PROCEEDINGS

48th Annual Meeting

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

Reno, Nevada

July 20, 21, 22, 1975

William D. Gorman, Editor

THE AVAILABILITY OF FOOD AMONG WASHINGTON HOUSEHOLDS WITH SCHOOL-AGED CHILDREN

Donald A. West and David W. Price

Washington State University

The availability of food to American households is a continuing public issue. Burdens have been imposed by rising food costs, and concern exists over coverage and the increasing costs of food distribution programs. Yet, the interrelationships among current determinants of food availability have not been examined closely. This situation exists partly because major increases in food distribution programs have occurred only recently and partly because data on major sources of food and factors influencing them have not been available.

Participation in the food stamp and national school lunch (NSLP) programs has increased rapidly so that both are now important determinants of the availability of food to U.S. households (9, p. 194).[1] Questions surrounding the manner in which these programs influence food availability and the magnitude of their effects have not been fully answered. Among these are: How is the value of food obtained by households affected by receipt of "bonus" food stamps and free lunches?[2] Has the influence of recognized variables such as income and household size on food expenditures changed as a result of the food distribution programs?

The purpose of this study is to analyze the effect of these programs and other factors on the value of food obtained by households. The data used are from a survey of households of school-aged children residing in the State of Washington in 1972 and 1973. While the data refer to Washington households, this population is believed to be similar to others in many respects so as to make the results applicable to the Western Region of the United States.

The Study Area Data and Procedures

The sample was drawn through a process which first selected school districts which were then stratified by size and geographic location within the state. In each district, students were classified according to ethnic status, income level (using eligibility for free or reduced price lunches as the distinguishing criterion) and by whether or not they participated in the NSLP. The sample was stratified so that the sampling fractions for low-income and minority groups were higher than those for high-income groups and Whites. Subjects were drawn at random from these classifications.[3] Households of students selected in this manner are the units of observation used in this study.

Selection of Variables

The dependent variable in the analysis, value of food, includes all food cash outlays plus the total value of bonus food stamps, free USDA commodities, free school lunches, gifts of food and home-produced food. Independent variables are household income, assets, household size, value of food stamps and free lunches, whether or not food was produced at home and length of pay period for the major income earner.

Household income was defined to include all sources of revenue to the household with the exception of the value of bonus food stamps and the value of free NSLP lunches. The FSP and NSLP benefits were separated so their effects on the value of food could be analyzed explicitly.

Assets represent a potential source of funds on which families may draw for food and other items in periods when current income is inadequate. Total assets were defined as the value of the house, vehicles, other property and liquid assets. Equities in assets are hypothesized to permit a household to consume at levels consistent with anticipated "permanent" income in times when "transitory" incomes are low.[4]

Household size and composition were accounted for with the use of "equivalent adult" scales which were used to place value of food, income, assets and food transfers

[1] In 1972 more than 13 million persons were receiving food stamps and over 25 million school-aged children were participating in the NSLP (Statistical Abstract of the United States, 1973, pp. 88-90).

[2] "Bonus stamps" are defined as the face value of food stamps minus their cost to the user.

[3] See (7) for a more detailed explanation.

[4] For expanded discussion, see (2), pp. 3-37.

on one equivalent adult basis (5, 6).[5] "Equivalent adult scales" account for the effects of age and sex composition of households as indicated by data from which the scales are developed. However, the scales do not control for economies of size in food procedurement and preparation that may exist among other populations. Consequently household size (number of persons) was included as an independent variable to investigate economies of size among the population sampled.

Food stamps were available to low-income families in the sample at a cash cost to the purchaser which ranged from zero up to approximately four-fifths of the value of the stamps (12, pp. 26-27). Bonus stamps represent an increase to household income and resulting savings in cash outlays arising from their use can be allocated to food and/ or other items. Similarily, eligible children in participating schools may receive free NSLP lunches each day they attend school. The value of these free lunches was calculated at $7.00 per child per month (20 lunches at $.35 each).[6] The other non-market source of food recognized explicitly was food produced by the household in gardens, orchards or on farms and meat obtained by hunting and fishing. The length of pay period for the major income earner in the household was included as a variable to investigate the effect of household cash flows on food expenditures.[7]

Analysis

Interaction among the variables were investigated using the Automatic Interaction Detector (AID) program developed by the Survey Research Center at the University of Michigan (10). This procedure explains variance in the dependent variable by dividing the data set into subclasses in a manner that maximizes between sums-of-squares among subclasses. Results from the AID analysis showed that some interactions might be present. These were specified in preliminary regression models. The resulting estimates indicated the interactions were nonsignificant at the .05 level.[8] Consequently, these variables were dropped from the analysis. The final regression model included the variables described above (Table 1).

Table 1. Regression results: variables influencing value of food obtained per month (equivalent adult basis) by Washington households with school-aged children

Independent Variables	Regression Coefficients Step 1	Step 2	Step 3
Constant term	39.400 [a](12.611)**	44.110 (8.872)**	45.473 (9.140)**
Ln monthly income, eq. adult basis	.929 (1.491)	2.601 (3.406)**	1.910 (2.398)**
Home-produced meat (dummy)		3.589 (4.039)**	3.316 (3.725)**
Length of pay period (dummies) Home-produced meat (dummy)		3.589 (4.039)**	3.316 (3.725)**
Length of pay period (dummies) Weekly		-1.424 (1.217)	-1.495 (1.282)
Biweekly		-2.222 (1.872)*	-2.446 (2.064)**
Monthly		-3.580 (2.797)**	-3.495 (2.740)**
R^2	.138	.238	.245

[a]t-values in parentheses, levels of significance are: **=5%,*=10%.

Two of the independent variables were transformed to improve goodness of fit. Household income was specified in logarithms to capture nonlinearities arising from a satiety level of food expenditures among high income households.[9] Household size was also specified in logarithms to permit decreasing economies of size associated with increases in household size.[10] Linear forms were retained for the other variables.

A test was made for the presence of heteroscedasticity by dividing the data into four income subsets. The model was estimated with each subset. Application of Bartlett's test to the error variances indicated the presence of heterosedasticity. When the error variances were plotted against various functional forms of household income, they were found to be most directly proportional to the square of the natural log of income. Consequently, the data were transformed by 1/ln of income and estimates were obtained using ordinary least squares.[11]

[5]Food scales are used to adjust the value of all food obtained by the household, and income scales are used to adjust household income, assets, bonus food stamps and the value of free lunches. The scale values used in the study are those estimated by Price from USDA 1965 Household Food Consumption Survey data following procedures used earlier with the 1955 HFCS (6,1970).

[6]The average price charged for lunches in Washington school districts in the 1970-71 school year was 34.3 cents. See (13, p. 4).

[7]Previous studies have found this variable to be significant in determining the level of household food expenditures. See (4, pp. 58-65). It should also be noted that in the early stages of model development, a number of additional variables were considered. These include meals purchased outside the home, ethnic status, female-headed households, occupation of household head, current geographic location and psychological variables representing need levels and management style. These variables were dropped since they had no significant effect on the value of food obtained.

[8]Various specifications of the model suggested by the AID analysis were estimated. These included interaction terms for household size and pay period and for household size and receipt of food stamps. These specifications were dropped because the coefficients for the interaction terms were nonsignificant.

[9]For an expanded discussion of choice of functional form in analysis of family budgets, see (1, pp. 32-36).

[10]Economies of size were revealed in both the AID results and the scales estimated by Price (1970).

[11]Procedures for correcting for heteroscedasticity are outlined in (3, pp. 214-217).

Regression Results

Results from three steps in the estimation process are presented in Table 1. In step 1 where income is the only independent variable, its coefficient is not statistically significant. In the second step where all but the asset variables are included, the income coefficient is significant and its magnitude indicates an income elasticity of .06 when evaluated at the means. When assets are added in step 3, the income coefficient declines somewhat in magnitude but remains significant. The income elasticities obtained are low relative to those found in many other studies (8, p. 7). However, they are not inconsistent with the elasticity of 0.1 found by Egbert and Hiemstra for low-income families enumerated in the U.S.D.A. Household Food Consumption Survey (14, p. 62).

Only partial explanations can be offered at this time for the low income elasticities we found in this study. They may be due, in part, to the manner in which the dependent variable is defined. Elasticities tend to be smaller where the dependent variable is value of food obtained from all sources because non-purchased food items are likely to have no relationship to monetary income (8, p. 7). The value of this non-purchased food is usually higher among low-income households who are more likely to receive food as gifts or pay (8, p. 7). A second explanation is that, through transfer payments, even the lowest-income households are able to obtain reasonable quantities of food and therefore, the change in value of food that occurs as income rises is not large.

The coefficient for the asset variable (step 3) is positive as expected and statistically significant. Its magnitude indicates that an additional $10,000 in assets is associated with an increase of approximately $4 in monthly food expenditures. This effect is consistent with Friedman's permanent income hypothesis.[12] It is also evident among our data that the lowest income households have very few assets. In view of this, the influence of assets suggests that only above some minimum income level do more costly outlays for food become a discretionary item in household budgets. Additional food allocations may be made only as households also satisfy demands for assets in the form of vehicles, homes and/or other property.

Household size has a strong effect on value of food obtained which remains even when the food, income, and asset variables are expressed on equivalent adult bases. When mean household size, 5.8 persons, is expressed in logarithms and multiplied by the coefficient, -8.394 (step 3), the monthly value of food obtained per equivalent adult is reduced by an average of $2.54 per household member. This result implies that additional economies of size exist in food procurement and preparation which are not reflected in the equivalent adult scales used to adjust the variables.

Bonus food stamps significantly influence the value of food obtained. The coefficient, 0.297, (step 3) indicates that nearly one-third of the additional household income provided by bonus stamps is used for food. This marginal propensity to obtain food out of this additional income is less than the range of .60 to .72 estimated by Reese, et al. (p. 20) for low-income families. However, it is well above the average propensity to obtain food out of all income, .21, in our sample.

The subset of low-income households receiving food stamps in our sample had an average propensity to obtain food out of all income of .37. In comparison, the marginal propensity to obtain food out of bonus stamp income, .30, is below the average propensity to consume out of all income among the food stamp households. This relationship appears consistent with the view that bonus stamp income is an addition to other income and that marginal propensities to consume food decline as incomes increase.

The coefficient for the free lunch transfer, 0.598, indicates that one additional dollar of this subsidy makes a larger addition to household food procurement than does an additional dollar in bonus stamps. Reasons for this difference are not clear and further investigation may be warranted. One possible explanation is that household food procurement is less sensitive to the free lunch transfer which accrues directly to the children. In addition, parents may view the free lunch as a direct benefit to the child's nutrition and do not reduce household food purchases to the same extent as when receiving other types of transfer payments.

Results from the other variables are consistent with expectations. Meat, the only home-produced food group which was statistically significant, increased the estimated monthly value of food per equivalent adult by $3.32. Increases in the length of pay period reduced the value of food obtained as expected from the work of Madden and Yoder (4, pp. 54-59). This latter result is further support for the hypothesis that food purchases become restricted as household balances dwindle near the end of the pay period.

Implications

In this study of the determinants of food obtained by households, the data were sufficiently complete to

[12] Assets, as defined in this study, fall within Friedman's classification of non-human wealth. For additional discussion on the theory of how non-human wealth protects a planned level of consumption against unexpected occurrences and of how proportional increases in non-human wealth and permanent income increase levels of consumption, see (2), Chap. 1, esp. pp 16-17.

permit formulation of a model containing income, assets, household size, bonus food stamps and free NSLP lunches. Results from regression analysis suggest that current income has less influence on the value of food obtained than indicated by many previous studies. In contrast, significant influence found for household assets suggests that this variable should receive additional attention by researchers. The results also indicate that marginal propensities to obtain food associated with the food transfer programs, food stamps and free school lunches, exceed average propensities to obtain food out of all household income. These results support the hypothesis that the food transfer programs stimulate food procurement to a greater degree than income from other sources.

BIBLIOGRAPHY

1. Currie, J.M., "The Analysis of Family Budgets," *The Demand for Food,* Manchester: Manchester University Press, 1972.

2. Friedman, Milton, *A theory of the Consumption Function,* Princeton: Princeton University Press, 1957.

3. Johnston, J., *Econometric Methods,* (Second Edition), New York: McGraw-Hill Book Company, 1972.

4. Madden, J. Patrick and Marion D. Yoder, "Program Evaluation: Food Stamps and Commodity Distribution in Rural Areas of Central Pennsylvania," The Pennsylvania State University Agricultural Experiment Station, Bulletin 780, June 1972.

5. Prais, S. J. and H. S. Houthakker, *The Analysis of Family Budgets,* (Second Edition), Cambridge: The University Press, 1971.

6. Price, David W., "Unit Equivalent Scales for Specific Food Commodities," *American Journal of Agricultural Economics,* May 1970, pp. 224-233.

7. Price, et al., *School Feeding Programs, Final Report,* 1975.

8. Reese, Robert B., J. Gerald Feaster and Garey B. Perkins, "Bonus Food Stamps and Cash Income Supplements," Economic Research Service, USDA, Marketing Research Report No. 1034.

9. Senate Committee on Nutrition and Human Needs, *Federal Food Programs-1973,* Part 2, "Hunger in America," Washington, D.C.: U.S. Government Printing Office, 1973.

10. Sonquist, John A., Elizabeth L. Baker and James M. Morgan, *Searching for Structure,* Ann Arbor, Michigan: Survey Research Center, Institute for Social Research, University of Michigan, 1973.

11. *State of Washington Pocket Data Book,* 1972, Office of Program Planning Fiscal Management, Olympia, Washington, January, 1973.

12. United States Department of Agriculture, *Food Stamp Facts,* Food and Nutrition Service, FNS-72, July, 1973.

13. West, Donald A. and Robert A. Hoppe, "Pricing and Participation Rates in the National School Lunches Program in Washington Public School Districts," College of Agriculture Research Center, Washington State University, Research Bulletin 784, October, 1973.

14. Egbert, Alvin C. and Stephen J. Hiemstra, "Shifting Direct Government Payments from Agriculture to Poor People: Impacts on Food Consumption and Farm Income," *Agricultural Economics Research,* Vol. 21, No. 3, U.S. Department of Agriculture, Economic Research Service, 1969, pp. 61-69.