Returns to Scale and the Effectiveness of Money Spent on the Expanded Food and Nutrition Education Program

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Abstract

In operation for more than 40 years and now in all 50 states and 6 territories, the Expanded Food and Nutrition Education Program has become a cornerstone in US nutrition education. The aim of the program is to assist limited resource audiences to acquire the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets, and to contribute to their personal development and improvement of the overall family diet and nutritional well-being. However, very little is known about the effectiveness of this program, especially at the national level. The purpose of this research is to determine the effectiveness of money spent on the Expanded Food and Nutrition Education Program in satisfying its stated goals for adult participants. Data from all states and territories participating in the program for the years 2000-2006 are utilized in a non-linear seemingly unrelated regression framework to estimate returns to scale and related cost measures. Controlling for participant and program characteristics, the amount of money spent on the Expanded Food and Nutrition Education Program has a positive and significant impact on two of three federal outcome indices used to measure outcomes for adults. Larger-funded programs (states/territories) are *relatively* more cost efficient than smaller programs.

Returns to Scale and the Effectiveness of Money Spent on the Expanded Food and Nutrition Education Program

Nutrition education programs are a common policy tool for improving nutrition and consequently public health. Lower socioeconomic status (SES) populations are usually targeted because of the well-established positive relationship between SES and health quality (e.g., Marmot and Wadsworth 1999). The Expanded Food and Nutrition Education Program (EFNEP) is one of the largest federally funded nutrition education programs in the United States and is administered by the United States Department of Agriculture (USDA) to youth and adults (General Accounting Office 2004). In operation for more than 40 years and now in all 50 states and 6 territories, the EFNEP has become a cornerstone in US nutrition education (USDA 2009a).

The aim of the EFNEP is to assist limited resource audiences to "acquire the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets, and to contribute to their personal development and improvement of the overall family diet and nutritional well-being" (2009a). The EFNEP is administered as a series of lessons at the county level through the USDA Cooperative Extension Service. Presently, the USDA spends about $66 million per year on the EFNEP (USDA 2009b). However, there is no national level information on the effectiveness of this federal level appropriation.

The USDA does reports basic EFNEP "impact data" annually, where impact is measured as the percentage of participants showing improvement from a *pre-test* to a

post-test on questions related to food resource management practices, nutrition practices, and food safety practices (USDA 2009a). The data suggest most participants tend to improve in these domains. However, these are only summary statistics with no multivariate analysis correlating these results with dollar expenditures or other program characteristics. A few more sophisticated analyses have appeared in the peer reviewed literature (e.g., Arnold and Sobal 2000; Dickin, Dollahite, Habicht 2005; Dollahite and Pierce 2003). The common approach in this literature has been to study a subset of participants in a single state in a single year that graduated from the EFNEP and analyze changes in nutrition knowledge or behavior. The general finding is that the EFNEP improves nutrition knowledge and behavior.

While these results are encouraging and suggestive, these studies are not designed to answer three fundamental questions:

(1) Does the money spent on the EFNEP contribute to the stated objectives of the program at the national level?

(2) What are the returns to scale associated with the EFNEP money in achieving its objectives at the national level?

(3) How much does it cost to increase the number of participants satisfying the objectives of the program at the national level?

Using the USDA impact data for all states and US territories for seven consecutive years (2000–2006), but in conjunction with several available covariates, we answer these questions using a nonlinear multivariate regression model. Results show that after controlling for participant and program characteristics, the amount of money spent on the EFNEP has a positive and significant impact on two of the three outcome indices used by

USDA. One index shows increasing returns to scale and another shows constant returns to scale associated with the EFNEP budget. We also find that larger programs are *relatively* more cost efficient and the cost of adding an additional person satisfying the program's objective (i.e., the marginal cost) can range from $375 to $695 on average, depending on the outcome index. These findings are the first to quantify the budget effects at the national level and also help in identifying potential sources where cost effective information may be gleaned. Limitations are discussed in the conclusions.

Methods

USDA collects data on the EFNEP by state/territory through its Nutrition Education Evaluation and Reporting System (NEERS) (USDA 2009c). The NEERS is a software program that allows administrators at the county and state level to collect and report data to USDA in aggregate form. Though the EFNEP is administered to youth and adults (age 18 and over), we focus on adult participants because the data and the methodology for collecting data from adults is standardized across all states/territories and therefore the adult data is more continuous, consistent, and reliable than for youth. Given the structure of the program, the budget effects will potentially be affected by participant and program characteristics so the analysis must control for these potential confounding factors. In general, the NEERS collects data on participant characteristics (e.g., age, education, and income), program characteristics (e.g., type of lesson, type of instructor) and most importantly responses to 10 required behavioral checklist questions for adults. The total EFNEP budget for each state/territory is available as well. All data is for all 50 states and 6 US territories for the fiscal years 2000 to 2006.

Dependent Variables

We use the same measurements developed by USDA as our dependent variables. Specifically, the USDA uses 10 behavioral checklist questions to form the basis for evaluating the success of the EFNEP. The 10 behavioral checklist questions were developed over a span of five years from 1993 to 1997 and involved several phases of development that assured content and face validity (see Anliker, Willis, and Montgomery 1998 for details). The major phases were (i) a committee formed the questions based on reviews of other existing and submitted instruments, (ii) feedback was solicited on the instrument from the EFNEP Coordinators in all 50 states, (iii) more feedback on the instrument was solicited from a larger pool of specialists, (iv) an Expert Panel met in Washington DC to revise the instrument, (v) the revised instrument was subjected to focus group testing and tested for reading level (determined it was at the 6^{th} grade reading level), (vi) based on feedback from the focus group, the instrument was revised and pilot tested in seven states, (vii) statistical analysis was conducted of the pilot tested instrument and the instrument was checked for validity and internal reliability, (viii) additional minor revisions were made based on the validity and reliability analysis to improve and finalize the instrument.

The 10 behavioral questions are given in table I and responses are based on a 5 point Likert scale (e.g., 1 = do not do, 2 = seldom, 3 = sometimes, 4 = most of the times, 5 = almost always). Participants answer these behavioral questions both pre and post EFNEP participation. USDA uses subsets of the 10 questions to create three indices to measure different aspects of nutrition knowledge: the Food Resource Management

Practices (FRMP) index is constructed from answers to questions 1–4, the Nutrition Practices (NP) index is constructed from answers to questions 1 and 7–10, and the Food Safety Practices (FSP) index is constructed from answers to questions 5 and 6. Improvement in an index occurs when the Likert score on at least one of the index questions increases from the pre-test to the post-test.

Our data are measured in terms of the percentage of participants showing an improvement for each index and, consequently, each index ranges from 0 to 100. Table II lists the variables definitions and summary statistics. On average, 83% of the participants improved in the FRMP index, 88% of the participants improved in the NP index, and 64% of the participants improved in the FSP index. The corresponding standard deviations are FRMP 9%, NP 6%, and FSP 11%.

Covariate Explanatory Variables

Budget: The variable budget is defined as the annual budget allocation (in US $) for each state and US territory. The average amount over all observations (i.e., states/territories and years) is $1,034,542 with a standard deviation of $908,877 (table II). We hypothesize that controlling for the other covariates, as the budget increases the index scores will improve.

Number of Participants and Participant Characteristics: We include in the analysis the number of participants as a control variable. The average number of participants is about 2,880 with a standard deviation of 4,200 (table II). We included several socio-demographic categorical characteristics of the participants as control variables: gender, race/ethnicity, age, educational level, household income, and place of residence (table II).

These socioeconomic control variables are typical of those found in the literature on health behavior (e.g., Pollard, et al. 2009). On average, females constitute 89% and whites and blacks about 65% of the participants. Most of the participants (~68%) fall in the 20 to 39 year age range and most (~63%) have income below 100% of the poverty line. Unfortunately, most of the participants (~72%) did not provide information on their level of education, but for those who did the largest percentage is for those with education only through some high school (~23%). The majority of participants (~43%) reside in central cities with populations over 50,000.

Program characteristics: Program characteristics may be important in terms of behavior change, so the analysis includes types of lessons and types of instructors as program control characteristics. EFNEP offers four types of lessons. The largest percentage of participants attend group lessons (~73%), followed by individual lessons (~21%), group and individual lessons (~6%) and other lesson types (~1%). Three types of instructors are involved in the program: professionals, paraprofessionals, and volunteers. The professionals train the paraprofessionals and volunteers, and provide technical support. The paraprofessionals and volunteers are mostly from the local area; thus, they are expected to be best suited to deliver lessons to local participants. Volunteers constitute the largest percentage of instructors (~85%), followed by paraprofessionals (~13%) and professionals (~2%).

Data analysis

There are three dependent variables: the FRMP index, the NP index, and the FSP index. Each is restricted to the range 0 to 100% and, to account for this restricted range,

we use a logistic functional form for each equation (Kmenta 1997). Mathematically, the three equations to estimate have the form

(1) $Y_i = 100 / (1 + e^{-\alpha_{0i} - \alpha_{1i} \ln B - \boldsymbol{\alpha}_{2i} \boldsymbol{X}}) + \varepsilon_i \qquad i = FRMP, NP, FSP$,

where Y denotes the nutrition index, ln B is the natural log of the budget, $\boldsymbol{X}$ the vector of control variables, ε the error term with an expected value of zero and the αs are conformable parameters. In economics, equation (1) represents a simple indirect production function, which is the natural economic construct for conducting cost-return or 'cost-benefit' type analysis (Shephard 1974).

An important feature of this model is that it is nonlinear and allows for increasing, constant, or decreasing returns to scale in the budget. Specifically, the change in the index for a one percent change in the budget (i.e., a one unit change in the natural log of B, ln B) is the marginal budget effect, or mathematically from equation (1),

(2) $MBE_i = \partial Y / \partial \ln B = \alpha_{1i} \times \left[100 \times e^{-\alpha_{0i} - \alpha_{1i} \ln B - \boldsymbol{\alpha}_{2i} \boldsymbol{X}} / (1 + e^{-\alpha_{0i} - \alpha_{1i} \ln B - \boldsymbol{\alpha}_{2i} \boldsymbol{X}})^2 \right]$

The sign of the marginal budget effect is determined by the sign of the parameter on the budget, α_{1i}, because the term in brackets is always positive. The magnitude of this effect will vary depending on the value of the budget and other covariates (i.e., the point of evaluation). Furthermore, because the dependent variable is a percentage and the budget is expressed in natural logs, simple calculus reveals that this marginal effect is equal to the ratio of average cost (AC_i) to marginal cost (MC_i) or

(3) $MBE_i = AC_i / MC_i \qquad i = FRMP, NP, FSP$.

The average cost (AC_i) is defined as the cost per person showing an improved index score and the marginal cost (MC_i) is defined as the cost to produce one more participant with an improved index score. Basic economics indicates if $AC_i > MC_i$ and therefore $MBE_i >$

1, there are increasing returns to scale, if $AC_i = MC_i$ ($MBE_i = 1$) there are constant returns to scale, and if $AC_i < MC_i$ ($MBE_i < 1$) there are decreasing returns to scale. The average cost is easily calculated from available data. However, the marginal cost cannot be estimated without an estimate of the marginal budget effect MBE_i via equation (3).

Because the error terms across equations are likely correlated, we use the non-linear seemingly unrelated regression (NLSUR) method (Wooldridge 2002) for model estimation using the statistical software STATA v10. As many of the explanatory variables are categorical percentages, a reference set of categories must be chosen to avoid the perfect collinearity problem (the more general version of the 'dummy variable trap'). The reference case here is the percentage of participants under the age of 20, with income less than 50% of the poverty level, education up to the high school level, residing in a central city with a population over 50,000, participated in a group lesson, and instructed by a volunteer. Gender is excluded from the estimation model as ~90% of the sample is female, so the variation is quite limited. Finally, because of repeated observations by states/territories, we use a cluster-robust covariance matrix to improve efficiency as there is likely correlation in the errors over time for the same state/territory (Woolridge 2002).

Results

The parameter estimates and their corresponding *p*-values are given in table III and are only briefly discussed as the marginal effects and cost estimates are the central focus of the analysis.

Budget

Consistent with our hypothesis, the parameter estimate for the budget is positive and significant at conventional levels in the Food Resource Management Practices (FRMP) and the Nutrition Practices (NP) index equations (FRMP: 0.135, *p*-value = .02 and NP: 0.102, *p*-value = .08). However, the parameter estimate for the budget is not significantly different from zero in the Food Safety Practices (FSP) index equation (0.0003, *p*-value = .99).

Control Variables

Very few of the participant characteristics are significant. We focus on those that are significant in more than one equation. As the percentage of participants with incomes over the 150% of the poverty line increases, the NP index (0.051, *p*-value =.02) and FSP index (0.028, *p*-value = .05) both increase. Though still positive, this effect is not significant in the FRMP index (0.035, *p*-value = .15). When the percentage of participants who did not report their age increases relative to the percentage of younger participants (i.e., those of age less than 20), all indices decrease (FRMP: –0.022, *p*-value = .09; NP: –0.022, *p*-value = .04: FSP: –0.016, *p*-value = .10). The only other control variable that is significant in more than one equation is the town size variable (Town2) for a town with a population less than 10,000 and rural non-farm area. Relative to the town base (Town5), those in a town with a population less than 10,000 and rural non-farm scored higher on all three indices (FRMP: 0.012, *p*-value = <.001; NP: 0.011, *p*-value = .001: FSP: 0.01, *p*-value = <.001).

With respect to the program characteristics, there is no apparent significant difference in the index scores associated with the lesson types, with exception of the "other" lesson type (Lesson4) in the FSP index equation. As the percentage of participants that did not participate in a group and/or individual lesson increases the FSP index score decreases (–0.014, *p*-value = .06). An increase in the percentage of professional instructors only increases the NP index (0.045, *p*-value = .05).

The fact that few of the participant or program characteristics are statistically significant is actually a positive finding because it implies there are no inherent personal characteristic biases in the program and the program is equally effective across various program characteristics, at least at the national level.

Marginal Effects and Cost Measures

Table IV gives the main results of interest. As indicated, the marginal budget effect is nonlinear and varies by evaluation point. The marginal budget effect for each index is evaluated at three different points: the lowest budget observation, the mean budget observation, and the highest budget observation. The lowest budget (observation) corresponds to the Northern Marianas territory in 2004 with a budget of $48,431. The mean budget (observation), over all states and territories and all years, is $1,034,542. The highest budget (observation) corresponds to Texas in 2006 with a budget of $4,315,548. The variance and associated *p*-values for these marginal budget effects are based on the delta method and account for clustering (Wooldridge 2002).

The second row in table IV gives the marginal budget effects, which as indicated, also measure returns to scale. For example, the 1.28 marginal budget effect for the

FRMP index at the lowest budget observation indicates for a one percent change in the budget, the number of participants showing improvement on at least one FRMP question will increase by 1.28 percent, which is greater than one percent indicating increasing returns to scale. Note regardless of the evaluation point, the marginal budget effect for the FRMP index is significant and shows increasing returns to scale at each point (lowest = 1.28, mean = 1.80, and highest = 1.48). The marginal budget effect for the NP index is significant and shows constant returns to scale (i.e., $ME_{NP} \cong 1$) at the mean and highest budget observations. For the FSP index, the marginal budget effect is not significantly different from zero.

Row three in table IV shows the number of participants improving in the corresponding index at each evaluation point. Taking the ratio of the corresponding budget (row 1) to this number (row 3) gives the average cost per number improved for each index for each evaluation point (row 4 in table IV). For the FRMP index, the lowest budget observation average cost is $769, the mean observation average cost is $688, and the highest budget observation average cost is $418. For the NP index, the lowest budget observation average cost is $794, the mean observation average cost is $705, and the highest budget observation average cost is $412. Finally, for the FSP index the lowest budget observation average cost is $1,053, the mean observation average cost is $849, and the highest budget observation average cost is $523. The general pattern for average cost is that the average cost, regardless of the index, is lower for higher budget observations, implying while the total cost may be larger, more people are showing improvement in the index scores on a *relative* basis.

Row five shows the marginal cost, which is the cost to produce one more participant with an improved index score. This number is recovered by using equation (3) in conjunction with the marginal effects in row two and the average costs in row four. For the FRMP index, the lowest budget observation marginal cost is $602, the mean observation marginal cost is $383, and the highest budget observation marginal cost is $283. For the NP index, the lowest budget observation marginal cost is $1,556, the mean observation marginal cost is $695, and the highest budget observation marginal cost is $417. Finally, and only for completeness, for the FSP index the lowest budget observation marginal cost is $167,798, the mean observation marginal cost is $120,950, and the highest budget observation marginal cost is $8,800. These marginal cost estimates for FSP are so high because from equation (3) we are effectively dividing the average cost by zero. Given the FSP marginal effects are not significantly different from zero one may argue these estimates are less precise than the other marginal cost estimates. However, similar to the average cost pattern, the marginal cost across all indices is lower for higher budget observations (larger programs).

Discussion

Our results indicate that for two of the three indices used by USDA to measure the success of the adult EFNEP (the FRMP and the NP), the money being spent has a positive and significant effect. In fact, for the FRMP index there are increasing returns to scale, whereas for the NP index there are constant returns to scale. There are also differences across program sizes, with larger programs in general having larger marginal effects and lower average and marginal costs. Importantly there does not appear to be

any personal characteristics bias in the program and the program is equally effective across various program characteristics, at least at the national level.

Given the stated objectives and outcome indices for the EFNEP utilized by USDA, our results suggest the EFNEP is generally cost effective. The results suggest two areas where USDA can look to further improve the EFNEP. First, determining what characteristics of the larger programs that lead to better relative outcomes *that are transferable to smaller programs* is an obvious avenue to consider. Second, determining the factors associated with the relative poor performance in the food safety practices and to a lesser degree the nutrition practices dimensions should be investigated.

Regarding limitations, two seem especially note worthy. First, behavioral checklists, such as that used by USDA, are utilized mainly for their high response rate and practicality in implementation. They are easy targets for criticism as they must navigate the often unclear tradeoffs between validity, reliability, response burden, and practicality in implementation. The procedures implemented by USDA in developing the behavior checklist are in line with the recommendations of the literature (e.g., Contento, et al. 2002; Kristal, et al. 1990) and there is some evidence that behavior checklist questions can correlate reasonably well with behavioral and some biological changes (e.g., Murphy, et al. 2001). Until more research is done on the quality of the USDA behavioral checklist and related indicators, these existing national indicators are the obvious place to start in any type of national level analysis and discussion of returns to scale and costs of the EFNEP.

Second, the stated objectives of the EFNEP focus on education and behavior and it is well known that improved knowledge and behavior may not translate into health benefits.

A few small state level EFENP cost-benefit studies do indicate the health benefits, in terms of reduced health spending, exceed the costs (Dollahite, Kenkle, and Thompson 2008; Joy, Pradham, and Goldman 2006; Rajgopal, et al. 2002; Schuster, et al. 2003). At the national level this is a daunting and outstanding question. However, regardless of the theory used to support the notion of changing health through an education program, a central component is to change behavior and this is one of the main direct goals stated by EFNEP. Consequently, the type of analysis conducted here seems the appropriate place to start with any type of returns to scale and cost analysis. As usual, these two points imply further research is needed but, at this time, the best available information indicates the EFNEP is an effective program in achieving its stated goals.

References

Anliker, J., W. Willis, and S. Montgomery. "The Development and Testing of the Behavior Checklist Questions for the EFNEP Evaluation/Reporting System." Available at: http://www.csrees.usda.gov/nea/food/efnep/ers/documentation/checklistdevelopment.pdf.

Arnold C. G., and J. Sobal. 2000. "Food Practices and Nutrition Knowledge After Graduation From The Expanded Food And Nutrition Education Program (EFNEP)." *Journal of Nutrition.*32(3):130-138.

Contento, I. R., J. S. Randell, and C. E. Basch. 2002. "Review and Analysis of Evaluation Measures Used in Nutrition Education Intervention Research. *Journal of Nutrition Education and Behavior*. 34 (1):2-25.

Dickin, K. L., J. S. Dollahite, and J. P. Habicht. 2005. "Nutrition Behavior Change Among EFNEP Participants Is Higher At Sites That Are Well Managed And Whose Front-Line Educators Value The Program." *Journal of Nutrition.* 135. (9):2199–2205.

Dollahite, J. S., and M. S. Pierce. 2003. "Outcomes of Individuals vs. Group Instruction in EFNEP." *Journal of Extension*. 41 (2). Available at: http://www.joe.org/joe/2003april/a4.php.

Dollahite, J. S., D. Kenkel, and C.S. Thompson. 2008. "An Economic Evaluation of The Expanded Food and Nutrition Education Program." *Journal of Nutrition Education and Behavior*. 40 (3):134-43.

General Accounting Office (GAO). 2004. *Nutrition Education*: *USDA Provides Services through Multiple Programs, but Stronger Linkages Among Efforts are Needed.* Washington, DC: United States General Accounting Office.

Joy, A. B., V. Pradhan, and G. Goldman. 2006. "Cost-Benefit Analysis Conducted For Nutrition Education in California" *California Agriculture*. 60 (4):185-191.

Kmenta, J. 1997. *Elements of Econometrics*. 2nd Edition. Ann Arbor: University of Michigan.

Kristal, A. R., B. F. Abrams, M. D. Thornquist, L. Disogra, R. T. Croyle, A. L. Shattuck, and H. J. Henry. 1990. "Development and Validation of a Food Use Checklist for Evaluation of Community Nutrition Interventions." *American Journal of Public Health*. 80 (11):1318-1322.

Marmot, M. and M. Wadsworth, eds. 1999. *Social Determinants of Health*. Oxford: Oxford University Press.

Murphy, A. P., L. L. Kaiser, M. S. Townsend, and L. H. Allen. 2001. "Evaluation of Validity of Items for a Food Behavior Checklist." *Journal of American Dietetics Association*. 101 (7):751-761.

Pollard, C., M. Miller, R. Woodman R, R. Meng, and C Binns. 2009. "Changes in Knowledge, Beliefs, and Behaviors Related to Fruit and Vegetable Consumption Among Western Australian Adults From 1995 to 2004." *American Journal of Public Health*. 99 (2):355-361.

Rajgopal R., R. H. Cox, M. Lambur, and E.C. Lewis. 2002. "Cost-Benefit Analysis Indicates the Positive Economic Benefits of the Expanded Food and Nutrition Education Program Related to Chronic Disease Prevention." *Journal of Nutrition Education Behavior*. 34 (1):26-37.

Shephard, RW. *Indirect Production Functions*. 1974. Verlag Anton Hain, Meisenheim Am Glad.

Schuster, E., Z. L. Zimmerman, M. Engle, J. Smiley, E. Syversen, and J. Murray. 2003. "Investing in Oregon's Expanded Food and Nutrition Education Program (EFNEP): Documenting Costs and Benefits." *Journal of Nutrition and Education Behavior*.35 (4):200-206.

United States Department of Agriculture (USDA). 2009a. National Institute of Food and Agriculture. *Expanded Food and Nutrition Education Program*. Washington, DC. Available at http://www.nifa.usda.gov/nea/food/efnep/efnep.html.

_____. 2009b. National Institute of Food and Agriculture (NIFA). *NIFA Budget Information. Archived Extension Activities.* Washington, DC. Available at http://www.csrees.usda.gov/about/offices/budget.html.

_____. 2009c. Cooperative State Research, Education, and Extension Service. *Nutrition Education Evaluation and Reporting System*. Washington, DC. Available at: http://www.csrees.usda.gov/nea/food/efnep/neers5/neers5.html.

Wooldridge, J. M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts. The MIT Press.

Table I. Behavior Checklist Question Components of Nutrition Knowledge Indices

	Behavior Checklist Questions	Indices
1	How often do you plan meals ahead of time?	FRMP, NP
2	How often do you compare prices before you buy food?	FRMP
3	How often do you run out of food before the end of the month?	FRMP
4	How often do you shop with a grocery list?	FRMP
5	How often do you let these foods (meat and dairy) sit out for more than 2 hours?	FSP
6	How often do you thaw frozen foods at room temperature?	FSP
7	When deciding what to feed your family, how often do you think about healthy food choices?	NP
8	How often have you prepared foods without adding salt?	NP
9	How often do you use “Nutrition Facts” on the label to make food choices?	NP
10	How often do your children eat something in the morning within two hours of waking up?	NP

Note: FRMP – Food Resource Management Practices; FSP – Food Safety Practices; NP – Nutrition Practices.

Table II. Variable Descriptions and Summary Statistics

Variable	Description	Mean(SD)
Dependent Variables		
FRMP	Percentage of participants who improved in one or more Food Resource Management questions	82.72(8.62)
NP	Percentage of participants who improved in one or more Nutritional Practice questions	87.91(5.85)
FSP	Percentage of participants who improved in one or more Food Safety Practice questions	64.44(11.40)
Covariates		
Budget	Annual federal budget allocation per state/territory (dollars)	1,034,542 (908,877.30)
Participant	Number of participants in a given state for a given year (1000s)	2.88(4.20)
Female	Percentage of female participants	89.29(8.20)
Male*	Percentage of male participants	10.70(8.21)
White	Percentage of White participants	40.34(26.21)
Black	Percentage of Black participants	25.02(25.79)
Hispanic	Percentage of Hispanic participants	19.65(23.01)
Other race*	Percentage of participants from other race	14.97(27.30)
AgeUnder20*	Percentage of participants who were under the age of 20 years	13.11(7.54)
Age20_29	Percentage of participants with age 20 to 29 years	45.56(18.34)

Table II. Variable Descriptions and Summary Statistics (con't)

Age30_39	Percentage of participants with age 30 to 39 years	22.71(11.18)
Age40_49	Percentage of participants with age 40 to 49 years	10.58(6.67)
Age50_59	Percentage of participants with age 50 to 59 years	3.62(3.52)
Age60+	Percentage of participants with age above 60 years	2.26(4.51)
AgeNA	Percentage of participants without age information	2.16(3.79)
Income50*	Percentage of participants whose household income is less than or equal to 50% of poverty level	36.75(19.22)
Income100	Percentage of participants whose household income is between 51 to 100% of poverty level	25.69(10.98)
Income150	Percentage of participants whose household income is between 101 to 150% of poverty level	8.82(5.96)
Income150+	Percentage of participants whose household income is more than 150% of poverty level	4.34(4.85)
IncomeNA	Percentage of participants for whom household income information is not available	24.39(22.37)
EduNA	Percentage of participants without information on education status	71.82(36.99)
Highschool*	Percentage of participants who had education up to high school	22.67(30.21)
Some college	Percentage of participants who had education some college education	4.56(6.94)

Table II. Variable Descriptions and Summary Statistics (con't)

College grad and up	Percentage of participants who graduated from college or above	1.70(2.92)
Town1	Percentage of participants who reside in rural farm area	2.98(8.70)
Town2	Percentage of participants who reside in town with population under 10,000 and rural non-farm area	26.82(24.89)
Town3	Percentage of participants who reside in town and cities with population 10,000 to 50,000 and their suburbs	21.34(16.04)
Town4	Percentage of participants who reside in suburb of cities with population over 50,000	5.34(6.51)
Town5*	Percentage of participants who reside in central cities with population above 50,000	43.52(29.07)
Lesson1*	Percentage of participants who were delivered group lessons	72.70(23.25)
Lesson2	Percentage of participants who were delivered individual lessons	20.53(18.63)
Lesson3	Percentage of participants who were delivered both group and individual lessons	5.59(8.20)
Lesson4	Percentage of participants for whom other type of instruction were used	1.17(3.69)

Table II. Variable Descriptions and Summary Statistics (con't)

Professionals	Percentage of professionals among the instructors	2.05(4.91)
Paraprofessionals	Percentage of para-professionals among the instructors	12.67(17.88)
Volunteers*	Percentage of volunteers among the instructors	85.27(19.77)

Note: * variables used as base in the model. Mean is calculated as the overall average across states and territories, for all seven years.

Table III. Nonlinear Seemingly Unrelated Regression Parameter Estimates

Variable	System Equation Results					
	FRMP		**NP**		**FSP**	
	parameter	**p-value**	**parameter**	**p-value**	**parameter**	**p-value**
ln Budget	0.135**	.02	0.102*	.07	0.0003	.99
Number of participants	0.015	.11	0.003	.77	0.008	.37
Income100	-0.012	.15	-0.008	.28	-0.001	.89
Income150	-0.031	.19	-0.026	.19	0.027	.11
Income150+	0.035	.15	0.051**	.02	0.028**	.05
IncomeNA	-0.002	.53	-0.0003	.93	0.001	.80
White	-0.002	.60	0.0004	.92	0.003	.38
Black	-0.005	.35	-0.002	.70	0.003	.37
Hispanic	0.005	.19	0.004	.35	0.009**	.01
Age20_29	-0.003	.57	0.001	.87	0.002	.68
Age30_39	0.013	.29	0.016	.18	0.026**	.01
Age40_49	-0.005	.78	0.003	.84	-0.009	.53
Age50_59	-0.112	.23	-0.035	.36	-0.068	.21
Age60+	0.112	.18	0.028	.27	0.028	.41
AgeNA	-0.022*	.09	-0.022**	.04	-0.016*	.10
Some college	-0.004	.81	0.002	.89	-0.014	.22
College grad and up	-0.013	.72	-0.013	.71	-0.002	.94

Table III. Nonlinear Seemingly Unrelated Regression Parameter Estimates (con't)

EduNA	-0.002	.51	0.001	.81	-0.005*	.06
Town1	0.002	.91	0.007	.69	-0.016	.20
Town2	0.012**	<.001	0.011**	.001	0.010**	<.001
Town3	0.006	.22	0.006	.16	0.004	.29
Town4	-0.005	.41	-0.014*	.08	-0.002	.76
Lesson2	0.006	.12	0.004	.20	-0.0002	.93
Lesson3	0.006	.48	-0.005	.42	0.004	.60
Lesson4	-0.010	.31	-0.003	.78	-0.014*	.06
Professionals	0.039	.12	0.045**	.05	0.022	.11
Paraprofessionals	0.005	.31	0.0001	.97	0.003	.34

Note: ** Significant at 5%, * Significant at 10%.

Table IV. Marginal Budget Effects and Cost Measures by Different Budget Sizes

	FRMP			NP			FSP		
	Lowest	**Mean**	**Highest**	**Lowest**	**Mean**	**Highest**	**Lowest**	**Mean**	**Highest**
Budget	$48,431	$1,034,542	$4,315,548	$48,431	$1,034,542	$4,315,548	$48,431	$1,034,542	$4,315,548
Marginal Budget Effect	1.28*	1.80**	1.48**	0.51	1.01*	0.99*	0.006	0.007	0.006
Number Improved	63	1,504	10,333	61	1,468	10,471	46	1,218	8,252
Average Cost per Number Improved	$769	$688	$418	$794	$705	$412	$1,053	$849	$523
Marginal Cost for One Additional Improvement	$602	$383	$283	$1,556	$695	$417	$167,798	$120,950	$8,800

Note: ** Significant at 5% level, * Significant at 10% level.