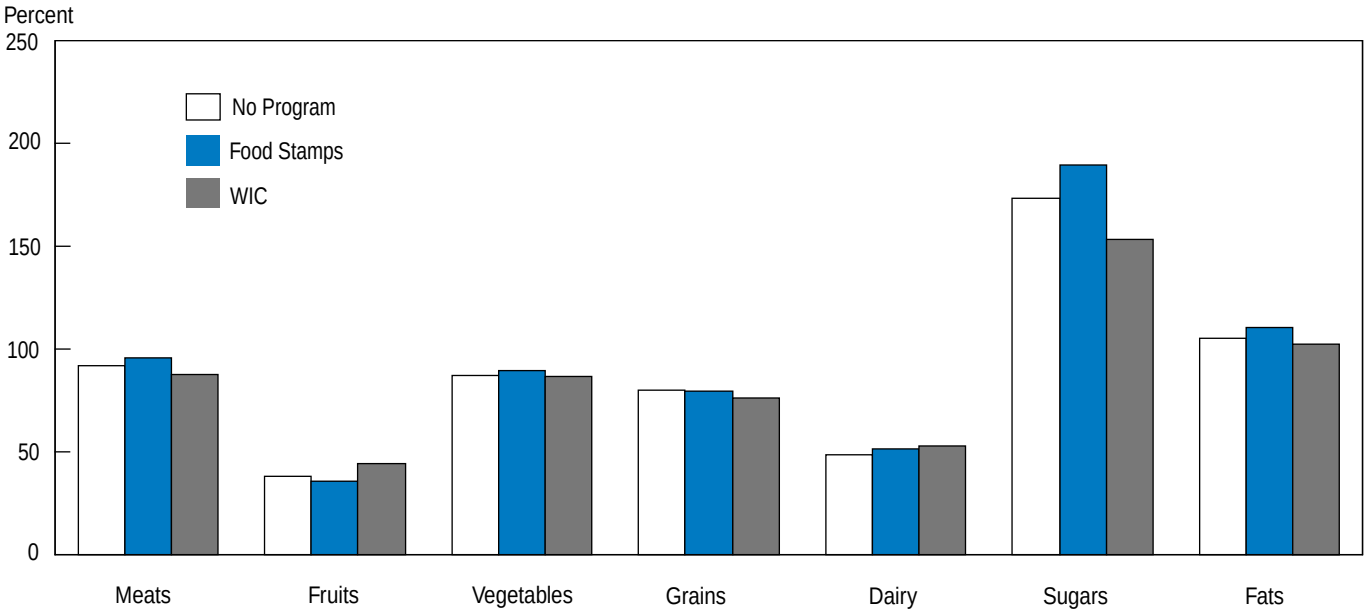
Figure 4
Predicted food intake for adult nonparticipants and participants in food and nutrition programs



Note: Each column represents food intake as a proportion of the midpoint of the recommended range.
Data source: Derived from table 1. Continuing Survey of Food Intakes by Individuals, 1994-96.

Implications for Nutrition Assistance Programs

This study finds that FSP and WIC participation have substantially different implications for dietary quality. Like increased income, FSP participation permits low-income households to purchase greater amounts of food. For three of the seven categories — meats, added sugars, and total fats — intake increases significantly with FSP participation. These results are encouraging to the extent that some low-income households may be short of food and need the additional calories and other nutrients from these categories. The results are less encouraging to the extent that public policy is concerned about program effects on the composition of the dietary bundle for low-income families, beyond the problem of simply having sufficient food. The two categories where intake falls most short of the recommendation — fruits and dairy — do not appear in this study to respond significantly to FSP participation, although in the case of dairy there is a small and statistically insignificant estimated positive impact. Meanwhile, intake of the two categories that most directly represent excess consumption and/or poor dietary quality — added sugar and total fats — does appear to increase significantly with FSP participation.

WIC participation is associated with significantly lower intake of added sugars, which makes sense if WIC-authorized fruit juices and cereals substitute for colas and sweet cereals. For the other categories, the effect of WIC participation is not significantly different from zero, which may reflect the imprecision of measuring WIC effects with this model and this data source rather than a true lack of effect. Though they could be due to sampling variation, the positive signs for WIC's effects on fruit and dairy intake appear reasonable.

Income and program participation are not the only factors that affect food intake. Indeed, the whole list of economic and demographic variables is capable of explaining only a portion of the diversity in food intake that one observes in real-world data. A distinctive feature of the present study is its investigation of patterns in the distribution of these other factors — the "random error" in statistical terminology.

The results suggest a substantial correlation in the random error for individuals in the same household. One interpretation of this finding — though not the only possible interpretation — would suggest that decisions at the household level go a long way toward determining food intake by household members. If household decisions are important, then nutrition education efforts might be advised to focus especially on the

Table 2—Estimated variances and cross-equation correlations for error components

	Meats	Fruits	Vegetables	Grains	Dairy	Added sugars	Total fats
Variance for individual and household error components:							
Individual component	5.20 **	1.77 **	2.97 **	6.75 **	.93 **	1.25 **	8.10 **
(Standard error)	.17	.06	.10	.22	.03	.04	.26
Household component	2.22 **	.77 **	1.15 **	2.78 **	.36 **	.51 **	2.75 **
(Standard error)	.19	.07	.11	.24	.03	.04	.28
Correlation matrix for individual error component:							
Meats	1.00	.04	.32	.34	.15	.17	.65
Fruits	.04	1.00	.06	.06	.05	.07	.07
Vegetables	.32	.06	1.00	.24	.11	.14	.47
Grains	.34	.06	.24	1.00	.27	.30	.61
Dairy	.15	.05	.11	.27	1.00	.15	.46
Added sugars	.17	.07	.14	.30	.15	1.00	.35
Total fats	.65	.07	.47	.61	.46	.35	1.00
Correlation matrix for household error component:							
Meats	1.00	.06	.15	.09	-.10	.12	.44
Fruits	.06	1.00	.26	.05	.14	-.10	.01
Vegetables	.15	.26	1.00	.18	.08	.17	.33
Grains	.09	.05	.18	1.00	.23	.43	.56
Dairy	-.10	.14	.08	.23	1.00	.15	.34
Added sugars	.12	-.10	.17	.43	.15	1.00	.53
Total fats	.44	.01	.33	.56	.34	.53	1.00

Notes: Each entry in a correlation table takes a value between -1 and 1. An entry of zero means that the error component referenced in the column heading is uncorrelated with the component referenced in the row heading. An entry of 1 means that the two components are perfectly correlated (as is the case automatically for the correlation between any variable and itself). Asterisks denote whether the variances of the individual and household error components are significantly different from zero: * = 10-percent level; ** = 5-percent level. The test statistic is a Wald chi-square statistic with one degree of freedom. Standard errors for the cross-equation correlations are available in the appendix.

Data source: Continuing Survey of Food Intakes by Individuals, 1994-96.

principal food purchaser or food preparer in the household. On the other hand, if individual decisions dominate, then nutrition education efforts may have to reach each household member to be effective, perhaps at greater expense to the program.[4]

What are the implications of the large positive observed correlations between total fats and the five main pyramid food categories, except fruits? One could argue that over-consumption from these categories is not a major concern. Intake from the main pyramid categories is not higher than the recommended range, assuming that under-reporting is not too severe. Moreover, consumers may in principle reduce consumption of total fats without reducing the number of servings in these main pyramid food categories, by choosing smaller amounts of discretionary fats (for example, by choosing leaner meats). This possibility is reflected in the HEI, which measures over-consumption of fats through components for fats and saturated fats, but which defines components for the five main

[4]See Bradbard and others (1997) for an interesting discussion of how parents (the principal food shoppers) respond to the food tastes of their children in selecting foods for the household: "Respondents in all ethnic groups agreed it does not make sense to purchase food that children will not eat" (Bradbard and others, 1997, p. 7).

pyramid food groups to measure only under-consumption, not over-consumption. However, the cross-equation correlations between total fats and the main pyramid food groups, except fruits, do raise the reasonable concern that nutrition education efforts may have a difficult time achieving lower intake of total fats without focusing also on consumption from the main pyramid food categories. In evaluating nutrition assistance programs, even for low-income Americans, it may be important to monitor both under-consumption and over-consumption of most of the major pyramid food categories, even though the best current survey evidence indicates that intake from these categories is not excessive on average.

Nutrition monitoring and nutrition education are both major priorities for the U.S. Department of Agriculture, and this emphasis has implications for nutrition assistance programs. As Kennedy concluded in her survey of public policy in nutrition, "Aggressive nutrition promotion programs need to be built into the food assistance and nutrition programs to increase the likelihood of sustained effectiveness. Newer paradigms of education including the use of social marketing need to be woven into the development of nutrition promotion programs" (Kennedy, 1999, p. 332). This study provides some background information for building this type of nutrition promotion emphasis into food assistance and nutrition programs.