Effects of WIC Program Participation on Food Consumption and Diet Quality

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Abstract:

This paper examines the effect of WIC program Participation on food consumption and diet quality of U.S. children between 2 and 4 years of age. Diet quality is assessed using the Healthy Eating Index, U.S. Department of Agriculture's instrument for measuring overall diet quality incorporating ten recommended components of dietary guidelines. The study has found that WIC program participation has significant positive influence in improving diet quality as measured by HEI and several of its components. The analysis has also indicated that the WIC program has significant positive influence in reducing sugar consumption by children. This research and the results presented have potential significance for researchers, economists and policy makers focusing on the determinants of children's diets and the role of Federal food assistance and nutrition education programs.

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Introduction

The Special Supplemental Food Program for Women, Infants and Children (WIC) was authorized by a September 26, 1972 amendment to the child nutrition act of 1966 and began in 1974. The WIC program recognized the fact that lower-incomes are linked to poor health through factors such as lack of accessibility to health services and health and nutritional information. The program had 7.2 million participants (3.6 million children) in fiscal 2000 at a total cost of $3.97 billion which consisted of $2.85 billion in food benefits and the remainder for nutrition and health services and administrative costs (United States Department of Agriculture (USDA) Food and Nutrition Service (FNS), 2002). To be eligible for WIC participation, the family income of the individuals must be at or below 185 percent of the Poverty Income Guidelines and the participating individuals must meet one or more of the seventy nutritional risk characteristics determined by a health professional. Those who participate in the Food Stamp Program (FSP), Medicaid, or Temporary Assistance for Needy Families Program (TANF) automatically meet the income eligibility for WIC program participation.

The WIC program provides supplemental foods and nutrition counseling to pregnant and lactating women and to children up to age 5 who are at nutritional risk. In addition, WIC provides benefits to non-breast-feeding postpartum women. It also supports good health care

during the critical times of growth and development of infants and lactating women. In general WIC provides participants with vouchers or checks that can be redeemed for specific nutrient-dense foods designed to supplement their diet. In Vermont, the food packages are delivered to the recipients' homes and in Mississippi the recipients pick them up at storage facilities operated by the State or local WIC agency. All other States use the retail food delivery system. The nutrition education part of the program provides guidance on obtaining a balanced diet with a variety of food items with the necessary nutrients.

Scope and Objectives

The benefits of WIC can be better understood by assessing the quality of food items consumed by the program participants and nonparticipants. The main focus of this study is to find an answer to the question - "Did the WIC program improve the food intakes of program participants that meet the dietary guidelines?" by comparing the food items consumed by the program participants and nonparticipants. This study can also provide insights for food industry suppliers by tracing the changes in consumer attitudes and preferences through the influence of nutritional educational programs such as the WIC program. The data for the study comes from the Continuing Survey of Food Intakes by Individuals (CSFII) for the years 1994-96 and the follow-up supplemental child nutrition survey for the year 1998. The survey data contain record types with detailed information on socioeconomic characteristics of the sample households and food intakes for individual members of the household. The analysis attempts to study the extent to which eating patterns differ between WIC participants and nonparticipants using food categories classified under the food guide pyramid dietary recommendations.

To compare the quality of diets consumed by the WIC participants and nonparticipants, the analysis uses the Healthy Eating Index (HEI), developed by the Center for Nutrition Policy and

Promotion (CNPP) of the USDA. The HEI is a single summary measure computed by summing ten components of a healthful diet with equal weight for each component (Bowman and others, 1998). The first five components measure the degree to which a person's diet conforms to the Food Guide Pyramid's serving recommendations for the five major food groups consisting of the grain group, the vegetable group, the fruit group, the milk group and the meat group. The grain group consists of bread, cereal, rice and pasta; the vegetable group contains dark green vegetables, pea, potato, tomato and starchy vegetables; the fruit group includes citrus, melon, berry and others; the milk group comprises of milk, cheese and yogurt, and the meat group contains meat, poultry, fish, dry beans, eggs, and nuts. The recommended number of servings for each of the above five food groups varies with the respondent's age, gender, physiological status (such as being pregnant or breastfeeding), and energy requirement (Eileen Kennedy and others, 1999). Four of the remaining five components are based on nutrients specifically mentioned in the Dietary Guidelines. Component 6 measures total fat as a percent of total energy intake; component 7 measures saturated fat as a percent of total energy intake; component 8 measures cholesterol intake; and component 9 measures sodium intake. The final tenth component addresses the variety in a person's diet - one of the key recommendations in the 1995 Dietary Guidelines.

Each of the ten components realizes a score using a scale of 0 to 10, resulting in a total HEI range of 0 to 100. For components 1-5, individuals who consume at least the daily-recommended number of servings in each food group receive a maximum score of 10; individuals who consume no item in a particular food group receive a score of 0 and intermediate scores are calculated proportionately. For example, if the serving recommendation for a food group was four, and the person consumed two servings, the person would receive a component score of 5

for that food group; if three servings were consumed, the score would be 7.5. If five servings were consumed, the person would receive the maximum score of 10, since additional servings receive no additional credits.

Components 6 to 10 are scored differently. Scores for total fat and saturated fat (components 6 and 7) are examined in proportion to the total food energy intake; cholesterol and sodium (components 8 and 9) are based on milligram consumed. Variety (component 10) is assessed by totaling the number of "different" foods consumed by an individual in amounts sufficient to contribute at least one-half serving of the relevant food group. Identical food items eaten on separate occasions are aggregated before imposing the one-half-serving constraint (Eileen Kennedy and others, 1999). The HEI and its components for the 1994-96 CSFII data and 1998 supplemental children nutrition intake data are computed by CNPP and are available at the web site: http://www.usda.gov/cnpp/.

The 1995 Dietary Guidelines also caution that consuming excess calories from foods high in added sugars may contribute to lower consumption of more nutritious foods. The WIC program emphasizes the importance of reducing sugar intake in children's diet and WIC-eligible breakfast cereals must contain less than 21.2 grams of total sugar per 100 grams (6 grams per oz.) of dry cereal. The present analysis explores to answer the question with respect to added sugar consumption between the WIC program participants and non-participants.

Brief Overview of Studies on WIC Program Evaluation

Several studies have examined the nutritional impact of the WIC program in the context of pregnant and lactating women and children within the age group of 1 to 5. The study by Basiotis,

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Johnson, Morgan, and Chen (1987) indicated that WIC participants had higher consumption of grains, fruit, dairy, and meat and lower intake of total fat, cholesterol and sodium. Arcia, Crouch and Kulka (1990) found WIC participants purchased more nutritious food, more nutrient-dense food and spent less on food away from home. Wilde, McNamara and Ranney (1999) have shown that WIC participants had a lower intake of added sugars. Oliveira and Gunderson (2000) have indicated that WIC participants had higher intakes of Vitamins C, A, B-6 and folate. Variyam (2001) used quantile regression to assess the effect of WIC on eligible preschool children and found that evaluation at just the conditional mean can be misleading. He discovered the impact of WIC varied considerably by quantile for iron and zinc. For calcium the effects were basically equal across quantile, but even for this nutrient there was variation in the impacts across quantiles of other important variables such as age and gender. Several studies have applied Becker's household model (Becker, 1965) to study health and nutrition issues of children (Behrman and Deolalikar (1988); Strauss and Thomas (1998); Rosenzweig and Schultz (1983)). The beneficial effects of maternal characteristics including their nutritional knowledge on the diet quality of children between 2 and 5 years of age was examined by Variyam, Blaylock and Lin (1998). A recent study by Carlson and Senauer (2002) estimates a health function for U.S. preschool children (ages 2-5 years) using data from the third National Health and Nutrition Examination Survey (NHANES III) to evaluate the beneficial impact of WIC program on child health.

Data for the Study

The analysis data are comprised of sample observations from (1) CSFII for years 1994-96 and (2) the supplemental child nutrition intake data for the year 1998. These surveys were conducted by the Agricultural Research Service (ARS), USDA using appropriate sample designs. The

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1994-96, 98 CSFII (designated to represent the combined samples of 1944-96 and 1998 data) is a face-to-face survey that collects two 24-hour dietary recalls for each respondent during nonconsecutive days. The CSFII is based on a stratified, multistage area sampling design. The sample together comprises a nationally representative sample of non-institutionalized children residing in the U.S. adult proxies, preferably the person responsible for preparing the child's meals, provided the food intake data for children. Respondents described both the types and amounts of food consumed during this period. A nutrient database containing the nutrient values of foods was used to calculate the total nutrient intake of the food consumed by the individual. The CSFII does not contain information on the nutrient contribution of the breast milk consumed by children and consequently breastfeeding children were excluded from the analysis, as were children whose WIC status could not be determined. Consequently only data for children 2 to 4 years of age who had 2 days of food intake data were included in this analysis. To be eligible for WIC participation, family income must be at or below 185 percent of the poverty guideline or the child must participate in the Food Stamp, Medicaid or Temporary Assistance for Needy Families (TANF) or Aid to Families with Dependent Children (AFDC)[2]. Also the child must individually be determined to be at nutritional risk by a health professional. CSFII data do not allow for determination of nutritional risk; therefore, for this study, WIC eligibility for children not participating in the program was determined solely by income eligibility as determined by the annual income of the household.

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[2] TANF replaced the AFDC program in 1997. Since the reference period of the data set (1994-96, 1998) spanned both the AFDC and TANF programs, participation in either the TANF or AFDC programs would make a child WIC eligible.

The determination of income eligibility is quite complex[3]. The difficulties in defining whose income counts for eligibility for WIC participation are documented in the phase I report, "Estimating Eligibility and Participation for the WIC Program," by the National Research Council (2001)[4]. Earlier researchers have also shown that due to higher variability of income among low-income households, the 185 percent income eligibility will likely underestimate the actual income eligibility for WIC program participation. Consequently, the present study uses the cutoff of 200 percent instead of the stipulated 185 percent poverty guideline for WIC participation[5]. The analysis data (1994-96 CSFII and 1998 CSFII Supplemental Children's Survey) include a total number of 4546 children between 2 and 4 years of age. These children were assigned to one of four mutually exclusive groups consisting of 767 income-eligible WIC recipients, 67 income-ineligible WIC recipients, 1767 income-eligible and 2640 income-ineligible WIC nonparticipants. Fifty eight of the 67 seemingly income-ineligible WIC recipients did not participate in the Food Stamp Program and resided in households with annual incomes above 200 percent of the poverty guidelines that did not participate in the AFDC program. However, these children may have legitimately participated in WIC due to various reasons. For example, they may have participated in the WIC program on the basis of monthly income instead of annual income or they may have been certified for WIC at a time when their

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[3] WIC regulations state that in determining the income eligibility of an applicant, State WIC agencies "may instruct local agencies to consider the income of the family during the past 12 months and the family's current rate of income to determine which indicator more accurately reflects the family's status" (7 CFR subpart C, Section 246.7)

[4] The Panel to Evaluate the USDA's Methodology for Estimating Eligibility and Participation for the WIC program chose to focus on several key issues which include:

- the accuracy of the Current Population Survey (CPS) in counting all infants and children
- adjunctive eligibility through the TANF, Food Stamp, and Medicaid programs
- use of monthly income versus annual income to determine income eligibility
- adjustment for 6-month certification periods
- alternative definitions of the economic unit
- the number of individuals who are at nutritional risk among those who are income-eligible for WIC.

[5] This analysis follows the conventions established by Fraker et al. (1990) and Oliveira and Gunderson (2000) who set the income eligibility cutoff point at 200 percent of poverty in their earlier work on WIC's impact on nutrient intake.

household incomes were within WIC guidelines. Also these children may have legitimately participated in WIC due to their participation in the Medicaid program. However their legitimacy could not be ascertained because CSFII did not contain information on an individual's participation in the Medicaid program.

The study focuses on the HEI and its key components. The food items represented in the development of the HEI are implicitly linked to the food items targeted by the WIC program. These food items have a lion's share in the computed value of HEI. The four other components of HEI - fat, saturated fat, cholesterol and sodium are not quite as critical for measuring the effectiveness of WIC program. The last component of HEI (a measure of consumption of a variety of food items) is likely more relevant for the educational component of the WIC program. The WIC participants are encouraged to eat a variety of food items to meet the nutritional requirements due to the fact that the same food item does not contain all the necessary nutrients. This study combines the six components of HEI into a single index - WIC Healthy Eating Index (WICHEI)[6]. In addition to the HEI items mentioned above, the study also analyzes the effect of the WIC program on the consumption of added sugar in the daily diet. Specifically, the study focuses on the HEI; the six separate components of the HEI (milk, meat, grain, vegetables, fruits and food-variety), WICHEI, and added sugar.

CSFII Survey Sample Characteristics

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[6] The HEI WIC Group as defined here does not fully reflect the dietary recommendations of the WIC program and require revision. For example, WIC program recommend the participants to buy breakfast cereals that are high in iron and low in sugar and fruit juices that are hundred percent pure and without added sugar. The WIC program also encourages the participants to buy low fat milk. A thorough modification of WICHEI using the foods provided and recommended under WIC program will become necessary and will be undertaken in the near future.

Table 1 provides the names and definitions of the variables for the study. The sampled observations contain useful information on child characteristics, household characteristics and geographic characteristics of the sample. Sample design characteristics have been taken into account while conducting the statistical analysis and Statistical Analysis System (SAS) software was used for the computation[7].

Table 2 presents the socioeconomic and demographic characteristics of the children belonging to the age group between 2 to 4. The table presents statistical information for the aggregate sample along with four distinct groups classified by income eligibility (eligible and ineligible) and WIC status (recipients and non-participants). All statistical data presented in the body of the table represent population values and were computed using appropriate sample weights and by taking account of the sample design characteristics. According to the table, 18.2 percent of U.S. children in the age group between 2 to 4 are WIC recipients. The characteristics of the children identified by sex and age variables are similar for WIC participants (income-eligible and ineligible) and WIC non-participants (income-eligible and income-ineligible). However, the racial distributions are quite distinct; for example, among the WIC non-participants, 46 percent of the eligible and 78 percent of the income-ineligible are Whites. Even though 17 percent of the children in the age group of 2 to 4 are Blacks, among the WIC participants, 28 percent of them are Blacks. In other words Blacks are more likely to be eligible or to participate. The household characteristics of the children belonging to the distinct groups are similar for variables such as household size, education level of the head of the household and value of the food stamps

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[7] Specifically the SAS procedure, SURVEYMEANS and SURVEYREG were used to conduct all the statistical computations. SAS Institute Inc., SAS OnlineDoc®, Version 8, Cary, NC: SAS Institute Inc., 1999. Copyright © 1999 by SAS Institute Inc., Cary, NC, USA.

received. The characteristics of the rest of the variables including income, percent of poverty, home ownership, household assets, food stamp participation, and household status are some what different across the above distinguished groups. The table shows that the geographic representation among the above mentioned groups of children are quite similar.

Table 3 presents the diet characteristics of the children by WIC and income status. Statistical estimates of the population averages for children in the group of 2 to 4 are presented in the body of the table along with their standard errors. The estimated standard errors of the table do not measure the true variation after accounting for the socioeconomic and geographic variables. Consequently any statistical significance using those estimates is likely misleading. Any statistical comparison ignoring other factors has high potentials for inappropriate and biased results. Consequently all such comparisons are provided in the next section using multivariate regression procedure with appropriate definition of variables that account for the variation due to the socioeconomic and geographical characteristics.

The estimate of the HEI for the U.S. children in the age group of 2 to 4 was 71.8. For the income-eligible WIC recipients, the estimate of HEI was 71.7 and for income-eligible WIC non-participants, the estimate of HEI was 69.4. For the income-ineligible WIC non-participants, the estimate of HEI was 73.3. An interesting question for the analyst is to find an explanation for the reasons for the apparent difference between income-eligible and income-ineligible. The estimates for the rest of the variables also show variations in both magnitude and direction. The estimate of the average number of spoons of added sugar consumption for the income-eligible WIC participants was 12.7 where as for the income-ineligible non-participants, the average was 14.5. Once again the question, whether the effect of participation was responsible for the

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reduction in consumption of added sugar in the daily diet requires better analytical procedures that appropriately account for socioeconomic and geographic characteristics of the children. The study addresses the answers to these questions in the next section.

Econometric Analysis of the Effects of WIC Program on the Diet of the Children

The econometric model to explain the consumption of food items is based on Becker's (1965) household production conceptual framework. Implicitly, the economic model assumes that the meal planner (child's parent) decides on the choice of foods consumed by the child. The nutrition education aspect of the WIC program provides additional nutritional knowledge and food resources to the program participants. Under ceteris paribus conditions, the meal-planner of the WIC household will likely have better nutrition knowledge and diet information than the meal-planner of the non-participant household.

A single equation model of demand for a specific food item is formulated and written as:

$$Q(Y) = f(X, G, E, \varepsilon)$$

(1)

Where Y represents the food item consumed by the child; X denotes a vector of socioeconomic and geographic characteristics; G denotes a vector of variables explaining household status with respect to child participation in the Food Stamp and WIC programs; E represents the targeted food calories; and ε represents a stochastic error term accounting for unexplained variation of the model.[8] In economic terminology, the stated model is a derived demand for the factor (in this case the food item) that entered into the meal planner's household production of child's health.

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[8] See Table 1 for the description of variables included in the econometric model.

The major focus of this study is whether or not the child participated in the WIC program. The WIC status variable is a proxy accounting for the effects of the WIC program due to the nutritional education and food-subsidy components of the program. The food stamp status variable is again a proxy explaining the effects of the food-subsidy component of the program. Variables representing age, sex, race/ethnicity, and survey-year were also included to measure the variation in food consumption by those distinct characteristics. Since a lack of money may restrict the purchase of nutritious food, a variable representing the annual income of the household expressed as a percentage of annual income of the poverty threshold was included as an independent variable. The size of the household has potentials for influencing the amount of time and resources available for the meal planner for meal preparation[9]. Similarly the household's assets may affect its ability to withstand unexpected decreases in income and consequently two measures of household wealth were considered: whether the household owned a home (since a home is the largest asset for most households); and whether the household had cash assets of more than $5,000. Household structure as measured by whether it was a dual-headed or a single-headed household may also influence the amounts of time available to prepare meals and or the food choices. Variables based on region of residence and metropolitan status were also constructed to account for regional differences in food consumption practices and prices. Whether the head of the household has completed the high school diploma is an important determinant of nutritional knowledge and hence included. The year of the survey variable is also included to account yearly variation of food consumption.

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[9] The CSFII defines a household as all persons who regularly share a house an apartment regardless of whether they eat together, a room, or a group of rooms used as separate living quarters.

The results of the estimates of the parameters of the econometric model are presented in tables 4 and 5. The model estimates presented in tables 4 and 5 are statistically significant with reasonable R-square values[10]. In table 4, the analysis was conducted using the sample of children from households who are income-eligible (households with income less than or equal to 200 percent of poverty). In table 5, the analysis was using the sample of children from all households (both income-eligible and income-ineligible). The results presented in table 4 provide the effect of WIC participation for the lower-income population and the results in table 5 provide the effect of WIC participation for the entire population. Estimates and t-values of the model parameters for each of the nine dependent variables - Healthy Eating Index, HEI WIC group, HEI vegetable group, HEI grain group, HEI Meat group, HEI milk group, HEI food-variety group and Added Sugar are presented in both these tables. In both the tables, the independent variables of the model are shown along the rows of the first column. The empirical results in general showed evidence for positive association between WIC program participation and healthy food consumption habits .

The model of Healthy Eating Index relates the diet-quality of foods consumed by the children to socioeconomic and program-participation characteristics. According to table 4, WIC program participants had 2.34 points higher HEI index value than nonparticipants[11]. The estimates of the parameters of food- calorie-intake, percent of poverty threshold, Hispanic, age-2 year, age-3 year and High-school diploma were positive and statistically significant. The calorie intake of the participants is included as an independent variable of the model because the computational formula for each component of HEI is sensitive to calorie intake. For example, children with

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[10] The estimates of R-squares of the regressions presented in tables 4 and 5 vary between .15 and .49 and the all the regression models are statistically significant at one percent level of statistical significance based on overall F-test.
[11] The difference between participants and nonparticipants was statistically significant at 5% or lower level.

Hispanic ethnicity had a higher HEI than whites. Higher HEI is positively associated with higher calorie intake. The estimates of HEI index of two-year old (and three-year old) is higher than for the four-year old. The positive parameter value for the High-school diploma indicates that the education level of the meal planner has positive influence on the HEI index of children. The estimates for the parameters - household size, non-metropolitan and South were negative and statistically significant. The estimates of the rest of the parameters of the model - Assets of $5000, Homeowner, Male, Black, Other racial/ethnic, Midwest, West Central City, Dual head family, year94, Year95, Year 96 were statistically insignificant.

HEI index value is a proxy for measuring overall diet quality and the results indicate that WIC participation has a positive effect on the overall diet quality of the participants. The HEI WIC group represents food items that are much closer to the goals of the WIC program than the overall HEI. The HEI WIC consists of six components - first five components of HEI along with the tenth component which accounts for the variety food eaten[12]. The maximum score for HEI WIC group will be 60 instead of the 100 for the overall HEI[13]. The results based on HEI WIC group indicates that average score of WIC participants was greater than that of nonparticipants by a score of 1.86. The results of the model on the individual components are also quite interesting and encouraging. The WIC participants consumed larger amount of fruits and milk products and ate greater variety of foods than WIC nonparticipants. Again these results are statistically significant.

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[12] Ideally the HEI WIC needs revision using the WIC program dietary recommendations and nutritional goals that pertain to Iron, Calcium, Vitamins, low-fat milk, limit of sugar content and others. The HEI WIC index using all these components may be considered for future research.

[13] As explained before HEI contains ten components for a maximum score of 100 points and HEI WIC group contains six components for a maximum score of 60 points.

Though the analysis indicates that WIC participants consumed greater amount of vegetables and grains, the results are not statistically significant. Also, the WIC participants consumed significantly (10% level of statistical significance) lesser amount of meats than WIC nonparticipants in spite of the fact that WIC provided eggs (which counts as meat).

An important component of the WIC program is nutrition education and one of its recommendations is reducing sugar in children's diet. According to table 4, WIC children consumed less than 2.23 teaspoons of sugar than did the nonparticipants. Also WIC children with higher calorie intake, WIC children coming from households owning their home, and WIC children coming from Midwest region consumed more sugar. Children of Hispanic and other racial/ethnic origin consumed significantly less sugar than Whites. All other socioeconomic characteristics of the children did not have any impact on the consumption of sugar.

Is it possible to separate the beneficial effect of WIC education from WIC targeted food nutrition assistance? The answer to this question will require additional modeling efforts and also more precise measures of the nutritional knowledge of the meal planner.[14] An implicit answer on the benefits of nutrition education component of the WIC program may be derived from the discussion above comparing the WIC and the Food Stamp Program. The estimate of the regression coefficient for food stamp dummy variable was statistically not significant indicating no relationships between program participation and HEI score. But, the regression coefficient corresponding to the WIC dummy variable showed significant positive relationship (Table 4).

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[14] This modeling effort may be considered as future research venture and the approach will be similar to the efforts of Variyam, Blaylock and Smallwood (1998).

The results shouldn't be taken as conclusive and more modeling efforts may become necessary to make any conclusive statements.

The results in Table 5 were estimated using the same model and variables presented in table 4 but by including income-ineligible nonparticipants. In other words the results in table 5 were based on a total number of 4546 observations whereas the results in table 4 were based on a sample of 2283 observations. The inclusion of children with higher household income than the WIC program participants has high potential to reduce the magnitude of the effect of WIC program because higher income households tend to have higher education and nutrition knowledge. In spite of the presence of this confounding income factor, the estimates were quite supportive to the discussions based on table 4. The results in tables 4 and 5 showed strong evidence for the effectiveness of WIC program in improving the diet quality of program participants.

Concluding Remarks

The primary objective of the study was to estimate the beneficial effects of WIC on food consumption and diet quality of children between 2 and 4 years of age using a nationally representative data set. The results of the study indicate a positive relationship between WIC program participation and the diet quality of foods consumed by children. There is also evidence for a positive association between WIC program participation and reduction in sugar consumption by children. This research and the results presented have potential significance for the determinants of children's diets and the role of government sponsored food assistance and nutrition education programs.

The research has also brought out potential questions and issues for future consideration and investigation in the model and data development and methodology. There are specific econometric issues related to the implied assumptions of the regression analysis, such as sample selection bias, measurement error problems, and single equation problems. Ideally, the conceptual framework of Becker's household production of health and diet quality can be applied to derive the structural analytical model synthesizing the household behavior. The effects of WIC program can be shown with greater precision by employing an alternative HEI that captures the implied goals of the WIC program. Such an effort will require a redefinition of the WIC HEI and its components. The computation of WIC HEI index should appropriately account for the dietary recommendations that pertain to Iron, Calcium, Vitamins, low-fat milk, limit of sugar content and the WIC-certified food items.

References

1. Arcia, G.T., L.A. Crouch and R.A. Kulka. An Impact of the WIC Program on Food Expenditures. American Journal of Agricultural Economics 72(1990):218 -226.
2. Basiotis, P.P., S. R. Johnson, K. Morgan, and A. Chen "Food Stamps, Food Costs, Nutrient Availability, and Nutrient Intake." Journal of Policy Modeling (1987):383 -404.
3. Becker, G. "A Theory of the Allocation of Time." The Economic Journal 75(1965): 493
4. Behrman, J. and A. Deolalikar. "Health and Nutrition." Handbook of Development Economics. H. Chenery and T.N. Srinivasan, eds., pp. 631-711. New York: Elsevier Science Publisher, 1988.
5. Carlson Andrea and Ben Senauer, "The Impact of the Special Supplemental Nutrition Program for Women, Infants, and Children on Child Health" American Journal of Agricultural Economics
Volume 85 Issue 2 Page 479 - May 2003
6. General Accounting Office, Human Resources Division. Early Intervention: Federal Investments Like WIC Can Produce Savings. GAO/HRD-92-18, April 1992.
7. Heckman, J. "Sample Selection Bias as a Specification Error." Econometrica, Volume 41, No 1. 1979.
8. Institute of Medicine, WIC Nutrition Risk Criteria: A Scientific Assessment, National Academy Press, Washington, DC. 1996.
9. Kennedy, E. T., Shanthy A. Bowman, Mark Lino, Shirley A. Gerrior and P. Peter Basiotis, 1999. "Diet Quality of Americans - Healthy Eating Index," America's Eating Habits - Changes and Consequences, Agricultural Information Bulletin Number 750, Edited by Elizabeth Frazao.
10. Kennedy, E. T., J. Ohls, S. Carlson, and K. Fleming, 1995. The Healthy Eating Index: Design and Applications Journal of the American Dietetic Association 95: 1103-1108.
11. Oliveira, V. and C. Gundersen. WIC and the Nutrient Intake of Children. Washington DC: U.S. Department of Agriculture, Food and Rural Economics Division, Economic Research Service, Food Assistance and Nutrition Research Rep. 5, 2000.
12. Rose, D., Habicht, J-P., and Devaney, B.: "Household Participation in the Food Stamp and WIC Programs Increases the Nutrient Intakes of Preschool Children," J. of Nutr., 128:548-555, March 1998.
13. Rosenzweig, M. and T. P. Schultz. "Estimating a Household Production Function: Heterogeneity, the Demand for Health Inputs, and Their Effects on Birth Weight." Journal of Political Economy 91(1983):723-746.
14. Strauss, J. and D. Thomas. "Health, Nutrition, and Economic Development." Journal of Economic Literature 36(1998):766-817.
15. U.S. Census Bureau. Statistical Abstract of the United States, 1999, Washington, D.C. 2001.
16. U.S. Department of Agriculture Food and Nutrition Servicce, Budget Division. Program Information Report (Keydata): U.S. Summary, September 1998. December 1998b.
17. U.S. Department of Agriculture Food and Nutrition Service (USDA, FNS). "WIC Program Participation and Costs." Web Site: http://www.fns.usda.gov/pd.wisummary.htm, data as of March 27, 2002.
18. U.S. Department of Agriculture Food and Nutrition Service, Office of Analysis and Evaluation. Income Variability among Families with Pregnant Women, Infants or Young Children. Prepared by Mathematica Policy Research, Inc. January 1997.
19. U.S. Department of Agriculture Food and Nutrition Service, Program Information Division.

Annual Historical Review: Fiscal Year 1996. June 1998d.

20. U.S. Department of Agriculture Food and Nutrition Service, Review of WIC Food Packages: Technical papers November 1991.

21. U.S. Department of Agriculture Food and Nutrition Service. The National WIC Evaluation: An Evaluation of the Special Supplemental Food Program for Women, Infants, and Children. Vol 1: Summary. Alexandria, Virginia: U.S. Department Agriculture, 1987.

22. U.S. Department of Agriculture, 1995, The Healthy Eating Index. CNPP-1, Washington, DC.

23. U.S. Department of Agriculture, Agricultural Research Service. 1994-96 Continuing Survey of Food Intake by Individuals and 1994-96 Diet and Health Knowledge Survey CSFII/DHKS CD-ROM. 1998.

24. U.S. Department of Agriculture and U.S. Department of health and Human Serrvices. 1995, Nutrition and Your Health: Dietary Guidelines for Americans, Fourth edition, Home and Garden Bulletin No. 232.

25. U.S. Department of Health and Human Services and National Centers for Disease Control and Prevention. Plan and Operation of the Third National Health and Nutrition Examination Survey, 1988-94. Washington DC, 1994.

26. U.S. General Accounting Office, "Early Intervention: Federal Investments Like WIC Can Produce Savings," Document HRD 92-18, Washington, D.C., April 1992.

27. USDA (U.S. Department of Agriculture). 1992. The Food Guide Pyramid. Home and Garden Bulletin No. 252.

28. Variyam, J. AWIC Participation and the Nutrient Intake of Preschoolers. Paper presented at AAEA annual meeting, Chicago IL, 5-8 August 2001.

29. Variyam, J. James Blaylock, and David Smallwood, " USDA's Healthy Eating Index and Nutrition Information" ERS No. 1866. 32 pp, May 1998.

30. Wilde, P., P. McNamara, and C. Ranney. "The Effect of Income and Food Programs on Dietary Quality: A Seemingly Unrelated Regression Analysis with Error Components." American Journal of Agricultural Economics 81(1999):959-971.

Table 1: Definition of Variables for the Regression Analysis

Variable	Definition
Child characteristics	
WIC recipient	Equals 1 if child is WIC recipient, and is 0 if child is non-recipient
Male	Equals 1 if child is Male and is 0 if child is female
White	Equals 1 if child is White, else 0
Black	Equals 1 if child is Black, else 0
Hispanic	Equals 1 if child is Hispanic, else 0
Other racial/ethnic	Equals 1 if child is non-Hispanic other, else 0
Age-2 year	Equals 1 if child is 2 year of age, else 0
Age-3 year	Equals 1 if child is 3 year of age, else 0
Age-4 year	Equals 1 if child is 4 year of age, else 0
Household Characteristics	
Percent of poverty	Household income as a percent of poverty threshold
Homeowner	Equals 1 if the head of the household owns home, else 0
Assets of $5,000	Equals 1 if household has assets of $5,000 or more, else 0
Household size	Number of household members
Food Stamp recipient	Equals 1 if household member receives Food Stamps, else 0
Food Stamp value	Monthly $ value of food stamps received by the household
Household Status	Equals 1 if household is dual-headed and is zero if single-headed
Head's education	Years of schooling completed by the head of the household
Head completed high-school	Equals 1 if completed high-school diploma, else zero
Geographic Characteristics	
Midwest	Equals 1 if household is in the Midwest, else 0
South	Equals 1 if household is in the South, else 0
West	Equals 1 if household is in the West, else 0
Northeast	Equals 1 if household is in the Northeast, else 0
Central city	Equals 1 if the household lives in the Central City, else 0
Metropolitan	Equals 1 if the household lives in the metropolitan area, else 0
Non-metropolitan	Equals 1 if the household lives outside the metropolitan area, else 0
Year of Survey	
Year94	Equals 1 if Survey conducted in Year 1994, else 0
Year95	Equals 1 if Survey conducted in Year 1995, else 0
Year96	Equals 1 if Survey conducted in Year 1996, else 0
Year98	Equals 1 if Survey conducted in Year 1998, else 0
Diet Characteristics	
Healthy Eating Index (HEI)	HEI is USDA's a summary measure of healthy food choice in percent
WIC Group HEI	WIC Group HEI is a summary measure for healthy food choice in percent
Grain Group HEI	Contribution to HEI through Grain Group consumption
Vegetable Group HEI	Contribution to HEI through Vegetable Group consumption
Fruit Group HEI	Contribution to HEI through Fruit Group consumption
Milk Group HEI	Contribution to HEI through Milk Group consumption
Meat Group HEI	Contribution to HEI through Meat Group consumption
Fat HEI	Contribution to HEI associated to Fat consumption
Saturated Fat HEI	Contribution to HEI associated to Saturated Fat consumption
Cholesterol HEI	Contribution to HEI associated to Cholesterol consumption
Sodium HEI	Contribution to HEI associated to Sodium consumption
Food Variety HEI	Contribution to HEI associated to the consumption of a variety of food items
Added Sugar	Teaspoons of added sugars

Table 2: Socioeconomic and demographic characteristics of the children by WIC Status.

Variables	All Children	WIC participants		WIC nonparticipants	
		Income Eligible	income ineligible	income eligible	income ineligible
	4,546	767	67	1,516	2,196
Child characteristics					
WIC recipient	18.2%				
Male	50.9%	52.1%	49.1%	51.0%	50.5%
White	60.6%	36.8%	54.5%	46.0%	77.7%
Black	17.3%	27.8%	26.6%	25.1%	8.6%
Hispanic	6.1%	6.7%	5.6%	6.3%	5.8%
Other racial/ethnic	16.1%	28.6%	13.3%	22.6%	8.0%
Age-2 year	33.0%	40.0%	26.8%	30.4%	32.6%
Age-3 year	33.8%	31.4%	40.9%	32.7%	35.0%
Age-4 year	33.2%	28.6%	32.2%	36.9%	32.4%
Household Characteristics					
Income	$40,034	$14,995	$48,722	$19,379	$60,930
Percent of poverty	194.8	84.1	255.0	110.5	282.0
Homeowner	55.0%	25.0%	64.2%	34.3%	77.5%
Assets of $5,000	33.9%	4.0%	18.5%	9.1%	60.1%
Household Size	4.5	4.8	5.0	4.7	4.2
Food Stamp recipient	20.3%	59.0%	15.7%	31.3%	0.9%
fsvalue	$271	$273	$252	$269	$258
Dual-headed household	80.8%	59.9%	91.4%	68.9%	94.8%
Single-headed household	19.2%	40.1%	8.6%	31.1%	5.2%
Head's education	12.8	11.0	12.3	11.5	14.2
Head completed high-school	81.4%	60.7%	75.6%	69.4%	96.0%
Geographic Characteristics					
Midwest	19.8%	19.7%	11.3%	16.5%	22.2%
South	23.9%	23.0%	45.5%	22.7%	24.2%
West	32.8%	32.3%	24.5%	33.7%	32.7%
Northeast	23.5%	25.1%	18.7%	27.1%	20.9%
Central city	32.8%	46.2%	29.6%	37.6%	25.6%
Metropolitan	48.3%	30.5%	47.2%	40.6%	59.0%
Nonmetropolitan	18.8%	23.3%	23.2%	21.8%	15.4%

Note: 1 Estimates of the Mean and standard errors were computed using the Statistical Analysis System (SAS) Procedure, SurveyMeans that accounts for Sample Design features and appropriate sampling weights.

Table 3: Diet characteristics of the children by WIC Status.

Variables	Estimates of Mean Values					Estimates of the Standard Errors				
	All	WIC participants		WIC nonparticipants			WIC participants		WIC nonparticipants	
	Children	income eligible	income ineligible	income eligible	income ineligible	All Children	income eligible	income ineligible	income eligible	income ineligible
	4,546	767	67	1,516	2,196	4,546	767	67	1,516	2,196
Healthy Eating Index (HEI)	71.78	71.66	70.80	69.44	73.31	0.25	0.50	1.10	0.34	0.35
WIC Group HEI	41.40	42.87	42.08	40.38	41.53	0.19	0.47	0.71	0.30	0.28
Grain Group HEI	7.96	7.96	8.02	7.84	8.04	0.04	0.11	0.24	0.08	0.06
Vegetable Group HEI	5.59	6.14	5.68	5.71	5.34	0.06	0.12	0.26	0.09	0.08
Fruit Group HEI	6.66	6.71	6.16	5.81	7.19	0.10	0.19	0.33	0.12	0.13
Milk Group HEI	7.32	7.30	7.48	7.00	7.51	0.06	0.15	0.19	0.09	0.08
Meat Group HEI	6.01	6.76	6.50	6.42	5.48	0.05	0.10	0.22	0.08	0.07
Fat HEI	7.39	7.09	6.80	6.95	7.78	0.05	0.13	0.24	0.10	0.06
Saturated Fat HEI	5.50	5.07	4.71	5.13	5.89	0.06	0.15	0.38	0.10	0.08
Cholesterol HEI	8.92	8.41	8.86	8.66	9.26	0.05	0.13	0.22	0.09	0.05
Sodium HEI	8.57	8.22	8.35	8.31	8.85	0.05	0.12	0.33	0.07	0.06
Food Variety HEI	7.86	8.01	8.24	7.60	7.97	0.04	0.09	0.17	0.07	0.08
Added Sugar	14.40	12.69	14.15	15.10	14.54	0.22	0.34	0.77	0.32	0.29

Note: 1 Estimates of the Mean and standard errors were computed using the Statistical Analysis System (SAS) Procedure, SurveyMeans that accounts for Sample Design features and appropriate sampling weights.

	Healthy Eating Index (HEI)		HEI WIC Group		HEI Vegetable Group		HEI Grain Group		HEI Meat Group		HEI Fruit Group		HEI Milk Group		HEI Food Variety Group		Added Sugar	
Table 4: Estimates of the Parameters of the Econometric Model for the subset of income eligible children in the age group between 2 and 4 years																		
	R-sq. = 0.21		R-sq. = 0.49		R-sq. = 0.19		R-sq. = 0.42		R-sq. = 0.29		R-sq. = 0.15		R-sq. = 0.16		R-sq. = 0.26		R-sq. = 0.34	
Variables	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	56.41	37.95	16.83	16.66	1.97	3.70	2.49	7.63	2.04	6.35	2.99	4.02	4.37	9.26	2.98	10.06	-1.10	-0.69
WIC Recipient	2.34	4.66	1.86	5.38	0.19	1.47	0.02	0.23	-0.16	-1.77	0.98	5.03	0.40	2.93	0.43	4.90	-2.23	-5.57
FDS Recipient	-1.06	-1.57	-0.29	-0.63	-0.14	-0.99	0.04	0.43	0.23	1.72	-0.12	-0.60	-0.14	-0.90	-0.17	-1.38	0.05	0.17
Energy	0.01	13.04	0.01	34.73	0.00	17.64	0.00	33.92	0.00	23.89	0.00	10.03	0.00	13.72	0.00	19.09	0.01	22.95
Percent of Poverty	0.01	2.74	0.00	0.71	0.00	-0.67	0.00	1.00	0.00	-1.12	0.00	1.96	0.00	0.41	0.00	0.36	0.01	1.39
Household Size	-0.43	-2.59	-0.24	-2.13	-0.06	-1.32	0.05	2.26	-0.05	-1.78	-0.16	-2.39	0.00	0.11	-0.03	-0.90	0.03	0.32
Assets of $5,000	0.85	0.86	0.31	0.53	-0.07	-0.32	0.18	1.35	-0.50	-3.47	0.41	1.35	0.22	1.37	0.06	0.31	-0.46	-0.62
Homeowner	0.15	0.25	0.14	0.42	-0.03	-0.28	-0.05	-0.49	0.00	-0.01	0.28	1.45	-0.10	-0.91	0.05	0.52	0.59	2.22
Male	-0.32	-1.01	-0.32	-1.12	-0.31	-2.73	0.11	1.52	-0.08	-0.72	0.13	1.03	-0.05	-0.53	-0.11	-1.36	-0.44	-1.24
Black	-0.02	-0.04	0.45	1.06	0.34	2.18	-0.03	-0.36	0.95	6.43	-0.07	-0.28	-0.89	-4.58	0.15	1.07	-0.47	-0.89
Hispanic	1.78	2.92	2.06	4.92	-0.04	-0.24	-0.35	-3.09	0.85	5.42	0.95	3.99	0.21	1.08	0.44	3.41	-1.63	-3.32
Otherr racial/ethnic	0.29	0.39	0.40	0.75	0.15	0.62	0.00	-0.01	0.52	2.89	0.04	0.12	-0.29	-1.07	-0.03	-0.15	-2.10	-3.39
Midwest	-0.87	-1.21	0.01	0.02	0.51	2.01	-0.12	-0.98	0.31	2.10	-0.50	-2.33	-0.02	-0.10	-0.16	-1.01	1.22	1.89
South	-1.38	-1.86	-0.21	-0.42	0.43	1.93	0.16	1.87	0.23	1.65	-0.73	-2.61	-0.25	-1.47	-0.07	-0.48	1.39	2.25
West	0.40	0.44	1.01	1.67	0.18	0.76	0.06	0.51	0.09	0.57	0.13	0.47	0.28	1.38	0.27	1.85	-0.34	-0.56
Central City	-0.27	-0.59	-0.19	-0.57	-0.11	-0.73	0.01	0.09	0.02	0.13	0.05	0.22	-0.23	-1.67	0.08	0.71	0.14	0.35
Non-metropolitan	-2.69	-5.81	-1.15	-2.63	0.06	0.33	-0.01	-0.11	0.32	2.23	-0.90	-6.00	-0.36	-1.53	-0.25	-1.89	0.15	0.37
Age-2 year	7.19	17.27	7.57	24.16	1.55	9.93	1.74	22.05	1.64	15.94	1.77	8.79	-0.07	-0.46	0.93	9.18	-0.55	-1.11
Age-3 year	7.07	16.10	6.87	24.62	1.59	18.18	1.88	29.41	1.63	17.28	1.12	7.32	-0.18	-1.93	0.83	8.85	0.79	1.84
Highschool diploma	0.17	2.53	0.09	1.67	-0.03	-1.48	0.03	2.70	-0.03	-2.10	0.05	1.66	0.04	2.03	0.03	1.90	0.06	1.10
Dual-head family	-0.13	-0.23	-0.12	-0.32	0.19	1.50	0.19	2.22	-0.12	-1.09	-0.34	-1.61	0.04	0.32	-0.07	-0.65	0.11	0.29
Year94	-0.64	-0.89	0.87	1.64	0.15	1.02	0.01	0.10	0.18	1.25	-0.35	-1.33	0.06	0.37	0.82	5.50	-0.87	-1.58
Year95	0.18	0.26	0.27	0.70	-0.18	-0.82	-0.15	-1.42	0.13	1.06	-0.01	-0.04	-0.19	-1.01	0.66	5.67	0.21	0.42
Year96	0.18	0.25	0.47	0.94	-0.01	-0.06	0.03	0.17	-0.24	-1.48	-0.13	-0.45	0.05	0.25	0.78	4.50	-0.58	-1.01

Note 1: Cells marked with red color represent the parameter values that are statistically significant at 5% or lower.

Note 2 : Cells marked with yellow color represent the parameter values that are statistically significant between 5% and 10%

Table 5 Estimates of the Parameters of the Econometric Model for all children in the age group between 2 and 4 years

	Healthy Eating Index (HEI)		HEI WIC Group		HEI Vegetable Group		HEI Grain Group		HEI Meat Group		HEI Fruit Group		HEI Milk Group		HEI Food Variety Group		Added Sugar	
	R-sq. =	0.22	R-sq. =	0.49	R-sq. =	0.19	R-sq. =	0.41	R-sq. =	0.28	R-sq. =	0.16	R-sq. =	0.15	R-sq. =	0.25	R-sq. =	0.314
Variables	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value	Estimate	t-value
Intercept	52.34	43.10	15.05	18.40	1.73	4.50	2.53	10.47	2.36	8.38	2.05	3.45	3.96	11.36	2.42	10.26	1.26	0.56
WIC Recipient	2.28	4.54	1.87	5.78	0.17	1.38	0.05	0.61	-0.12	-1.34	0.92	5.06	0.39	3.14	0.46	5.57	-2.20	-6.24
FDS Recipient	-1.22	-1.92	-0.30	-0.67	-0.09	-0.60	-0.02	-0.25	0.19	1.68	-0.18	-1.03	-0.07	-0.54	-0.13	-1.22	-0.27	-0.84
Percent of Poverty	0.01	19.54	0.01	50.84	0.00	22.55	0.00	40.13	0.00	29.18	0.00	12.68	0.00	18.73	0.00	29.37	0.01	29.88
Household Size	0.01	4.01	0.00	1.67	0.00	-1.50	0.00	1.02	0.00	-3.01	0.00	4.10	0.00	1.89	0.00	2.06	0.00	0.68
Energy	-0.30	-2.32	-0.18	-1.97	-0.05	-1.42	0.04	1.97	-0.04	-1.69	-0.11	-2.06	0.00	-0.18	-0.01	-0.47	0.02	0.19
Assets of $5,000	1.50	3.63	0.96	4.20	0.00	-0.01	0.09	1.24	-0.18	-2.02	0.53	3.27	0.17	2.34	0.35	4.84	-0.66	-2.05
Homeowner	0.20	0.52	0.08	0.31	-0.04	-0.46	-0.02	-0.29	-0.03	-0.43	0.16	1.40	-0.01	-0.08	0.01	0.19	0.45	1.91
Male	-0.29	-1.23	-0.32	-1.80	-0.27	-4.26	0.06	1.30	0.01	0.16	0.01	0.13	-0.03	-0.40	-0.10	-1.57	-0.10	-0.40
Black	-0.19	-0.55	0.29	0.87	0.48	3.81	-0.11	-1.19	1.07	11.41	-0.23	-1.22	-1.04	-6.86	0.12	1.15	-0.31	-0.53
Hispanic	1.45	2.71	1.57	4.62	0.03	0.21	-0.40	-4.70	0.82	7.07	0.78	4.17	0.01	0.05	0.33	3.01	-1.45	-3.78
Otherr racial/ethnic	0.19	0.42	0.26	0.70	0.30	1.79	-0.15	-1.39	0.68	5.10	-0.07	-0.28	-0.29	-1.66	-0.21	-1.72	-2.20	-4.57
Midwest	-0.45	-1.04	-0.19	-0.62	0.45	2.92	-0.15	-2.14	0.14	1.32	-0.58	-3.09	0.03	0.27	-0.09	-0.81	1.72	3.56
South	-1.31	-3.27	-0.36	-1.59	0.50	3.10	0.04	0.46	0.21	2.07	-0.88	-4.14	-0.15	-1.43	-0.07	-0.88	1.21	2.25
West	0.19	0.38	0.45	1.42	0.14	0.85	-0.01	-0.10	-0.01	-0.05	-0.16	-0.99	0.28	2.14	0.20	2.24	0.25	0.47
Central City	0.31	0.97	0.16	0.68	-0.04	-0.37	0.02	0.33	0.07	0.76	0.14	1.13	-0.14	-1.46	0.11	1.31	0.21	0.72
Non-metropolitan	-2.13	-4.36	-0.93	-2.22	0.08	0.60	-0.07	-0.94	0.26	2.51	-0.71	-3.44	-0.27	-1.43	-0.22	-1.81	0.57	1.57
Age-2 year	7.51	19.79	8.11	33.06	1.71	16.28	1.68	26.71	1.56	19.44	1.92	16.17	0.18	1.69	1.05	14.22	-1.69	-5.47
Age-3 year	7.16	19.56	7.26	28.59	1.59	21.95	1.89	37.44	1.60	22.94	1.29	10.45	-0.01	-0.13	0.90	12.67	-0.12	-0.49
Highschool diploma	0.33	6.28	0.16	4.07	-0.03	-1.42	0.04	4.33	-0.06	-5.32	0.11	4.98	0.04	2.57	0.06	4.40	-0.09	-1.92
Dual-head family	0.43	0.87	0.18	0.53	0.16	1.60	0.19	2.78	-0.17	-1.75	-0.08	-0.50	0.07	0.53	0.01	0.11	-0.15	-0.40
Year94	-0.20	-0.43	0.36	1.07	-0.07	-0.59	0.07	1.12	0.08	0.82	-0.30	-1.79	-0.18	-1.32	0.75	8.04	-0.20	-0.56
Year95	-0.23	-0.51	-0.15	-0.56	-0.09	-0.68	-0.10	-1.45	0.13	1.31	-0.23	-1.58	-0.33	-2.48	0.48	5.37	0.74	1.88
Year96	0.27	0.48	0.33	0.90	-0.12	-0.74	0.14	1.52	-0.12	-0.97	-0.24	-1.32	0.01	0.09	0.64	5.51	0.03	0.10

Note 1: Cells marked with red color represent the parameter values that are statistically significant at 5% or lower.

'Note 2 : Cells marked with yellow color represent the parameter values that are statistically significant between 5% and 10%