS_I is defined as the change in food expenditure resulting from a one dollar increase in non-bonus income. MPS_B is the change in food expenditure resulting from a one dollar increase in bonus stamp value.

TABLE 2. SUMMARY OF MPS_I AND MPS_B BY SELECTED FOOD GROUPS AND PROGRAM PARTICIPATION, 1976

Food Group Expenditures/ Program Status	Marginal Propensity to Spend Non-bonus Income (MPS_I)[a]		Marginal Propensity to Spend Bonus (MPS_B)[a]	
	Mean value coefficient	S.E.	Mean value coefficient	S.E.
Meat and protein expenditures (FGE1)				
FS EFNEP	.060	(.039)	.335	(.226)
FS non-EFNEP	.128	(.048)	.328	(.119)
non-FS EFNEP	.062	(.035)		
non-FS non-EFNEP	.117	(.055)		
Dairy expenditures (FGE2)				
FS EFNEP	.014	(.008)	-.065	(.113)
FS non-EFNEP	.033	(.017)	.053	(.062)
non-FS EFNEP	.027	(.008)		
non-FS non-EFNEP	.112	(.082)		
Fruit and vegetable expenditures (FGE3)				
FS EFNEP	-.015	(.021)	.095	(.044)
FS non-EFNEP	.029	(.014)	.220	(.055)
non-FS EFNEP	.043	(.020)		
non-FS non-EFNEP	.053	(.022)		
Bread and grain expenditures (FGE4)				
FS EFNEP	.013	(.026)	.208	(.064)
FS non-EFNEP	.039	(.030)	.229	(.075)
non-FS EFNEP	.056	(.029)		
non-FS non-EFNEP	.027	(.017)		

[a]See footnote 4 for definitional clarification of these concepts. The MPS_I and MPS_B coefficients for the various program categories when summed across the four food groups would not equal 1.0, since there is a "miscellaneous" food group category which is not included in study.

Meat product expenditures were not affected by the interaction of length of EFNEP participation (MP) and frequency of food group demonstrations (LN) among FS EFNEP households (LNMP=0). Among non-FS EFNEP households, interaction between EFNEP variables increased expenditures (LNMP = 23.161) (Appendix Table 1.)

Dairy Products (FGE2). The MPS_Bs t-test coefficients for dairy products were not significantly different from zero among households using food stamps (FS EFNEP and FS non-EFNEP). This finding suggests that the food stamp bonus was not used to purchase additional dairy products. Non-bonus income had a positive impact on dairy product expenditures for all household categories, with the exception of non-FS non-EFNEP households (Table 2).

Regression results suggest that extended EFNEP participation (MP) resulted in a decline in dairy product expenditures in the FS EFNEP category (MP= −3.578), but had no effect on expenditures in the non-FS EFNEP category (Appendix Table 1.)

Fruit and Vegetable Products (FGE3). Bonus stamps were effective in increasing fruit and vegetable expenditures among FS EFNEP and FS non-EFNEP households. Among FS EFNEP participants, $0.095 of each bonus dollar was spent for fruit and vegetables. Among FS non-EFNEP households, $0.22 of each additional bonus dollar was spent on this food group (Table 2).

With the exception of FS EFNEP households, fruit and vegetable expenditures were responsive to non-bonus income. However, the marginal propensities to spend non-bonus income (MPS_Is) on this food group were low in relation to the MPS_Bs for the relevant household categories. The highest MPS_I for this food group was $0.053 among the non-FS non-EFNEP category (Table 2). There was no interaction effect (LNMP=0) between length of EFNEP participation (MP) and frequency of food group demonstrations (LN) on this food group's expenditures among all household categories (Appendix Table 1).

Bread and Grain Products (FGE4). Bonus dollars had significant impact on bread and grain products expenditures. FS EFNEP households spent $0.208 of each additional bonus dollar for additional grain products. The MPS_B for the FS non-EFNEP category was slightly higher at $0.229. The marginal propensities to spend non-bonus income on bread and grain products were not significantly different from zero among all household categories, with the exception of non-FS EFNEP households. This finding suggests that an increase in non-bonus income would have a positive impact on bread expenditures only among non-FS EFNEP households (Table 2).

The LNMP term, measuring the interactive impact of extended EFNEP participation (MP) and frequency of food group demonstrations (LN), suggests that grain expenditures declined with increases in length of EFNEP participation and frequency of food group demonstrations among FS EFNEP households (LNMP= −35.079), but increased among non-FS EFNEP households (LNMP= 6.328) (Appendix Table 1).

Nutrient Intake

Table 3 presents mean Nutrient Adequacy Ratios (NARs)[5] by program participation group as computed from household 24-hour dietary recall data.[6] The table also shows the

[5]See footnote 1.

[6]See footnote 2.

TABLE 3. GROUP MEANS FOR NUTRIENT ADEQUACY RATIO BY PROGRAM PARTICIPATION, 1976

Nutrient Adequacy Ratio (NAR)	Program Status			
	FS EFNEP (n=50)	FS non-EFNEP (n=34)	non-FS EFNEP (n=73)	non-FS non-EFNEP (n=71)
NAR1 (Protein)				
Mean	1.52	1.51	1.58	1.36
% below RDA[a]	6.1	18.6	10.9	21.1
% below 66% RDA	0.0	0.0	0.0	8.5
NAR2 (Calcium)				
Mean	0.88	0.70	0.98	0.58
% below RDA	65.3	69.8	52.1	83.1
% below 66% RDA	36.7	48.8	31.5	64.8
NAR3 (Iron)				
Mean	0.63	0.60	0.62	0.54
% below RDA	95.9	97.7	95.9	98.6
% below 66% RDA	63.3	65.1	65.7	76.1
NAR4 (Vitamin A)				
Mean	1.29	0.89	1.25	0.84
% below RDA	36.7	60.5	43.8	66.2
% below 66% RDA	26.5	51.1	23.3	54.9
NAR5 (Vitamin C)				
Mean	1.49	1.15	1.49	0.96
% below RDA	18.4	44.2	28.7	57.8
% below 66% RDA	8.1	39.5	17.8	46.5

[a]Recommended Dietary Allowances (RDAs) are taken from 1973 levels established by the National Research Council, National Academy of Sciences [7].

percentage of diets below the Recommended Dietary Allowances (RDAs)[1] and those below 66 percent of the RDAs. Because the RDA is an allowance rather than the minimum requirement for a nutrient, the 66th percentile is often used to differentiate between adequate and poor diets [7].

Protein (NAR1). Mean protein adequacy ratios were higher than the mean adequacy ratios for calcium, iron, vitamin A, and vitamin C (Table 3). Of the four household categories, only one (non-FS non-EFNEP) registered protein intake below the 66th percentile level of the RDA for that nutrient. There was no statistically significant relationship between food stamp bonus (B) and protein adequacy among FS EFNEP and FS non-EFNEP households (Appendix Table 1). The LNMP coefficient measuring interactive impact of length of EFNEP participation (MP) and frequency of protein food demonstrations (LN) was also nonsignificant, suggesting that increases in these variables had not appreciable joint impact on protein adequacy among FS EFNEP and non- FS EFNEP households (Appendix Table 1).

Calcium (NAR2). The fact that the bonus stamp (B) coefficient was not significantly different from zero among FS EFNEP and FS non-EFNEP households suggests that an increase in bonus value did not result in increased calcium adequacy among these households. The interactive effect of length of EFNEP participation (MP) and frequency of demonstration lessons with dairy products (LN) affected calcium adequacy among non-FS EFNEP households (LNMP= .8763), but registered no impact among FS EFNEP households (Appendix Table 1). Table 3 indicates that a high proportion of households in all program categories were below RDA standards for calcium. The level of deficiency was more severe among non-FS non-EFNEP households—65 percent were below the 66th percentile level of the RDA.

Iron (NAR3). Mean adequacy ratios for iron were the lowest of the five NARs. In all program categories, more than 90 percent of the households were below RDA for this nutrient, and more than 60 percent of households in all categories were below the 66th percentile level of the RDA. The incidence of iron deficiency was more severe among non-FS non-EFNEP households—76 percent were below the 66th percentile level of the RDA (Table 3).

Bonus stamp value (B) had no significant effect on iron adequacy among FS EFNEP and FS non-EFNEP households. Likewise, length of EFNEP participation (MP) and frequency of demonstration with iron-based foods (LN) had no significant impact on this nutrient's adequacy level for these two household categories (Appendix Table 1).

Vitamin A (NAR4). Mean adequacy ratios for vitamin A were the third highest of the five NARs among the four household categories. Mean adequacy ratios were above 1.0 for two of four household categories (FS EFNEP and non-FS EFNEP). However, even among these households, one-quarter to one-half of the population had vitamin A adequacies below two-thirds of the RDA (Table 3).

No significant relationship was found between food stamp bonus value and vitamin A adequacy among FS EFNEP and FS non-EFNEP households. The t-values of the interaction term LNMP suggest that both the length of program participation (MP) and the frequency of food group demonstrations (LN) were crucial in improving vitamin A adequacy among FS EFNEP (LNMP= .4606) and non-

FS EFNEP (LNMP= 1.0254) households (Appendix Table 1.)

Vitamin C (NAR5). The mean values for vitamin C adequacy were greater than 1.0 in three of four household categories. Mean NARs for this nutrient ranked second to those of protein in value. In spite of these generally high average NARs across household categories, two household categories with mean NARs close to or above 1.0 had vitamin C adequacy levels below two-thirds of the RDA in 40 to 50 percent of their population (Table 3). This finding suggests that nutrient adequacy distribution, as well as nutrient group means, should be considered in evaluating nutritional status of target population.

Non-bonus income (HI) had no significant effect on vitamin C adequacy among all household categories. Similarly, bonus income (B) had no significant impact on this nutrient level among FS EFNEP and FS non-EFNEP households. Family size (FS) explained some variation in vitamin C adequacy in all household categories. The values of the LNMP coefficients for FS EFNEP and non-FS EFNEP households were positive and significant, suggesting that extended EFNEP participation (MP) and frequency of food group demonstrations (LN) interacted to increase vitamin C adequacy levels (Appendix Table 1).

ALTERNATIVE INSTRUMENTS: POLICY IMPLICATIONS

Regression results were used to simulate Nutrient Adequacy Ratios for different levels of three alternative policies. Variables such as family size, ethnicity, urbanity, and schooling were held constant for each policy combination. The three alternative policy instruments were (1) type of income supplement (cash or food stamp coupons), (2) amount of supplement ($0 or $123),[7] and (3) months of participation in EFNEP. The implication of the simulated NARs has meaning only in terms of the validity of the 24-hour dietary recall as a measure of nutrient intake [5]. Despite these caveats, the projections are believed to provide crude estimates of the potential impact of alternative policy instruments.

Table 4 lists nine simulated policy alternatives and the projected NARs for each nutrient. Policy I can be considered a baseline in which no food program is available. In such a situation, the simulated NARs for calcium (.43), iron (.29), and vitamin A (.01) are well below recommended intakes. Participation in EFNEP without the benefit of any type of income supplement, as in Policies G and H, dramatically improves calcium intakes (.94, .92) and vitamin A intakes (1.30, 1.27). Iron adequacy improves (.43, .46), but levels are still considerably below RDA standards. With a cash monthly supplement of $123[8] but without nutrition education (Policy F), the NARs for nutrients are not increased significantly above the baseline levels, except for vitamin C. In contrast, with a food stamp coupon supplement of $123 and no nutrition education (Policy C), the NAR value of calcium is raised to .74 and that of vitamin A to .99. Under Policy C, iron adequacy increases to only .45, which is comparable to iron intake levels under policies consisting of nutrition education alone (G and H).

Policies that combine some form of nutrition education with income supplementation are also effective in increasing the baseline NARs to more acceptable intake levels. The food stamp supplement programs (Policy A or B) appear to promote the highest NAR value for iron when coupled with nutrition education. The severity of iron deficiency in the sample population (Table 3) is consistent with findings at the national level for the low income population in general [2]. If nutrition education is included in policy alternatives, there appears to be no other significant difference between NARs achieved with food stamp coupons (Policies A and B) and direct cash supplements (Policies D and E). Also, no significant difference is achieved by extending EFNEP participation from 12 to 18 months. This tendency also is noted in the regression results, which show that EFNEP participation had a positive effect on NAR values up to 14 months of participation, with diminishing marginal productivity thereafter.

The questions raised about the internal validity of the 24-hour dietary recall as a measure of food and nutrient intake [5] suggest caution in the use of the findings for policy purposes. Despite these and other limitations of studies of this type, the data arrayed may be useful in identifying the direction and assessing the relative impact of alternative food and nutrition policies.

The source and amount of food stamp income supplement and length of participation in the EFNEP affected food group expenditures and nutrient intake. If the two main goals of the FSP remain food expenditure supplementation and improvement of the nutritional status of low income households, the choice of policy instruments is likely to af-

[7] $123 represented the estimated sample mean FSP bonus value of participants at the time of the study (1976).

[8] See footnote 7.

TABLE 4. SIMULATED NUTRIENT ADEQUACY RATIOS, BY ALTERNATIVE FSP INSTRUMENTS AND LENGTH OF EFNEP PARTICIPATION

Policy	FSP Policy Instruments			Projected Nutrient Adequacy Ratios (NARs)				
	Amount of Income Supplementation[a]	Source of Income Supplementation	Months of EFNEP Participation	Protein	Calcium	Iron	Vitamin A	Vitamin C
A	$123	FSP coupons	12	1.35	.89	.57	1.47	1.18
B	$123	FSP coupons	18	1.36	.83	.63	1.39	1.33
C	$123	FSP coupons	0	3.56	.74	.49	.99	1.41
D	$123	cash	12	1.48	.79	.45	1.39	1.39
E	$123	cash	18	1.48	.77	.49	1.37	1.51
F	$123	cash	0	1.64	.40	.19	.08	1.48
G	$ 0	--	12	1.52	.94	.43	1.30	1.38
H	$ 0	--	18	1.53	.92	.46	1.27	1.49
I	$ 0	--	0	1.63	.43	.29	.01	1.06

[a] $123 represents sample mean bonus value of the FSP as it operated at the time of the study.

fect both goals significantly. The Food Stamp Program at the time of the study (1976) required a cash purchase and provided coupon allotment equal in value to the purchase requirement, plus a bonus subsidy. Of the various simulated policy alternatives, this policy instrument, used jointly with EFNEP (Policies A and B), appears to be the most effective instrument for increasing nutrient intake of low income households. There is, however, an optimum length of EFNEP participation which, when combined with this particular FSP policy instrument, would produce the most desirable nutrient results. Specifically, EFNEP participation appears to have a positive effect on NARs only up to 18 months of participation, with falling marginal product thereafter (Policy B). A direct cash income supplement along results in inadequate nutrient intake of calcium, iron, and vitamin A.

Elimination of the purchase requirement in the current FSP is intended to improve the program participation rate. To the extent that, in the aggregate, the simulated policy alternatives suggest that joint FSP/EFNEP participation is nutritionally superior to direct cash supplement or a joint cash-EFNEP program, serious thought and analysis should be given to the nutritional impact of the various policy instruments being proposed as a part of national welfare reform.

APPENDIX

Model Specification

The complete model specification for both the food group expenditure and Nutrient Adequacy Ratio estimates was:[a]

$$FGE_m \text{ or } NAR_{ij} = \alpha_0 + \alpha_1 HI + \alpha_2 B + \alpha_3 FS + \alpha_4 F + \alpha_5 A + \alpha_6 W + \alpha_7 Y + \alpha_8 H + \alpha_9 TFE + \alpha_{10} MP + \alpha_{11} BHI + \alpha_{12} BFS + \underline{\beta}'\underline{LC} + \underline{T}'\underline{E} + \underline{T}'\underline{R} + \underline{\theta}'\underline{S} + \Phi' LNE + w$$

Where

underlined variables and coefficients represent vectors.

FGE_m = food group expenditures/month

m = 1-4

1 = meat and protein expenditures

2 = dairy product expenditures

3 = fruit and vegetable expenditures

4 = bread and grain product expenditures

NAR_{ij} = Nutrient Adequacy Ratios, defined as:

$$\frac{\text{nutrient intake/homemaker/day}}{\text{Recommended Dietary Allowance (RDA)}}^{b}$$

i = 1-5

1 = protein
2 = calcium
3 = iron
4 = vitamin A
5 = vitamin C

j = 1-4

1 = FS EFNEP participating group
2 = FS non-EFNEP participating group
3 = non-FS EFNEP participating group
4 = non-FS non-EFNEP participating group

The independent variables were:

HI = household income/month, including the sum of earnings for all household members, welfare payments, pensions and social security

B = bonus stamp value

TFE = total food expenditures/month

FS = number of persons in household

LC = vector of 0-1 dummy variables representing life cycle family composition

LC1 = 1 for beginning couple, no children

LC2 = 1 for oldest child birth to 6 years

LC3 = 1 for oldest child 7 to 13 years

LC4 = 1 for oldest child 14 to 20 years

(independent variables continued)

LC5 = 1 for first child gone until last one leave

LC6 = 1 for empty nest or retirement couple

E = vector of 0-1 dummy variables for ethnic background

E1 = 1 if white

E2 = 1 if nonwhite

F = 1 if head of household is femal

A = number of household members regularly eating meals away-from-home

W = 1 if homemaker is employed

Y = age of homemaker

R = vector of 0-1 dummy variables for residence location

R1 = 1 if rural nonfarm

R2 = 1 if urban

S = vector of 0-1 dummy variables representing highest level of education completed by home maker

S1 = 1 if less than grade 9 education

S2 = 1 if grade 9-12 education

H = 1 if homemaker indicated a perception of a special health need (pregnancy, diabetes etc.)

MP = months of participation in EFNEP

BHI = interaction term between income (HI) and bonus stamp (B).

BFS = interaction term between family size (FS) and bonus stamp level (B).

LNE = number of food demonstrations by EFNEP aides

LNE1 = number of demonstrations with meat and protein products

LNE2 = number of demonstrations with dairy products

LNE3 = number of domonstrations with fruits and vegetables products

LNE4 = number of demonstrations with grain products

w = disturbance term

a These models are the same models used to estimate total food expenditures in an earlier paper [8]. Definition of independent variables and the rationale for inclusion of selected variables are given in that paper.

b See Footnote 1 of this paper.

TABLE 1. SELECTED REGRESSION RESULTS, DEPENDENT AND INDEPENDENT VARIABLES, FOOD GROUP EXPENDITURES AND NUTRIENT ADEQUACY RATIOS

Independent variable[a]	Food group[a]	Food group expenditure coefficients — Program status				Nutrient group[a]	Nutrient adequacy ratio coefficients — Program status			
		FS EFNEP	FS non-EFNEP	non-FS EFNEP	non-FS non-EFNEP		FS EFNEP	FS non-EFNEP	non-FS EFNEP	non-FS non-EFNEP
HI	FGE1	0.2338 (0.089)[b]	0.1277 (0.048)	0.1541 (0.061)	0.1770 (0.055)	NAR1	---	0.0100 (0.006)	---	0.000056 (0.000861)
	FGE2	---	---	---	0.1764 (0.096)	NAR2	-0.000564 (0.000660)	0.0075 (0.006)	---	-0.0058 (0.003)
	FGE3	-0.0146 (0.021)	---	0.1095 (0.040)	---	NAR3	0.0034 (0.001)	---	---	-0.0037 (0.001)
	FGE4	0.0129 (0.026)	0.0392 (0.030)	0.1159 (0.034)	0.1870 (0.068)	NAR4	---	0.0151 (0.011)	0.0029 (0.0016)	---
						NAR5	0.0004 (0.001)	0.0092 (0.008)	-0.0040 (0.002)	-0.0147 (0.005)

TABLE 1. SELECTED REGRESSION RESULTS, DEPENDENT AND INDEPENDENT VARIABLES, FOOD GROUP EXPENDITURES AND NUTRIENT ADEQUACY RATIOS - continued

FS	FGE1	-6.0864	10.9340	---	3.5534	NAR1	-0.1174	0.0498	-0.0546	0.0206
		(6.616)	(7.229)		(2.472)		(0.084)	(0.184)	(0.059)	(0.042)
	FGE2	8.1319	3.3109	---	-0.5904	NAR2	0.1154	0.1070	---	0.0132
		(3.118)	(1.902)		(1.116)		(0.097)	(0.093)		(0.037)
	FGE3	---	-0.9183	2.7102	1.4012	NAR3	0.0421	---	-0.0025	0.0518
			(1.670)	(1.337)	(1.234)		(0.051)		(0.032)	(0.019)
	FGE4	-3.2337	-1.0518	-0.2108	1.5345	NAR4	0.3746	-0.1516	---	-0.3541
		(3.503)	(2.377)	(1.305)	(0.794)		(0.164)	(0.552)		(0.208)
						NAR5	-0.4241	-0.8703	-0.5265	0.6114
							(0.231)	(0.374)	(0.178)	(0.280)
B	FGE1	0.7550	0.6590	---	---	NAR1	0.0008	0.0071	---	---
		(0.207)	(0.216)				(0.002)	(0.005)		
	FGE2	-0.0651	0.0533	---	---	NAR2	-0.0056	0.0026	---	---
		(0.113)	(0.062)				(0.002)	(0.0005)		
	FGE3	-0.1017	0.2200	---	---	NAR3	0.0036	0.00051	---	---
		(0.103)	(0.054)				(0.003)	(0.0034)		
	FGE4	-0.1082	0.2294	---	---	NAR4	-0.0175	0.0254	---	---
		(0.115)	(0.075)				(0.005)	(0.018)		
						NAR5	-0.0091	-0.0131		
							(0.001)	(0.010)	---	---
E2	FGE1	-0.4468	0.0561	4.9718	10.5760	NAR1	-0.1636	-0.1550	-0.1998	0.1711
		(10.620)	(9.985)	(6.661)	(10.750)		(0.151)	(0.241)	(0.187)	(0.155)
	FGE2	-23.0920	-11.7990	-6.9045	1.3193	NAR2	0.1178	-0.4194	0.2322	0.0486
		(7.793)	(5.759)	(2.591)	(4.861)		(0.166)	(0.256)	(0.181)	(0.136)
	FGE3	5.3690	17.4290	0.9942	2.4072	NAR3	-0.0962	-0.1779	-0.1812	0.0301
		(5.057)	(5.056)	(3.670)	(5.448)		(0.092)	(0.099)	(0.107)	(0.070)
	FGE4	1.3706	6.3232	3.9775	-5.2218	NAR4	-0.1333	-0.6058	0.1067	0.0729
		(6.180)	(6.855)	(4.150)	(3.458)		(0.232)	(0.462)	(0.313)	(0.273)
						NAR5	0.2060	0.1578	-0.1149	-0.2833
							(0.236)	(0.441)	(0.309)	(0.274)
A	FGE1	4.3317	-0.4646	0.8441	-2.6870	NAR1	0.1079	0.1521	0.1021	-0.0138
		(3.676)	(3.877)	(2.165)	(3.301)		(0.087)	(0.080)	(0.057)	(0.051)
	FGE2	-3.6608	-2.1797	0.0274	0.7396	NAR2	0.0420	0.1320	0.0957	0.0522
		(2.675)	(1.750)	(1.075)	(1.491)		(0.081)	(0.087)	(0.061)	(0.048)
	FGE3	-2.8473	-2.8608	1.0518	-1.3647	NAR3	-0.0777	0.0610	0.0354	-0.0666
		(1.785)	(1.537)	(1.371)	(1.663)		(0.050)	(0.031)	(0.031)	(0.023)
	FGE4	-3.9833	-2.7353	1.1795	-1.9218	NAR4	-0.3420	0.1533	0.0522	0.1031
		(2.252)	(2.002)	(1.369)	(1.061)		(0.121)	(0.150)	(0.095)	(0.089)
						NAR5	-0.1677	0.2378	0.1151	
							(0.124)	(0.134)	(0.105)	
F	FGE1	-5.2609	10.3730	-9.6584	6.3791	NAR1	0.0681	-0.1846	-0.0120	-0.3679
		(3.507)	(12.700)	(3.960)	(11.360)		(0.118)	(0.271)	(0.110)	(0.153)
	FGE2	1.8903	0.1333	-1.6650	1.3229	NAR2	0.1134	0.1158	0.0333	-0.2670
		(5.628)	(5.620)	(2.107)	(5.140)		(0.120)	(0.290)	(0.133)	(0.134)
	FGE3	9.3659	-1.7626	-1.8427	-0.9886	NAR3	0.0194	-0.1120	0.0354	-0.0907
		(4.027)	(4.934)	(2.365)	(5.635)		(0.070)	(0.113)	(0.062)	(0.069)
	FGE4	8.4483	11.6130	0.0706	3.1553	NAR4	-0.1386	-0.0490	-0.2792	0.0928
		(5.091)	(7.104)	(2.398)	(3.656)		(0.206)	(0.545)	(0.207)	(0.270)
						NAR5	0.0243	-0.3377	0.0493	0.0129
							(0.200)	(0.511)	(0.203)	(0.283)
S2	FGE1	-2.5481	-3.6485	-7.1349	-1.2527	NAR1	-0.0948	0.2108	-0.0378	0.0641
		(10.170)	(9.980)	(3.895)	(9.294)		(0.124)	(0.177)	(0.118)	(0.121)
	FGE2	-14.9210	-3.7631	-1.2954	4.2826	NAR2	0.1442	0.2680	0.1251	0.1319
		(8.270)	(5.934)	(1.963)	(4.551)		(0.154)	(0.193)	(0.138)	(0.111)
S2-continued	FGE3	-4.0231	-2.6334	-6.7936	0.6948	NAR3	-0.0763	0.1694	-0.0596	0.0066
		(4.957)	(5.210)	(2.397)	(4.934)		(0.071)	(0.073)	(0.066)	(0.057)
	FGE4	-3.9970	-3.1866	-4.6821	-0.8518	NAR4	0.3343	0.7328	0.1841	-0.1365
		(6.256	(6.318)	(2.313)	(3.241)		(0.209)	(0.345)	(0.218)	(0.236)
						NAR5	-0.0865	0.0898	0.3787	0.0457
							(0.208)	(0.321)	(0.208)	(0.225)
MP	FGE1	0.4414	---	-1.6470	---	NAR1	---	---	-0.0349	---
		(0.506)		(0.982)					(0.028)	
	FGE2	-3.5779	---	---	---	NAR2	0.0299	---	-0.0627	---
		(1.925)					(0.044)		(0.032)	
	FGE3	0.0234	---	0.1936	---	NAR3	---	---	0.0053	---
		(0.246)		(0.308)					(0.004)	
	FGE4	2.6663	---	---	---	NAR4	---	---	---	---
		(1.389)				NAR5	---	---	-0.0740	
									(0.050)	
LNMP	FGE1	---	---	23.1610	---	NAR1	0.0267	---	0.5291	---
				(14.450)			(0.098)		(0.404)	
	FGE2	---	---	0.9735	---	NAR2	---	---	0.8763	---
				(1.568)					(0.463)	
	FGE3	---	---	---	---	NAR3	0.0723	---	---	---
							(0.057)			
	FGE4	-35.0790	---	6.3289	---	NAR4	0.4606	---	1.0254	---
		(19.470)		(2.196)			(0.310)		(0.727)	
						NAR5	0.3761		0.3063	
							(0.177)		(0.133)	
BFS	FGE1	0.0081	-0.0823	---	---	NAR1	---	---	---	---
		(0.033)	(0.042)							
	FGE2	---	---	---	---	NAR2	---	---	---	---
	FGE3	0.0233	---	---	---	NAR3	---	---	---	---
		(0.010)								

TABLE 1. SELECTED REGRESSION RESULTS, DEPENDENT AND INDEPENDENT VARIABLES, FOOD GROUP EXPENDITURES AND NUTRIENT ADEQUACY RATIOS - continued

	FGE4	0.0520 (0.016)	---	---	---	NAR4	---	---	---	---
						NAR5	0.0022 (0.001)	0.0040 (0.002)	---	---
	Food Group Equations Statistics[c]					Nutrient Adequacy Ratio Equations Statistics[c]				
R^2	FGE1	.7147	.3641	.8080	.6430	NAR1	.4711	.5022	.5139	.3322
	FGE2	.6278	.7552	.5946	.4150	NAR2	.6261	.4844	.5508	.4091
	FGE3	.7174	.8479	.6924	.4567	NAR3	.6414	.7458	.3699	.3817
	FGE4	.6818	.7626	.6897	.5972	NAR4	.6474	.5162	.3039	.2619
						NAR5	.5041	.5719	.3022	.3458
F	FGE1	6.262	5.986	11.963	3.242	NAR1	1.247	1.009	2.618	1.822
	FGE2	3.478	3.277	6.298	1.157	NAR2	2.344	1.034	3.250	2.038
	FGE3	7.034	5.925	6.399	1.513	NAR3	1.789	2.934	1.361	1.818
	FGE4	4.856	3.855	6.137	2.409	NAR4	2.170	.881	1.157	0.971
						NAR5	1.307	1.366	1.758	1.447

[a]See empirical model for definitions of dependent and independent variables and program status.

[b]Numbers in parentheses are standard errors.

[c]Statistics are for the complete set of independent variables.

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