Implications of an Economic Evaluation of Projected Health Outcomes in a Community Nutrition Program for Limited Resource Audiences.

J Dollahite, D Kenkel, CS Thompson, M Scott-Pierce.
Division of Nutritional Science and Department of Policy, Analysis, and Management, Cornell University.

The objective of this research was to apply and extend economic evaluation methods—cost effectiveness analysis (CEA) and cost benefit analysis (CBA)—to the Expanded Food and Nutrition Education Program (EFNEP) in New York State (NYS), a major nutrition education program with important public health implications. EFNEP is a national program, delivered through Cooperative Extension in all 50 states and 6 territories with funding from USDA. It is an educational program designed to improve the diet and nutritional well-being of low-income families and to contribute to their personal development. A broad societal perspective was taken in this study, consistent with the goal that the economic evaluation should provide guidance to policy makers on the allocation of resources among EFNEP, other food and nutrition programs, and other uses more generally. Additionally, these data have important implications for allocations of resources and program management within a state.

Previous CBAs have been reported based on the Virginia, Iowa, and Tennessee EFNEPs. The Tennessee CBA measured actual savings in food expenditures realized by participants, reporting an average savings of $2.48 in direct food costs over five years for every dollar spent on EFNEP. The Virginia and Iowa studies assessed projected health benefits as in the present study. They estimated benefit-to-cost ratios between $10 and $11 for every dollar spent. Neither study included estimates of CEAs or of society's willingness to pay for improved health.

In Federal fiscal year 2000, during which data were collected for the present study, 5730 adult participants graduated from the NYS EFNEP. For the CBA, all costs of the adult program (Federal, State, and local dollars) were included. Benefits were based on self-reported data collected from graduates pre- and post-education regarding nutrition and food safety practices. Health benefits, estimated from the outcome data, were monetized using secondary data sources. The method used in Virginia was replicated and then revisions were made for comparison. Incidence rates for the diseases assessed were updated from those used in the previous studies. Lifetime risk (cumulative incidence) was used for chronic conditions. Criteria for success in dietary change, as well as rates for diet attributable risk, particularly for osteoporosis, stroke, and commonly occurring infant diseases were changed to be more consistent with current understanding of the impact of diet on health outcomes. Both the effectiveness of the Program in reducing future health care costs and society's willingness to pay for the projected improvements in morbidity and mortality were estimated. The CEA used quality adjusted life years (QALYs) to measure people's utility levels and preferences over different health states, expressing these in a common metric.

Replicating Virginia, the estimated benefit-to-cost ratio for the adult NYS EFNEP was $3.17:$1.00. Cost per graduate was higher in NYS than in Virginia or Iowa ($849 vs. 553 and $710, respectively). In addition, a smaller percentage of participants had changed to optimal nutrition behaviors in NYS, thereby making the benefit-to-cost ratio

only about one-third those reported for the other two states. Changes in the criteria for successful dietary change and for parameter values used to monetize benefits decreased the estimated benefit-to-cost ratios. The benefit-to-cost ratio for Virginia fell to $3.21:$1.00 and for NYS to $0.90:$1.00. The largest impact of this modification resulted from decreasing the diet attributable risk of osteoporosis from 100% to 15%. It had originally accounted for 88% of the direct benefit in NYS data and even after the revision, still counted for over half. Sensitivity analysis revealed a benefit-to-cost range of $0.09-1.35:$1.00 and included 0 and 30% diet attributable risk for osteoporosis, lower retention rates of changed behaviors and higher disease risks for low-income people.

Analyses were expanded to include the CEA that resulted in a total of 245 QALYs. Compared to the alternative of no program, and only considering the Program's direct costs, the NYS EFNEP was estimated to have an incremental cost-effectiveness ratio of $19,842 per QALY saved. This impact of the program is estimated to be cost saving in medical and productivity costs. Society is normally willing to pay in excess of $200,000 per QALY. Hence, the willingness to pay analysis resulted in a benefit-to-cost ratio of $10.08:$1.00.

Cost benefit analyses were also done on two sub-groupings of data in an attempt to understand variation across the State from a programmatic perspective. First, the effect of population size and density was investigated by comparing benefit-to-cost ratios among rural counties (<50,000 residents), urban counties (>50,000 residents), and New York City. Programs in rural areas had the best benefit-to-cost ratios ($1.05:1.00 vs. $0.94:1.00 in NYC and $0.56:1.00 in other urban areas). The urban result is probably an artifact due to several urban programs in the State with overall poor outcomes. Second, the effect of different program delivery methods was investigated by comparing benefit-to-cost ratios among local programs delivering $\geq$60% of their classes in groups, $\geq$60% individually, balanced with 40-60% delivered in groups and 40-60% delivered individually, and a mixed method in which classes were delivered in groups along with individual contacts with participants. Individual education produced better benefit-to-cost ratios than group education. The best results were seen among counties that provided a combination of group and individual instruction. This method appeared to improve efficiency and retain the individualized education that had the greatest impact.

Based on state of the art economic analyses, the NYS EFNEP is cost savings in terms of projected future health care costs. These results provide evidence that can be used by Federal policy makers to make funding decisions, although caution should be used because not all potential benefits were measured. Nutrition and food safety benefits to other family members, increased use of other programs and the consequent benefit flows, increased food security, and contributions of the Program to personal development of participants are all benefits that have been reported but are not captured by this study. The results are also useful at the State level to guide funding decisions as well as changes needed to improve programmatic outcomes.

Final Report

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Jamie Dollahite[1], Donald Kenkel[2], C Scott Thompson[2,] Michelle Scott-Pierce[1]
Division of Nutritional Sciences[1] and Department of Policy, Analysis, and Management[2]CornellUniversity,
Ithaca, New York, 14853

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Introduction

Nutritionally sound diets are basic to good health. In spite of public education by USDA and HHS through avenues such as the Dietary Guidelines for Americans and the Food Guide Pyramid, the American public in general, and low-income people in particular, do not meet these recommendations (US DHHS 2000). Those who support community nutrition education programs, such as the Expanded Food and Nutrition Education Program (EFNEP) or the Supplemental Food Program for Women, Infants, and Children (WIC) believe their programs will encourage individuals and families to change food choice behavior and ultimately will improve the health of program participants. This has been borne out by previous studies of EFNEP that have shown long- term improvements in food and nutrition behavior after graduation from the Program (Arnold and Sobal 2000; Briink and Sobal 1994; Leidenfrost 1986). But from an economic perspective, effectiveness only tells part of the story. Resources have competing uses, a fact that is particularly obvious in the context of budget constraints. Thus, for evaluation and comparative purposes, the effectiveness of a program relative to its costs is of great interest.

EFNEP is delivered through Cooperative Extension in all 50 states and 6 territories, with funding from the United States Department of Agriculture, state, and local funds. It is "designed to assist low-income audiences in acquiring the knowledge, skills, attitudes, and changed behavior necessary for nutritionally sound diets and to contribute to their personal development and the improvement of the total family diet and nutritional well-being" (EFNEP 2002). The adult Program targets families with children in both group and one-on-one settings. Currently the Program directly reaches over 150,000 adults each year, with indirect effects on another half million family members. The youth program additionally impacts about a half million children directly. In Federal fiscal year 2000, 7765 adults enrolled and 5730 graduated from the New York State (NYS) EFNEP. Of these, 38% were white, 34% Hispanic, 24% black, 3% Asian, and 1% Native American. In addition, the 32,009 family members of Program graduates were a potential secondary target audience. Though the Program is targeted to families with children $\leq$185% of the Federal poverty level, 84% of the participating households were at $\leq$100% of the poverty level. Data in Table 1 further highlights participants' lack of resources by describing their enrollment in other assistance programs. Core measurable outcomes of EFNEP include the following: participants will (1) practice desired dietary behaviors, (2) apply dietary recommendations daily in family meals and snacks, (3) manage their food budgets and related resources to meet family needs, (4) use desired food safety/handling practices, and (5) apply parenting practices that contribute to the development of healthy parent-child feeding relationships and other interactions. While these are the expected outcomes, in New York State emphasis is placed on individualizing instruction to meet the learner's needs, so a given participant may not be exposed to all of these areas. Additional outcomes expected for selected participants include these: participants will (1) improve physical fitness and health practices, (2) engage in volunteer roles that complement their skills and interests, participate in other (non-EFNEP) programming, (3) gain appropriate weight during pregnancy, and (4) breast-feed their babies after delivery. It is clear from other data (Dickin 2001; Peters 2001) that, while the program does center around food and

nutrition and lessons appropriate to these outcomes are taught, an over-riding goal of the Program is empowerment of the participants which then impacts the individual in many ways such as improvement in self-esteem resulting employment, improved employment, return to school, etc. and extends the positive impacts, nutritional and otherwise, to the family.

Table 1. NYS EFNEP: Family enrollment in assistance programs in Federal Fiscal Year 2000 (Total families enrolled = 7765)

Program	Number of Families	Percent of Total Enrolled
Supplemental Food Program for Women Infants and Children (WIC)	3208	41%
Food Stamps	3131	40%
Food Distribution Program on Indian Reservations (FDPIR)	20	<1%
The Emergency Food Assistance Program (TEFAP)	121	2%
Head Start	815	10%
Child Nutrition	2600	33%
Temporary Assistance for Needy Families (TANF)	1101	14%
Other Public Assistance	887	11%
Enrolled in EFNEP only	1418	18%

Nutrition-related diseases and conditions are a leading cause of preventable death in the U.S. (US DHHS 2000; McGinnis and Foege 1993). The socio-economically disadvantaged and minorities represented in the EFNEP population experience particularly high rates of chronic diseases such as heart disease and diabetes that can be reduced by changing dietary choices (Variyam 1999). The goal of this research was to apply and extend economic evaluation methods—cost effectiveness analysis (CEA) and cost benefit analysis (CBA)—to this major nutrition education program with important public health implications. Over the past decade or so, CEA has become a well-established evaluation method for health care interventions. The application of these methods to public health interventions is less common, although it has been discussed in a monograph prepared by researchers at the Centers for Disease Control and Prevention (Haddix, Teutsch, Shaffer and Dunet 1996). In the fields of medicine and public health, CBA is not as well-established as CEA because of objections to placing a dollar value on health (Kenkel 1997).

The need for research establishing the cost-effectiveness of nutrition education programs has been noted for a number of years (Brun 1987). To date, three studies

have been undertaken in an effort to analyze the economic impact of EFNEP. The Virginia EFNEP has reported a cost benefit analysis based on Federal Fiscal Year 1996 data (Rajgopal et al. 2002). This study was replicated by the Iowa Program (Wessman et al. 2000). The benefit-to-cost ratio of the EFNEPs in these states was reported to be between $10 and $11 for every dollar spent. Estimated benefit accrued in future health care savings and avoiding or delaying the loss of productivity resulting from morbidity associated with certain diet-related diseases. A different approach was used by the University of Tennessee Agricultural Extension Service in their CBA of EFNEP in which benefits were measured in terms of the savings in food expenditures realized by Program participants (Burney and Haughton 2002).

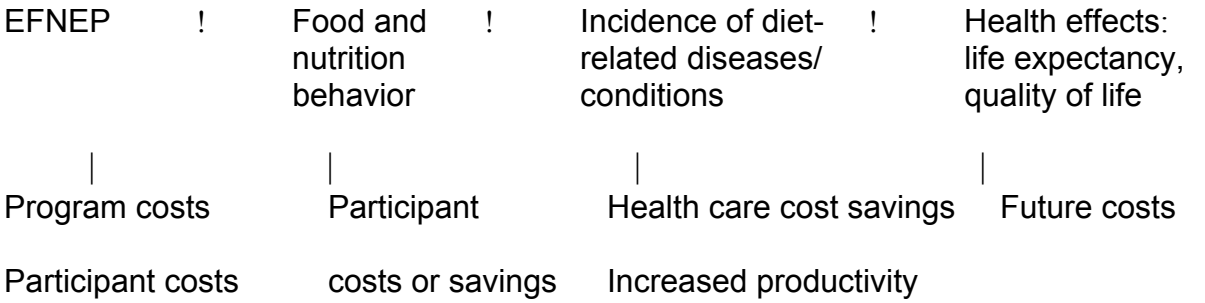
Such data are important for justification of program funding and for determination of priorities and assessment of management practices within a given program. Cost benefit analyses have been used in public sector economics to evaluate a wide range of government interventions (education, environment, public transport, etc. (Boardman et al 1996). The objective of the research reported here was to demonstrate the feasibility, usefulness, and short-comings of cost-benefit and cost-effectiveness analyses in nutrition education research, using the NYS EFNEP as an example. We have addressed a variety of issues that exist when using this methodology in a community nutrition setting, including the difficulty in identifying the best variables, differing costs related to sub-categories of programs, other programmatic benefits not captured by these data, and issues related to data collection.

Methods

In the present research, the Virginia study was first replicated using data from the NYS adult EFNEP (Federal fiscal year 2000) and then other analyses were undertaken to look at benefits beyond those measured by Virginia, using the quality adjusted life years approach (QALY) and to look more carefully at various sub-categories of programs within NYS, including geographic characteristics of the site (rural vs. urban) and program delivery methods (individual education vs. group education) in order to identify local level variables impacting the benefit-to-cost ratio.

Primary and secondary data sources were explored to estimate the costs or savings that were likely to accrue, based on the extent to which EFNEP participants reported behavior change related to food choice and food safety. The evaluation reported here was guided by a conceptual model outlining the "event pathway" (Torrance et al. 1996). A schematic of the model that traces the cascade of cost implications and the health consequences of NYS EFNEP is presented in Figure 1.

Figure 1. Event Pathway for evaluation of the economic impact of EFNEP on the incidence of diet-related diseases.



The event pathway for the health effects begins with the nutrition education provided by EFNEP. This has been demonstrated to change food and nutrition behavior (Arnold and Sobal 2000; Briink and Sobal 1994; Leidenfrost 1986). Epidemiologic and clinical evidence predicts that these behavioral changes will reduce the incidence of certain diet-related diseases and conditions, leading to improvements in life expectancy and quality of life. Each step of this pathway also has economic cost implications. Delivery of the program involves resource costs and time costs for participants. Food and nutrition behavioral changes could yield costs or savings for participants, depending upon whether their food expenditures increase or decrease due to their healthier diet. Research recently published from the University of Tennessee Agricultural Extension Service estimated that the Tennessee EFNEP results in substantial savings in food expenditures for participants (Burney and Haughton 2002). Decreased incidence of diet-related diseases and conditions will reduce the associated health care expenditures and productivity losses. However, as shown in the last step, a complete economic

evaluation should also recognize that increasing life expectancy has implications for future costs.

CBA and CEA

Two types of economic evaluation were conducted in the project— cost-benefit analysis (CBA) and cost-effectiveness analysis (CEA). Both methods require estimates of the costs of the intervention, based on the concept of opportunity costs. A health intervention uses inputs or resources that could have been employed in some alternative use. The *opportunity cost* of a health intervention is the value of those resources if employed elsewhere. When measuring costs from a societal perspective, the goal is to determine what society gives up, in terms of foregone consumption of other goods and services, when resources are used in the health intervention.

CBA. Completing the CBA required monetizing the health benefits of the EFNEP. In principle, the program yields benefits because it improves the health of program participants and their families. Ideally, these benefits are measured by estimating societal willingness to pay for the health improvements. CBA allows judgments about whether the intervention is desirable because the resources used in the intervention are in a more highly valued use.

Two approaches were taken to monetize the benefits of adult EFNEP. The first approach approximated societal willingness to pay for the health improvements by estimating the benefits of avoiding or delaying health care costs and the benefits of avoiding or delaying the loss of productivity from morbidity related to nutrition-related diseases/ conditions (Virginia Cooperative Extension 1999). This approach provides a plausible lower bound estimate of the dollar value of the health benefits of the Program (Berger et al. 1987, Kenkel 1994). Standard sources of cost data provided the estimates to implement this approach. The second approach used previously published results on willingness to pay for morbidity and mortality improvements, as summarized in Tolley, Kenkel and Fabian (1994), Johannesson and Meltzer (1998), and Hirth et al. (2000).

CEA. The CEA was a cost-utility analysis, a form of CEA where the effect of the health intervention is measured in a common metric based on people's utility levels or preferences over different health states. The QALY approach was used to express the predicted health outcomes of the NYS EFNEP in a common metric. The first step was to estimate the years of life expectancy gained due to the health improvements stemming from the Program. The QALY approach also recognizes that extending life expectancy of someone in poor health is not equivalent to extending life expectancy of someone in perfect health. To capture this, different health states were given QALY weights ranging from 0 (death) to 1 (perfect health). Published research on QALY weights for a wide range of health states were used to estimate the number of QALYs saved by the NYS EFNEP. The QALY weights came from the catalogue of preference scores prepared by the Harvard Center for Risk Analysis (2002).

Benefits

The benefits were calculated based on (1) self-reported food and nutrition behavior pre- and post-education and (2) current literature that reported reductions in medical expenditures and productivity losses due to diet-related conditions. The steps to implement this approach are summarized in the following formula:

BENEFIT *= ([A] Annual number of graduates in EFNEP x [B] Incidence rate of the disease/ condition x [C] Incidence of the disease/ condition related to diet x [D] Percent of graduates practicing optimal food and nutrition behaviors related to avoiding or delaying the disease/ condition) x [E] Present value of appropriate benefits for the disease/ condition.*

This formula is necessary because the health improvements due to EFNEP cannot be directly estimated. Instead, data were collected on D to estimate the treatment effect and this was combined with estimates of B and C to yield an estimate of the health impact. For the CBA, the impact was then monetized by multiplying by E. For the CEA, the impact was expressed in terms of QALYs saved by replacing E with the present value of the QALYs saved appropriate for each disease/condition.

The treatment effect (D) was measured by assessing self-reported behaviors of program participants as reported on a behavior checklist in a pre- and post- intervention comparison, along with dietary intake collected via a 24-hour recall. The checklist contained 20 questions related to food practice (e.g. preparing foods in a manner which lowers fat content) and food consumption behavior (e.g. variety in fruit and vegetable intake). Participants responded on a 5-point Likert scale related to the relative frequency in which they practiced this behavior ("almost always" to "do not do"). For a given disease or condition, an individual identified as practicing optimal nutrition behavior was one who reported practicing behavior(s) related to the prevention of that disease or condition, as measured by the checklist, "sometimes," "seldom," or 'never" pre-education and "most of the time" or "almost always" post-education. This change had to occur with each item on the checklist related to that particular disease or condition in order for the participant to be identified as one who had reached "optimal behavior." In addition, the participant reported intake of foods at exit that met current dietary guidelines (Recommended Dietary Intake and Food Guide Pyramid). Variables for each condition are found in Table 2

Costs

The direct tangible costs of the NYS EFNEP consisted of the value of resources, including direct payments of real dollars and in-kind funds, used in the administration and implementation (including planning, evaluating, marketing, etc.) of the adult Program. Costs were divided into the following categories: salaries, wages, and benefits; office space; utilities; equipment; supplies and training; and staff travel. A cost worksheet, with detailed instructions, was developed to collect these data for the EFNEP in each county. The worksheet was based on the instrument used by the

Table 2. Items from the food behavior check list and dietary intake used to assess behavior change in diseases/cones/conditions assessed.

Variables	Heart Disease	Stroke	Hyper-tension	Colo-Rectal Cancer	Osteo-Porosis	Obesity	Diabetes	Food-Borne Illness	LBW Infants	Infant Diseases
Check List Items										
Prepare food w/o salt	X	X	X		X					
Use "Nutrition Facts" Label										
Trim fat from meat	X					X	X			
Think about healthy food choices				X	X	X	X			
Meat/dairy sitting out > 2 hrs								X		
Thaw foods at room temperature								X		
Food Group or Nutrient										
Fruits/vegetables ≥ 5 servings	X	X	X	X		X				
Other ≤ 4 servings										
Dairy ≥ 2 servings					X					
Carbohydrates<=250							X			
≤ 15% protein					X					
≤ 65 g fat	X			X		X				
≥ 20 g fiber	X			X		X	X			
Calcium ≥ 800 mg		X	X		X					
<2300 Kcal						X	X			
> 2100 Kcal									X	
Other items										
"Yes" for nursing										X

Virginia Cooperative Extension (Cox et al. 2000) with revisions that incorporated the feedback from a pilot study and consultation with NYS personnel. The worksheets were completed by personnel in the county Extension offices, the costs summed within each EFNEP locality, adjusted for the percentage of staff time devoted to the adult Program, and then each locality total was summed to provide the NYS total. Specific calculations for each cost category are outlined in the Appendix. Because of distortionary taxation, raising $1.00 of revenue imposes more than $1.00 of costs on the economy, so, as in the Virginia study (Rajgopal et al 2002), the marginal excess burden of taxes needed to finance the NYS EFNEP was assumed to be 17% of the total costs and this was applied to the total costs.

Revisions and secondary analyses

After replication of the Virginia study, cost and benefit calculations were again completed based on more specific and more current data when these were available in the literature. We also analyzed the implications of uncertainty about parameter values for the results of the CEA and CBA. For example, sensitivity analysis conducted by Virginia Cooperative Extension (1999) yielded benefit-to-cost ratios ranging from $2.66 to $17.04 of benefits for every $1 of program costs. In addition to those identified by the Virginia study, we made further adjustments to the calculations, in certain cases using different incidence rates for given conditions, and were added change in self-reported dietary intake. (The Virginia study only looked at dietary intake post-education to determine how well current dietary recommendations were met. See Table 2). We also conducted sub-group analyses based on characteristics of the sites (rural vs. urban) and program delivery methods (individual education vs. group education).

Changes in outcome data used. Several changes were made in the methodology for assessing behavior change among participants. The first change we made was to alter two of the criteria used to assess changes in dietary intake:

- Rather than using <65 g of fat as the goal for a low fat diet which would impact incidence of heart disease, cancer, and obesity, we calculated the fat content of the reported diet as percent of energy from fat, using ≤30% as the criterion for success so that fat is adjusted for energy intake (Nutrition and Your Health 2000)
- Rather than using <2300 Kcal as the goal energy intake for prevention of obesity and diabetes, we calculated change in energy intake from pre- to post education, using –20% as the goal. This method does not assume equal energy needs for all and would be expected to yield a deficit of approximately 300-500 Kcal, considered reasonable for weight loss.

In both cases, the changes adjust for overall energy intake and so would be expected to be more valid.

The second change we made was to add an analysis in which we assessed the change in dietary behavior, excluding those participants who met the guidelines at program entry. The Virginia study assessed change in behavior checklist items, from pre- to post-education, but not in the food intake data as assessed by 24-hour recall. Instead, only the food intake data collected after the educational intervention were used and were compared to current recommendations. So, with the change we made, if they did not meet the guidelines prior to education and did meet them post-education, we counted them as having changed and benefit having accrued.

.***Changes in benefit data based on disease risk rates, age of onset, survival time, and cost of treatment .*** Figures used in the Virginia study for the projected survival time after treatment and lost days of work were verified but no changes were made. On the other hand figures for disease risk rates, age of onset, survival time, and cost of treatment were updated and, in several cases, corrected. The Virginia and Iowa studies used disease rates that appeared to represent either prevalence rate or annual incidence rate. The appropriate figure for chronic disease is cumulative incidence or lifetime risk, which we used when available and attempted to approximate when not. Using colorectal cancer as an example, the incidence rate in the Virginia study was 15%

(a rate more representative of all cancers), the percentage of the incidence rate attributed to diet for all cancers was 35%, and the average age of onset was assumed to be 36. We recalculated the benefits achieved with optimal dietary practices for those variables related to colorectal cancer using figures more specific to lifetime risk for colorectal cancer, per se, of 5.6% (Cancer Facts 2001) a percentage attributable to diet specific to colorectal cancer of 12% (Slattery 2000), and an average age of onset of 67 (Kuwanda 2000).

We made modifications in the incidence rate for osteoporosis changing it to 32%. We were unable to find lifetime risk of osteoporosis so we used the cumulative incidence of vertebral fractures (Cummings et al 1989) which would be a conservative estimate as many people have osteoporosis without ever experiencing a fracture. Other authors support this level, indicating that more than one-third of women have at least one fracture (Rodriquez-Martinez & Garcia-Cohen 2002) The most significant modification we made was in the incidence rate for osteoporosis attributable to diet, which was 100% in the Virginia study. We adjusted this downward to 15%. While we do not have data specifically indicating the incidence of osteoporosis attributable to diet or physical activity, both variables recognized to be important in prevention of osteoporosis, a study by Seeman and colleagues (1996) suggested that 60-80% of the osteoporosis is attributable to genetics and body mass index. Indications of the impact of exercise on osteoporosis can be found in cross-sectional studies of non-athletes that indicate a contribution of muscle strength to bone density in the range of 9-38%, with lower contributions in women (Snow et al. 1996). Assuming that these factors are additive, less than 30% of bone density would be attributable to diet. We chose the mid-point of the range, i.e. 15%, and then applied outer limits of 0-30% in sensitivity analyses. Heaney (1996) indicated that of dietary influences, dietary calcium concentration contributes 11% to calcium balance, which is influenced substantially by other dietary factors that impact calcium absorption (15%) and urinary excretion (51%). Fiber, lactose, fat, caffeine, etc. have relatively small effects on absorption, while protein and sodium have sizable effects on excretion. We therefore added the checklist item related to salt usage and a protein intake of <15% of energy to the osteoporosis variables.

In the case of most other diseases or conditions assessed, lifetime risk or incidence rates and diet attributable risk rates were updated from the figures used in the Virginia study. Exceptions to this were food-borne illness for which we used the same overall incidence rates and diet attributable risk rates, as well as for diet attributable risk for obesity and low birthweight infants. Present value of benefits related to the decrease of hypertension was also updated. Figures used in our modified analyses were as follows:

Heart disease 32% lifetime risk (Lloyd-Jones et al. 1999)
30% diet attributable risk (Hu et al. 2000)

Stroke *5%* cumulative risk before the age 70 (Amer Heart Association 2001)
27% diet attributable risk (Harsha et al. 1999)

Hypertension 90% lifetime risk (Vasan et al. 2002)
45% diet attributable risk, based on midpoint of reported changes with diet of 20-70% (Harsha et al. 1999; Whelton et al. 1998; Hypertension Prevention 1990, 1997)

cost of hypertension $892 (Treatment of hypertension 1999)

Obesity 36% prevalence in decade of life (59-59 years) at which it is the highest for women; lifetime risk not available (NHANES III)
50% diet attributable risk (Rajgopal 2002)

Type 2 diabetes 22% prevalence in decade of life (65-75 years) at which it is highest; lifetime risk not available (Diabetes Statistics 2002)
51% diet attributable risk (Hu et al. 2001)

Low birthweight infants Incidence rate of 7.6 cases/100 births (Child and Infant Health 2002)
assumed 100% diet attributable risk (Rajgopal 2002)

Commonly occurring infant diseases Incidence rate 111/100 infants
Diet-related incidence (comparing bottle to breast feeding) 52/100 infants (Cunningham 1979)

Sub-groups. Additional analyses were done using self-reported behavioral outcomes collected from two different sub-groupings of local programs: those in geographic areas of differing population size and those using different educational delivery methods. Population sizes were categorized as required in the Federal Evaluation Reporting System used in EFNEP:

- New York City,
- counties serving population centers of 50,000 (urban), excluding NYC, and
- counties with no population center > 50,000 (rural).

EFNEP uses a variety of educational delivery methods. Program evaluation data indicate that outcomes were better among those participants taught individually. Yet, states have been encouraged for the last 20 years to provide group instruction because of the efficiency and presumably the improved cost-effectiveness (Honnold et al. 1980; Chipman and Kendell, 1989). We therefore thought it important to compare benefit-to-cost ratios of sites by program delivery method. While we have a number of local programs providing education only through groups (New York City and other densely populated areas), we no longer have any local programs in the State doing only individual education. We therefore grouped programs in the following way for analysis:

- *primarily group education* defined as ≥60% participants taught in groups;
- *balance between group and individual education* defined as 41-59% of participants taught in groups and 41-59% taught individually;
- *primarily individual education* defined as ≥60% of participants taught individually
- *mixed education* defined as participants taught with a combination of methods. (Three county programs use this mixture, often enrolling participants in group classes but following up one-on-one in person and/or by phone to meet individual needs.)

Revised benefit data combined with sub-category data. The revised benefit figures obtained based on updated incidence rates, age of onset, and cost of treatment were then applied to the two sub-groupings of data and analyzed to assess differences in benefit-to-cost ratios. These were also used to calculate the QALYs.

Results

Costs of NYS EFNEP

The total costs for the NYS adult EFNEP (Figure 3) are substantially higher than the actual EFNEP funding that NYS receives from the Federal government each year. This is due to both in-kind and direct funding received from local and State governments and from in-kind received from other agencies.

Table 3. Total direct costs of NYS EFNEP	
Salaries, Benefits, and Wages	$ 2,937,874
Office Space	499,146
Utilities	154,796
Equipment	179,718
Supplies/Training	275,997
Travel	112,286
Marginal Excess Burden	707,169
Total Costs	**$ 4,866,986**

Cost-benefit analyses

Replication of Virginia EFNEP study. The total estimated direct benefits of the NYS adult EFNEP were $15.3 million (Table 4). About 88% of the estimated direct benefits were associated with osteoporosis prevention, which was assumed to occur at a rate of 100% if calcium and dairy intakes failed to meet the recommendations of 800 mg and 2 servings per day, respectively. When combining the direct benefits associated with osteoporosis, low birthweight infants, and commonly occurring infants diseases, these benefit categories accounted for about 93% of the $15.3 million.

The total estimated indirect benefits of the NYS adult EFNEP were about $157,400, substantially lower than the estimated direct benefits (Table 5). The indirect benefits associated with delaying the onset of hypertension compose the majority of total indirect benefits, due to the estimated number of graduates potentially avoiding hypertension and because of the number of lost workdays that can occur with this disease.

Benefit-to-cost ratio. The above benefit and cost totals yield a benefit-to-cost ratio of **$3.17:$1.00**, applying the Virginia methodology to NYS data (Table 6). When the criteria for successful dietary changes were modified to include $\leq$ 30% of calories as fat and a decrease of 20% of calories, only a slight decrease in the benefit-to-cost ratio was seen. However, when the Virginia method was modified to include change in dietary

Table 4. Direct benefits of NYS adult EFNEP replicating Virginia study

Disease/ Condition	Graduates in EFNEP	Incidence rate of disease / condition in the population (%)	Incidence rate of disease / condition related to diet (%)	Graduates practicing optimal nutritional behaviors related to disease/ condition (%)	Estimated number of graduates to accrue benefits	Present value of benefits related to disease/ condition	Total direct benefits
Heart Disease	5730	31.2	26	0.26	1.22	$ 1,169	$ 1,422
Stroke	5730	1.7	100	3.65	3.55	21,878	77,733
Hypertension	5730	37.4	45	3.65	35.17	361	12,692
Colorectal Cancer	5730	15.0	35	0.52	1.58	27,068	42,632
Osteoporosis	5730	28.0	100	7.71	123.76	109,070	13,498,563
Obesity	5730	37.0	50	0.49	5.18	11,989	62,102
Diabetes	5730	14.5	45	0.47	1.76	75,918	133,748
Foodborne Illness	5730	2.8	100	1.69	2.72	31,272	730,264
Low Birthweight Infants	5730	7.3	100	2.30	9.64	37,613	362,439
Commonly Occurring Infant Diseases	5730	100.0	100	3.61	207.00	1,642	339,950
						TOTAL	**$ 15,261,545**

Table 5. Indirect benefits of NYS EFNEP replicating Virginia study

Disease/ Condition	Average age of onset for the disease	Average age delayed onset resulting from EFNEP	Average number of annual lost work days	Estimated number of graduates to accrue benefits	Present value of lost earnings due to disease	Total indirect benefits
Heart Disease	55	60	58	1.22	1076	$1,309
Stroke	45	50	60	3.55	3234	11,490
Hypertension	30	35	41	35.18	2304	81,043
Colorectal Cancer	--	--	--	--	--	--
Osteoporosis	--	--	--	--	--	--
Obesity	23	65	1.83	5.18	201	1,039
Diabetes	40	65	0.6	1.76	420	740
Foodborne Illness	23	65	1.5	2.72	2645	61,777
Low Birthweight Infants	--	--	--	--	--	--
Commonly Occurring Infant Diseases	--	--	--	--	--	--
					Total	**$ 157,399**

intake the benefit-to-cost ratio for NYS fell by about 40%, suggesting that the Virginia figure may have been inflated significantly by using only post-education dietary assessment rather than change in dietary intake.

Table 6. Comparison of benefit-to-cost ratios with modifications for Virginia and New York

	Virginia		New York State	
	Dollar Benefit: $1.00 cost	**Sensitivity**	**Dollar Benefit: $1.00 cost**	**Sensitivity**
Virginia replication	10.63	2.66-17.03[a]	3.17	0.79-5.13[a]
Criteria modification[b]			3.14	0.79-5.11[a]
Pre- to post-change in intake[b,c]			1.86	0.46-3.22[a]
Incidence rates, cost, & age of onset[d]	3.21	3.21–0.80	0.90	0.10-1.39[e]
All modifications included[b,c,d]			0.86	0.09-1.35

[a]Sensitivity analyses included retention rate of dietary behaviors (lowest assumed 25% retention) and 11% higher incidence rates for diseases in the low-income population (Rajgopal 2002).

[b] When comparing pre- to post-education, used ≤ 30% calories as fat goal rather than ≤ 65 g fat, and a 20% decrease in calories as energy goal rather than <2400 Kcal.

[c]A change in dietary intake from pre- to post-education was included. (Virginia replication used post-education dietary intake only.)

[d] Incidence rates, incidence attributable to diet, cost of disease, and age of onset were modified consistent with current literature.

[e]Sensitivity analysis same as for subscript *a*, except for osteoporosis in which outer limits of 0% and 30% were used for diet attributable risk.

Revised Analyses Revisions to the analyses revealed wide variation in the benefit-to-cost ratios calculated using different assumptions and for different sub-groupings of data.

Updated rates for risk of disease and diet attributable risk. Risk rates were updated for colorectal cancer, hypertension, heart disease, stroke, type 2 diabetes, obesity, osteoporosis, low birth weight, and commonly occurring infant diseases. The most important changes were seen with adjustment in the osteoporosis risk attributable to diet when 15% was used rather than 100%. With this modification alone, the benefit-to-cost ratio for the Virginia EFNEP falls from $10.64-$2.60:$1.00 and for the NYS EFNEP it falls to $0.81:$1.00. Based on our assessment of research reporting calcium balance data and data related to the contributions of genetics, body size, and physical activity to bone density, we believe that changing the diet attributable risk for osteoporosis to 15% represents a more reasonable estimate.

In several cases such as type 2 diabetes, the Virginia study used prevalence rates rather than cumulative incidence or lifetime risk. To the extent possible, based on the literature, we used lifetime risk. Lifetime risk was not available for obesity and type 2 diabetes, so we estimated risk using the decade of life during which this prevalence was highest. Lifetime risk would, of course, be somewhat higher than this because of previous mortality and the fact that both of these conditions are increasing dramatically in the population (Must et al. 1999). However, we felt that this provided a conservative estimate that was closer to lifetime risk than prevalence rate collected at an arbitrary time. In the case of commonly occurring infant diseases (gastritis, otitis media, and viral infections) these investigators assumed that there was a 100% incidence rate and that breast feeding would have a 100% protective effect. Research by Cunningham (1979) indicated that there were 111 cases of these diseases per 100 infants who were bottle-fed and only 59 cases per 100 infants who were breast fed. We therefore used 52 cases/100 infants as the risk attributable to diet. All of these modifications together brought Virginia's benefit-to-cost ratio to $3.21:1.00 (Table 6). The same modifications applied to the NYS data brought the benefit-to-cost ratio to $0.90:1.00

Sub-groups. Programs categorized by population. Population size and density impacted the benefit-to-cost ratio but not in a linear fashion. Rural programs (<50,000 residents in the county) had the highest ratio at $4.07:$1.00 and urban programs outside of NYC had a ratio over 40% lower in the replication study (Table 7). The NYC program fell in between in spite of markedly higher staff salaries and rent. Using the modified method that included all modifications noted above, benefit-to-cost ratios among these different sites fell 55-75%. Only the rural programs retained a benefit-to-cost ratio greater than one-to-one.

Programs categorized by educational delivery method. Individualized program delivery had a better benefit-to-cost ratio than group delivery (Table 7). Applying the Virginia method to NYS data, local programs that taught >60% of participants individually were about 30% more beneficial than those teaching >60% in groups. Interestingly, those programs with approximately half of participants in groups and half taught individually had the lowest ratio. This category of counties includes some programs with overall lower performance as measured by behavioral outcome data and hence may be a

function of local management more than delivery method, per se. The best benefit-to-cost ratio was seen in a small group of three counties that used only individual delivery methods with 53% of participants, only group methods with 36% and a mixture with 11%. Participants in the latter group are enrolled in groups initially but then followed individually after the group has ended to provide additional education as needed and desired by the participant. Using the modified method that included all modifications noted above, these benefit-to-cost ratios for counties using different program delivery methods fell about 75%. Only the group of programs using the mixed method retained a benefit-to-cost ratio greater than one-to-one, but in this case it was well above this mark at $1.51:$1.00.

Table 7. Dollar benefit : $1.00 cost for New York State by sub-group

	Delivery Method[a]				Location[b]		
	Group	Individual	Balanced	Mixed	Rural	Urban	New York City
Virginia Replication	2.83	3.75	2.44	5.89	4.07	1.24	3.21
Modified Method[c]	0.81	0.98	0.61	1.51	1.05	0.56	0.94

[a] *Group method* includes counties with ≥ 60% of participants taught in groups.
Individual method includes counties with ≥ 60% of participants taught individually.
Balanced method includes counties with 40-60% of participants taught in groups and 40-60% taught individually.
Mixed method includes counties with approximately10% of participants taught in groups but with individual followup.

[b] *Rural counties* had <50,000
Urban counties had >50,000

[c] The fat goal used was ≤ 30% calories, and the energy goal for weight loss was a 20% decrease in calories. Change in dietary intake from pre- to post-education was included, and modifications in lifetime risk, diet attributable risk, cost of disease, and age of onset were modified consistent with current literature.

Cost effectiveness analysis.

The same variables as those in Table 4 used to calculate direct benefits were used for the cost-effectiveness analyses to determine QALY except that the present value of quality of life adjustment was substituted for the present value of benefits for each

disease/condition; updated incidence rates were used. The total QALYs for the NYS EFNEP were 245 (Table 8).

Compared to the alternative of no program, and only considering the Program's direct costs, the NYS EFNEP was estimated to have an incremental cost-effectiveness ratio of $19,842 per QALY saved. Considering the impact of the program on future medical and productivity costs related to nutrition, the NYS EFNEP was estimated to be cost-saving; i.e. it both improved health and reduced costs.

Table 8. Quality adjusted life years for NYS EFNEP

Disease/ Condition	Graduates in EFNEP	Incidence rate of disease / condition in the population (%)	Incidence rate of disease / condition related to diet (%)	Graduates practicing optimal nutritional behaviors related to disease/ condition (%)	Estimated number of graduates to accrue benefits	Present value of quality of life adjustment related to disease/ condition	Total quality of life benefits
Heart Disease	5730	32.0	30	0.26	1.44	0.7827	1.13
Stroke	5730	7.0	27	3.65	14.63	1.0915	15.97
Hypertension	5730	90.0	45	3.65	84.65	1.6965	143.60
Colorectal Cancer	5730	5.6	12	0.52	0.2	1.8834	0.38
Osteoporosis	5730	33.0	15	7.71	21.88	0.9298	20.34
Obesity	5730	35.6	50	0.49	4.98	6.2827	31.31
Diabetes	5730	18.4	51	0.47	2.53	2.3387	5.93
Foodborne Illness	5730	2.8	100	14.55	23.35	0.9817	22.92
Low Birthweight Infants	5730	7.6	100	2.30	10.03	0.2500	2.51
Commonly Occurring Infant Diseases	5730	110.8	52.3	3.61	119.95	0.0100	1.20
						TOTAL QALYs	**245.29**

Willingness to Pay Analysis

For the CBA that replicated the approach of the Virginia EFNEP study, the benefits of health improvements were measured by estimating the benefits of avoiding or delaying health care costs plus the benefits of avoiding or delaying the loss of productivity from morbidity due to nutrition-related diseases and conditions. This approach has been criticized because it is not tightly linked to what society is willing to pay to improve health. Recent estimates suggest that society is willing to pay at least $200,000 for each QALY saved (Johannesson and Meltzer 1998, Hirth et al 2000). Measured this way, the 245 QALYs saved by EFNEP are worth $49,057,890 to society. As a result, using a willingness to pay approach to value the benefits of the NYS EFNEP leads to a benefit-to-cost ratio of $10.08:$1.00.

Discussion

Community nutrition programs designed to prevent disease are presumed to be less costly, both in terms of actual dollars expended as well as quality of life gained, than treatments brought to bear after diseases have occurred. Previous evaluations of EFNEP have shown long-term improvements in food and nutrition behavior after graduation from the Program (Brink and Sobal 1994; Leidenfrost 1986). Evidence of improved resource management practices, improved nutrition practices, and improved food safety practices by Program participants has also been demonstrated. Additionally, participants have shown improved dietary intake of key nutrients that are often limited in the diets of low-income people and they have shown substantial improvements in the intake of food to meet the recommendations of the Food Guide Pyramid. All of this evidence points to the effectiveness of EFNEP, that it does provide benefits to those in the Program. But from an economic perspective, effectiveness only tells part of the story. In order to determine the estimated dollars saved, several states have undertaken cost benefit analyses of their EFNEPs (Rajgopal et al. 2002; Wessman et al. 2000; Burney and Houghton 2002). This has been seen as a means of evaluating the effectiveness of the program and to communicate its value to Congress in an effort to increase funding (Rajgopal et al. 2002).

The standard approach in economic evaluation is to complete a Reference Case analysis that adopts the perspective of society as a whole. The broad societal perspective means that all costs, effects, and benefits of EFNEP should be incorporated, no matter who pays the costs or receives the effects and benefits (Torrance et al. 1996). This broad perspective is consistent with the goal that the economic evaluation should provide guidance to policy makers on the allocation of resources among EFNEP, other food and nutrition programs, and other uses more generally. We first replicated the Virginia Cooperative Extension Study, adopting and adapting the narrower governmental perspective, which only includes a subset of program costs. This narrow perspective is appropriate if the goal is to help governmental decision-makers weigh the costs of EFNEP to taxpayers against the benefits to participants (Rajgopal et al. 2002). In addition, we conducted the CEA and the willingness to pay based CBA from the broader societal perspective. It is important to keep in mind that programs in different locations and analyses using different assumptions would be expected to provide quite variable results. Our economic evaluations of the NYS EFNEP conducted from the broad societal perspective were more favorable, suggesting that the investment of resources in EFNEP is a good investment for society as a whole, but has a lower return from the narrower perspective of government budgets.

Comparison of NYS data to previous studies

Previous cost-effectiveness studies closely related to the proposed project include a study of cholesterol reduction in adults (Stinnett et al. 1996) and a study of strategies to prevent neural tube defects (Kelly et al. 1996). The study by Stinnett et al. (1996) considered interventions such as dietary therapy for primary prevention targeted to

people without prior heart disease, and daily use of lovastatin for secondary prevention targeted to people with prior heart disease. A computer simulation model was used to estimate net costs and effects on quality-adjusted life expectancy. The results suggested that many strategies for lowering cholesterol levels, including dietary therapy, tend to be relatively cost-effective compared with many health care interventions currently in use. The study by Kelly et al. (1996) evaluated the cost-effectiveness of food fortification and supplementation to increase folic acid consumption in women of reproductive age. Consumption of at least 0.4 mg of folic acid daily is recommended to reduce the risk of serious birth defects known as neural tube defects. A decision tree model was used to estimate the number of neural tube defects prevented by each strategy. The results suggested that fortification of grain may be cost-saving, both improving health and reducing health care costs. The present research built on the methods used by Stinnett et al. (1996) and Kelly et al. (1996) to explore the cost-effectiveness of nutrition education as an intervention to improve health in a low-income and disproportionately minority population. However, our study was broader because it considered the comprehensive impact of nutrition education and was not limited to cholesterol levels and folic acid.

The benefit-to-cost ratio of the NYS data is lower than the ratios reported in the Virginia and Iowa studies which were $10.64:$1.00 and $10.75:$1.00, respectively. The difference between NYS and the other two states can be accounted for both in the relative cost differences between the states and the differences in benefits accruing to the respective state Programs. Specifically, NYS devoted $849 in resources per graduate of EFNEP, Virginia and Iowa devoted $553 and $710 per graduate, respectively. Holding all else constant, if NYS devoted the same resources per graduate as Virginia, the NYS benefit-to-cost ratio would improve to $4.89:$1.00. Thus, cost differences can explain some of the difference in ratios between the states but do not account for all of the difference.

A look at the following factors that are used to calculate direct benefits yields the source of the remaining difference between ratios: (1) annual number of graduates from the Program, (2) incidence rate of the disease/condition in the population, (3) incidence rate of the disease/condition related to diet, (4) percent of graduates practicing optimal nutritional behaviors related to the disease/condition, (5) estimated number of graduates to accrue benefits, and (6) the present value of the benefits related to the disease/condition. Factors (2) and (3) are identical in all three studies so those factors cannot account for the difference in ratios. Likewise, the present value of benefits related to each condition, factor (6), differed only slightly between states and vaied only due to the choice of base year chosen to index treatment costs. The annual number of graduates from each Program, factor (1), is substantially different among states, and should actually benefit NYS in the benefit calculations. NYS had almost twice the number of graduates as Virginia and almost three times the number of Iowa. Factor (5) is a function of factors (1) through (4) and thus would not be a 'cause' of the difference in ratios. However, the percent of graduates practicing optimal nutritional behaviors as they related to a particular disease/condition, factor (4), was substantially lower almost across the board when compared to outcomes in the other two states. This could be due to the way in which the practice of optimal nutrition behaviors was measured using the NYS data, or could reflect actual behavior differences between the states. In

addition, the intervention of EFNEP may have resulted in smaller improvements because NYS participants had healthier behaviors to begin with, although the Virginia and Iowa data are not available to test this possibility. In any case, the differences in benefits between states can almost be fully accounted for in the respective state differences in percent of graduates practicing optimal nutritional behaviors. This raises the question of differences in program delivery among states. Virginia reported using the curriculum *Eating Right is Basic* (Coleman 1995) in their EFNEP and choosing the diseases/conditions to investigate in the CBA based on this curriculum. The items in the ERS are closely tied to the concepts taught in this curriculum, as well as the national EFNEP objectives. The NYS EFNEP has a history of local (county) control in programming and, while *Eating Right is Basic* is encouraged, it is not mandated and many locales use other curricula. In addition, while lessons in NYS have a food and nutrition focus, they are designed around the articulated needs of the participants, consistent with adult learning theory (Cantor 2001). So, a given NYS participant may well not be exposed to the breadth of material in *Eating Right is Basic*, and hence would not be expected to have all the elements of behavior change supported by this curriculum or evaluated by the ERS. Meeting the needs of the participant and using a variety of teaching materials may be part of the reason for the lower benefit-to-cost ratio in NYS. One would expect that outcomes would be more consistent among groups that were instructed with a curriculum that covered all of the behavioral outcomes measured, as was done in the Virginia study. In addition, the evaluation instrument would not be expected to capture the breadth and depth of outcomes occurring in this more individualized approach, i.e. outcomes not covered in the standardized curriculum.

In addition, increasing numbers of participants are being educated in groups, rather than in individual one-on-one sessions. In the study year, 67% of participants in NYS were educated in groups. as compared to <50% in Virginia's study year (Cox 2002). Outcomes in the NYS EFNEP, as measured by ERS, are significantly better for individual, one-on-one education than for groups.

Several analyses were done to look at sub-sets of the NYS data in an effort to determine potential mediating factors within the State, including population size and density of local sites, as well as program delivery methods.

Costs of program delivery that were identified as potential differences by geographic area included cost of living, cost of transportation related to distance to travel, and efficiency in group size because of population density. Generally speaking, rural areas have a lower cost of living in NYS and higher costs as front-line staff travel greater distances to get to participants and teach smaller numbers of participants at a time. Ninety percent of participants educated individually live in rural areas. However, individual lessons, while less efficient in terms of numbers reached, may be able to meet participant needs more closely. The results of analyses of these sub-groups indicate that the best benefit-to-cost ratios in the NYS EFNEP are seen in rural areas and where the program is highly individualized. An informal interview with supervisory staff in the counties providing mixed delivery indicated that an important part of individualization of instruction is empowering front-line staff to elicit needs and meet them in ways that are most effective with a given participant. This not only includes

delivery methods but choice of lesson content, within the guidelines of the Program, and of curricular materials.

Reliability of the estimated benefit-to-cost ratio

The reliability of any estimated benefit-to-cost ratio depends on the validity of the model and parameter values used. An example of this can be seen in the osteoporosis data. Benefits attributable to avoiding osteoporosis accounted for 88% of total benefits in NYS, 89% of total benefits in Virginia, and 82% in Iowa when 100% of the risk of osteoporosis was attributed to diet as in the replication of the Virginia study. In addition to the number of graduates practicing optimal nutrition behaviors, the large proportion of total benefits represented by avoiding osteoporosis comes from the large present value of benefits related to avoiding one case of osteoporosis and to the estimated number of graduates to accrue benefits in all three states. The estimated benefits decline dramatically, to just over 50% of the total benefits when the incidence of osteoporosis attributable to diet is brought down from the 100% to the more reasonable 15%.

Quality Adjusted Life Years

Only considering the program's direct costs, the NYS EFNEP is estimated to have an incremental cost-effectiveness ratio of $19,842 per QALY saved. By standard benchmarks for CEA, this suggests that the NYS EFNEP is at least as cost-effective as many current health and safety interventions (Harvard Center for Risk Analysis 2002).

Including the program's impact on future medical costs and productivity related to nutrition, compared to the alternative of no program, the NYS EFNEP is cost saving. That is, the results showed that the Program both improved health and reduced health care costs. The correct treatment of future medical and productivity effects in CEA is controversial (Gold et al 1996). Moreover, it should be stressed that it is not necessary that an intervention yield cost savings for a favorable economic evaluation. Whether or not future cost savings are included, the cost-effectiveness of NYS EFNEP compares favorably with other interventions to improve health. In addition, using estimates of societal willingness to pay to save a QALY, the estimated benefits of EFNEP far exceed the costs.

Other benefits not captured in these analyses.

The benefit-to-cost ratios presented here apply to a limited number of benefits accruing from EFNEP. Expected outcomes that were not assessed include improvement in the dietary intake of other family members, management of household budget, parenting practices, and exercise and other health habits. In addition, no estimates were made about the benefits from other programs to which families were referred or benefits from EFNEP that did not accrue until after the participant left the program.

Normally the enrolled participant is the person primarily responsible for acquisition and preparation of food for the family. This is the only individual for whom outcome data were collected. In the year this study was completed, an additional 32,009 family members were potentially reached secondarily through the participant and changed household practices, but benefits to these individuals were not included in the analyses. For example, one activity that is stressed in EFNEP classes is the importance of family mealtime. Data indicate that the frequency of children eating dinner with the family was associated with a more healthful diet (Gillman et al. 2000).

A recent study by Burney and Haughton (2002) suggests that there is additional benefit resulting from improved use of financial resources. They reported that EFNEP participants in Tennessee saved an average of $2.48 in direct food costs over five years for every dollar spent on EFNEP. This outcome was validated by improvement in food security as measured by one item on the assessment instrument.

Referrals to other programs, particularly food assistance programs, which may have an additional educational component, are a routine practice in EFNEP. During the study year, 4553 referrals were made to other programs for low-income audiences, greatly increasing the exposure of participants to consequent benefit flows from other from community resources such as WIC and food stamps. Amplification of benefits that would be expected to occur are exemplified by WIC benefit-to-cost data that have shown a savings of $1.77-3.13 for every dollar spent on mothers and newborns up to 6 months of age (Savings 1992).

In addition to nutritional well-being, EFNEP is intended "to contribute to personal development" (EFNEP 2002). No attempt was made in the present study to measure this impact or its consequences on personal or family health, although the empowerment of front-line staff (Taylor et al. 2001) and of participants has been cited as a benefit in others' work (Arnold and Sobal, 2000; Brink and Sobal 1996; Peters 2001). In addition to nutritional benefits accruing for children when families eat together, cited above, other reports indicate benefits such as decreased drug use (CASA, 2001).

In addition to these expected but unmeasured benefits, no attempt was made to assess further behavior change after graduation from the Program, a phenomenon that has been reported elsewhere (Arnold and Sobal 2000; Briink and Sobal 1994; Leidenfrost 1986).

Limitations of the data/methodological issues

There are several methodological concerns, related to the outcome data collected in the evaluation of EFNEP, which warrant attention. The first of these is the validity and reliability of the Food Behavior Checklist items. Content and face validity were determined for a previous version of the Checklist (Anliker 2001). NYS data have been used in a factor analysis, indicating that the domains are appropriate, and to determine Cronbach's alpha coefficients, the results of which support acceptable internal reliability of domains. However, preliminary cognitive testing of items has indicated that some participants, particularly those who are Spanish-speaking, are evasive about answering

some questions because of apparent lack of trust (Nitzke 2002). There is also the question of whether participants always understand the questions, an issue that is amplified in situations such as in New York City, where literally hundreds of ethnic groups, representing several dozen languages, are found in EFNEP groups. In addition, measures of criterion validity have not been available, although there is currently effort to correct this situation and the results look positive (Anliker 2001).

The second issue is the limited number of items available to measure each behavior change of interest. In order to keep the evaluation instrument brief, the decision was made to limit checklist items to variables that could not be measured by dietary recall. An example of this is that there are no checklist items that address changes in use of fat in cooking, trimming of meat, etc. These decisions have resulted in a situation where data cannot be triangulated for validation purposes. In addition, in some cases the items available do not represent the variable of choice. For example, it is well recognized that the level of saturated fat in the diet is more important for heart disease risk than the level of total fat, but only total fat is available from the EFNEP data.

The third methodological concern is the potential impact of social desirability and/or lack of knowledge on the responses of participants to items on the evaluation instrument. The evaluation data are all self-reported, with no objective measures available, and they are collected by the same person who has provided the intervention. While one would assume that participants would therefore report practicing better behavior than they actually are, a study by Rohs et al (2001) reported that data may be skewed because, at the pre-intervention assessment the participant thinks (s)he is practicing more desirable behavior than (s)he actually is. Once knowledge and skills have been gained, reported practices more closely reflect true practice and the reported behavior change calculated when post- are compared with pre-intervention data inadequately reflects the actual change, which is much more positive. Pilot data in the NYS EFNEP indicate that responses to the pre-intervention assessment, when asked <u>at the end of the intervention</u> indicate significantly better behavioral change than is reported when the pre-intervention assessment occurs <u>prior to the intervention</u>. While we are continuing to investigate this, our preliminary understanding is that more behavior change is actually occurring that is captured by the instrument because participants do not want to admit how poorly they are doing at the beginning and later, when a relationship is established with the educator, they are more honest, and/or participants simply better understand the questions after gaining knowledge in the intervention.

A fourth methodological concern relates to the dietary intake data. Gathering accurate data of this type is always a challenge in spite of the staff training done in EFNEP to assure data quality. In the Virginia study, only post-intervention data were used to look at nutrient intake (calcium, fat, and energy). When we used both pre- and post-intervention data, we saw a sizable drop in the benefit-to-cost ratio from $3.17 to $1.86:!.00 For example, investigators in the Virginia study used absolute amounts of energy (<u>≤</u>2300 kcal for obesity and type 2 diabetes) rather than looking at change which might be attributable to the Program. A sizable amount of research supports the concept that twenty-four hour dietary recall data are routinely under reported, which would suggest that fewer participants were actually at <u>≤</u> 2300 Kcal than indicated. We attempted to correct this in our second methodological modification. However, we

would be much more confident in the recall data if there were another method available to assess criterion validity. In addition, the Virginia study reported only total fat intake rather than fat as a percentage of energy, the more common method used to normalize with energy intake across people of varying size and activity level. In our modification, we used ≤30% as the cut-off point. Finally, no data were available from the ERS database on the type of dietary fat, i.e. saturated vs. mono- or poly-unsaturated, an important limitation in assessing risk for coronary heart disease (Executive Summary 2001).

A final concern is the limitation of the analyses in two categories: (1) participants' time costs and (2) future costs. Many health interventions, including EFNEP, involve participants' time. These time costs are part of the opportunity costs of an intervention because they constitute a real change in the use of resources by participants and thus society. Leisure time is considered an economic good, so time costs matter whether people miss work or forego leisure because of the health intervention. EFNEP may also have implications for future costs that arise because of improvements in life expectancy. The Panel on Cost-Effectiveness in Health and Medicine recommends that economic evaluations "should include the net costs of health care and non-health consumption during years of life added by the intervention" (Gold et al. 1996). The treatment of future costs in economic evaluations has been a controversial issue, however. For example, some research suggests that the lifetime health care costs of nonsmokers are higher than those of smokers, primarily due to smokers' shorter life expectancy, therefore raising a doubt about the cost-benefit of smoking prevention or intervention. Other analysts question the implication that smoking prevention may not be as cost-effective as previously believed. We have not considered participants' time costs or future costs in our analyses to date. This is additional work that should be done in the future.

Implications of cost benefit analyses in nutrition education programs

Cost-benefit and cost-effectiveness analyses have implications for funding decisions and program management at every level. While EFNEP was the program investigated here, other nutrition education programs can use similar methodology to leverage funding and to use available funds more effectively.

Federal level. The Federal allocation for state EFNEP has not gone up, in spite of inflation, for many years. Yet the education provided by the Program directly supports the goals of both the United States Department of Agriculture and the United States Department of Health and Human Services as indicated in the Dietary Guidelines for Americans (Nutrition and Your Health 2000) and Healthy People 2010 (US Department of Health 2000), respectively. Data showing that there are actual monetary and quality of life benefits to the EFNEP provides an incentive to Congress and the Federal agencies to increase dollars allocated to the Program. It is important for experts designing these studies to base analyses on data that is supported by the body of scientific knowledge and is reasonable. Over valuation of programs may lead to benefit-to-cost ratios that are so high that they lack apparent credibility. An example of this is the osteoporosis issue discussed above. Simultaneously, programs can be

undervalued if they are too narrowly focused or if program advocates do not make it clear that benefits accrue that have not been captured in a given analysis. For example, health benefits beyond those addressed in the present study and the benefits to other family members that we did not measure.

State level. Analyses of program effectiveness using cost-benefit and cost-effectiveness studies has great potential for upper level management of nutrition education programs. This could be state level management for government funded programs such as EFNEP, or corporate level management in the private sector. Results can provide data for advocating for more money, for making decisions regarding budgetary allocations to local programs, for identifying training needs, and for making decisions regarding program delivery methodology. In the case of NYS, we have assessed those sites with the best benefit-to-cost ratios, identified best practices, and using this information as the basis of training to strengthen program delivery in other sites.

Local level. The results of cost-benefit analyses can also be used by individual programs at the local site. In our study administrators and educators in county offices have expressed a strong interest in the results of this study on both the cost and benefit sides, and intend to use the information as a management tool. From an accounting perspective, the local Extension offices operate in virtual "financial information isolation" from each other. Though they have a very good idea of their own sources and uses of funds, they remain essentially unaware of how they compare to other Extension offices. This study will provide a useful means for administrators to analyze their own costs relative to other Extension offices throughout the State. Likewise, the educators are interested in the benefits portion of the study, given that the benefits that accrue are directly related to the work they do in the EFNEP program. Though they already have numerous productivity measures of their work effort (e.g., number of graduates in the Program, pre- to post-behavioral outcomes), the accrued benefits estimated in this study will give them a unique perspective on the number of lives they are affecting in very real terms. In addition, they are eager to learn more about peer programs that have the highest benefit-to-cost ratios to assist them in improving program management and delivery in order to more successfully impact the lives of participants. In NYS, both educators and administrators are involved in leveraging county and State funds for local programming. Being able to articulate the success of the work they do in terms of monetized benefits will assist them in this effort.

References

American Heart Association. *2002 Heart and Stroke Statistical Update*. Dallas TX: American Heart Association, 2001.

Anliker J. Evalution: Different branches of the same tree. Presented at Nutrition Education for Diverse Audiences II conference. Dallas TX, September 13, 2001.

Arnold CG, Sobal J. Food practices and nutrition knowledge after graduation from the Expanded Food and Nutrition Education Program (EFNEP). *J Nutr Educ*. 2000;32:130-138.

Berger MC, Blomquist GC, Kenkel, DS Tolley GS. Valuing changes in health risks: A comparison of alternative approaches, *Southern Econ J*. April 1987;4.

Boardman AE, Greenberg DH, Vining AR, Weimer DL. *Cost-Benefit Analysis: Concepts and Practice*. Prentice Hall 1996.

Brink M, Sobal J. Retention of nutrition knowledge and practices among adult EFNEP participants. *J Nutr Educ* 1994;26:74-78.

Brun JK. Where we are going. *J Am Dietet Assoc* 1987;87:S81-S82.

Burney J, Houghton B. EFNEP: A nutrition education program that demonstrates cost-benefit. *J Am Dietet Assoc* 2002;102:39-45.

Cancer Facts and Figures 2001. Atlanta GA: American Cancer Society. 2001. pp 13,20.

Cantor JA. *Delivering Instruction to Adult Learners.* 2nd ed. Dayton OH: Wall and Emerson, 2001.

Child and infant health. National Center for Health Statistics, Centers for Disease Control and Prevention. Accessed at February 1, 2002 at http://www.cdc.gov/nchs/fastats/children.html.

Chipman H, Kendell P. 20 years of EFNEP: changes and challenges. *J Nutr Educ* 1989;21:265-269.

Coleman G. *Eating Right is Basic.* 3rd ed. East Lansing MI: Michigan State University Bulletin Office, 1995.

CSA National Survey of American Attitudes on Substance Abuse VI:Teens. The National Center on Addiction and Substance Abuse at Columbia University. 2001. Accessed February 22, 2002 at http://www.casacolumbia.org/usr_doc/52809%2Epdf.

Cox RH, Rajgopal R, Lewis EC, Lambur MT. *Manual for Conducting Cost-Benefit-Analysis of EFNEP.* Blacksburg VA: Virginia Cooperative Extension. 2000.

Cox RH. Personal communication. January 14, 2002.

Cunningham AS. Morbidity in breast-fed and artificially fed infants. II. *J Pediatrics*. 1979;95:685-689.

Dickin K. Unpublished data from dissertation research. 2001.

EFNEP. Cooperative State Research Education and Extension Service. Accessed March 23, 2002, at http://www.reeusda.gov/f4hn/efnep/about.htm.

Executive Summary. *Third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III).* Washington DC: National Institutes of Health. NIH Pub No. 01-3670. 2001

Gillman MW, Rifas-Shiman SL, Frazier AL, Rockett RH, Camargo CA, Field AE, Berkey CS, Colditz GA. Family dinner and diet quality among older children and adolescents. *Arch Fam Med. 2*000;9:235-240.

Gold, MR, Siegel, JE, Russell, LB, Weinstein, MC. *Cost-Effectiveness in Health and Medicine*. Oxford University Press, 1996.

Haddix, AC, Teutsch, SM, Shaffer, PA, Dunet DO. *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation*. Oxford University Press, 1996.

Harvard Center for Risk Analysis. The CUA database: Standardizing the methods and practices of cost-effectiveness analysis. Accessed at April 2, 2002 at http://www.hsph.harvard.edu/organizations/hcra/cuadatabase/intro.html.

Heaney RP. Nutrition and risk for osteoporosis. In Marcus R, Feldman D, Kelsey J. *Osteoporosis.* Academic Press, Inc. 1996.

Hirth RA, Chernew ME, Miller E, Fendrick AM, Weissert WG. Willingness to pay for a quality-adjusted life year: In search of a standard. *Medical Decision Making.* 2000 20(3):332-342.

Honnold R, Kristiansson K, Coffey FA, Gunn B, Yancy E. *Cost Effectiveness of Three Nutrition Education Delivery Systems*. Burlington VT: The Extension Service, University of Vermont. 1980

Hypertension Prevention Collaborative Research Group. Effects of weight loss and sodium reduction intervention on blood pressure and hypertension incidence in overweight people with high-normal blood pressure. *Arch Int Med.* 1997;157:657-667.

Hypertension Prevention Trial Research Group. The Hypertension Prevention Trial: three- year effects of dietary changes on blood pressure. *Arch Int Med.* 1990;150:2408-2409.

Johannesson M, Meltzer D. Some reflections on cost-effectiveness analysis. *Health Econ.* 1998; 7: 1 –7.

Kelly, AE, Haddix, AC, Scanlon, KS, Helmick CG, Mulinare, J. Appendix B: Cost-effectiveness of strategies to prevent neural tube defects. In Gold, MR, Siegel, JE, Russell, LB, Weinstein, MC, editors. *Cost-Effectiveness in Health and Medicine*. Oxford University Press, 1996.

Kenkel, DS. The cost of illness approach. In Tolley GS, Kenkel DS, Fabian R, editors. *Valuing Health for Policy: An Economic Approach*. University of Chicago Press, 1994.

Kenkel, DS. On valuing morbidity, cost-effectiveness analysis, and being rude, *J Health Econ.* 1977;16:749-757.

Kuwanda SK. Colorectal cancer 2000. *Postgrad Med.* 2000;107:96-98.

Leidenfrost NB. An assessment of long-term effects of the Expanded Food and Nutrition Education Program as reported by participants. Washington DC: Extension Service, US Department of Agriculture, 1986.

Lloyd-Jones DM, Larson MG, Beiser A, Levy D. Lifetime risk of developing coronary heart disease. *Lancet.* 1999;353(9147)89-92.

McGinnis, JM, Foege WH. Actual causes of death in the United States. *JAMA.* 270 (1993): 2207-2212.

Must A. Spadano J, Coakley EH, Field AE, Colditz G, Dietz W. The disease burden associated with overweight and obesity. *JAMA.* 1999;282:1523-1529.

National Diabetes Fact Sheet. Accessed April 4, 2002, at http://www.cdc.gov/diabetes/pubs/estimates.htm#prev.

NHANES III, Prevalence of BMI, overweight and obesity: United States, 1960-1994. Accessed April 4, 2002, at http://www.cdc.gov/nchs/about/major/nhanes/datatblelink.htm.

Nitzke S. *Personal Communication.* February 1, 2002.

Nutrition and Your Health. Dietary Guidelines for Americans. Washington DC: USDA/DHHS. 2000. Accessed March 22, 2002 at http://www.health.gov/dietaryguidelines/.

Peters S. Understanding and supporting civic practice in extension's community nutrition work. Presented to Community Nutrition Seminar, Cornell University, April 9, 2001.

Rajgopal R, Cox RH, Lambur M, Lewis EC. Cost-benefit analysis indicates the positive economic benefits of the Expanded Food and Nutrition Education Program related to chronic disease prevention. *J Nutr Educ Behav.* 2002;34:26-37.

Rodriquez-Martinez MA, Garcia-Cohen EC. Role of Ca2+ and vitamin D in the prevention and treatment of osteoporosis. *Pharmacology & Therapeutics.* 2002;93:37-49.

Rohs FR. Langone CA, Coleman RK. Response shift bias: A problem in evaluating nutrition training using self-report measures. *J Nutr Educ.* 2001;33:165-170.

U.S. Department of Health and Human Services*. Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: U.S. Government Printing Office, 2000.

Savings in Medicaid Costs for Newborns and Their Mothers from Prenatal Participation in the WIC Program, Vol 2, USDA, FNS, 1992.

Seeman E, Hopper JL, Young NR, Formica C, Goss P, Tsalamandris C. Do genetic factors explain associations between muscle strength, lean mass and bone density? A twin study. *Am J Physiol.* 1996;270: E320-E327.

Slattery ML. Diet, lifestyle,l and colon cancer. *Semin Gastrointest Dis.* 2000;11:142-6.

Stinnett, AA, et al. Appendix C: The cost-effectiveness of dietary and pharmacologic therapies for cholesterol reduction in adults. In Gold, MR, Siegel, JE, Russell, LB, Weinstein, MC, editors. *Cost-Effectiveness in Health and Medicine*. Oxford University Press, 1996

Taylor T, Serrano E, Anderson J. Management issues related to effectively implementing a nutrition education program using peer educators. *J Nutr Educ.* 2001;33:284-292.

Tolley, GS, Kenkel, DS, Fabian, R. *Valuing Health for Policy: An Economic Approach*. University of Chicago Press, 1994.
Torrance, GW, Siegel, JE, Luce, BR. Framing and designing the cost-effectiveness analysis. In Gold, MR, Siegel, JE, Russell, LB, Weinstein, MC, editors. *Cost-Effectiveness in Health and Medicine*. Oxford University Press, 1996.

Variyam JN. Role of demographics, knowledge, and attitudes. In: Frazao E, ed, *America's Eating Habits: Changes and Consequences,* Food and Rural Economics Division, Economic Research Service, US Department of Agriculture, Agriculture Information Bulletin No. 750 (AIB-750), 1999, pp 281-294

Vasan RS, Beiser A, Seshadri S, Larson MG, Kannel WB, D'Agostino RB, Levy D. Residual lifetime risk for developing hypertension in middle-aged women and men. *JAMA*.2002;287:1003-1010.

Wessman C, Betterley C, Jensen H. *An Evaluation of Costs and Benefits of Iowa's Expanded Food and Nutrition Education Program (EFNEP).* Ames IA: Iowa State University Extension. 2000.

Whelton PK, Appel LJ, Espeland MA, Applegate WB, Ettinger WH, Kostis JB, Kumanyika S., Lacy CR, Johnson KC, Folmar S, Cutler JA. Sodium reduction and weight loss in the treatment of hypertension in older persons. *JAMA*.1998;279:839-846.

Appendix. Calculation of Specific Cost Categories

Salaries, wages, and benefits included direct payments of real dollars and in-kind funds in to EFNEP educators (supervisors and front-line workers) and support staff who contributed to the administration or implementation of EFNEP. For each salaried employee, gross earnings were multiplied by the percentage of their time that they devoted to EFNEP and the resulting salary expense was then multiplied by a 30% benefit multiplier to arrive at total cost. For each employee paid on an hourly basis, the average number of weekly hours they devoted to EFNEP was multiplied by their hourly wage and then multiplied by 52 weeks, giving a yearly EFNEP wage expense for each hourly employee. The yearly EFNEP wage expense was then multiplied by the 30% benefit multiplier to obtain a benefit cost figure for each of the hourly employees. Thus, for each employee there were both a total salary/wages amount and a total benefit amount, which totals could be directly attributable to work expended on EFNEP. To arrive at a total Salaries, Wages, and Benefits cost, the total (salaries/wages plus benefits) for each employee was summed within each EFNEP locality and then each locality total was summed.

Office Space expense included in-kind values and/or real dollars expended for rent or purchase of office space used in the administration or implementation of EFNEP. For local Extension offices that paid a mortgage or owned the building that housed their office, staff was asked to provide the following information:
(a) The value of the building according to 1) a recent appraisal of the building, 2) the loss acquisition cost of the building less the cost of the land, or 3) the current value of the building on the organization's balance sheet;
(b) The percentage of the space used by the overall Extension staff, including meeting/conference rooms used frequently;
(c) The percentage of the Extension office space that is used to support EFNEP, calculated by dividing the total number of staff hours spent on EFNEP divided by the total number of hours worked by all Extension employees;
(d) The value of other space provided to EFNEP by all outside agencies;
(e) The cost of janitorial services, elevator service, upkeep of grounds, necessary maintenance, normal repairs and alterations for the fiscal year in Extension office space. This category included the cost of all insurance relating to the property, but it did not include costs that added to the permanent value of the property or that prolonged the property's intended life.

With this information, the office space expense was calculated as

$$[[[(a) \times (b) \times .02] + (e)] \times (c)],$$

where the .02 multiplier is the percentage established by the Office of Management and Budget (OMB) used to calculate the yearly value of office space for Extension space.

For organizations that rented space or had agreements with their local governments to use publicly owned facilities, Extension staff was asked to provide the following:

(a) The amount of rent paid in FY 2000 or the value of space received in-kind;

(b) The percentage of the occupied space used to administer and implement EFNEP, calculated by dividing the total number of hours spent on EFNEP divided by the total number of hours worked by all Extension employees;

(c) The value of other space provided to EFNEP by all outside agencies;

(d) The cost of janitorial services, elevator service, upkeep of grounds, necessary maintenance, normal repairs and alterations for the fiscal year in Extension office space. This category included the cost of all insurance relating to the property, but it did not include costs that added to the permanent value of the property or that prolonged the property's intended life.

With this information, the office space expense was calculated as

$$[[(a) + (d)] \times (d)] + (c) .$$

Utilities cost included real and in-kind dollars expended for utilities (i.e., electricity, water, telephone, gas, etc.) in office space used to administer or implement EFNEP. The total cost figure was arrived at by multiplying the utilities cost for the entire Extension office space by the percentage of the Extension space used to support EFNEP. Total utility expenditures for each locality were then summed for the cost of utilities for NYS EFNEP. As a side note, many localities utilities are included with their agreement for office space (i.e., lease agreement or in-kind agreement to occupy a public building). That is, they are not paid separately and such utility expenses would not appear on their accounting books. Hence, the expenditures reported for utilities would tend to be an underestimate of the actual resources expended for utilities. However, since these unreported utility figures would be included in the cost figures for office space, the final total for all costs combined would not be biased due to this method of accounting for utility costs.

Equipment expenses consisted of the yearly value of existing capital equipment (computers, printers, furniture, etc.) owned by the Extension and used by EFNEP staff. The amount spent on leased equipment (used by EFNEP staff) during the year was also included in this category, as were amounts spent on non-capital equipment used by EFNEP staff. Finally, amounts spent on repairs or maintenance on any of the types of equipment (capital, non-capital, leased) used by EFNEP staff was included. Note that both real dollars expended and in-kind funds were considered costs.

Supplies and training included both real dollars expended and the in-kind value of any supplies used for EFNEP and training received by EFNEP staff were included in this cost category. Specifically, each local Extension office was asked to provide the following information:

(a) The cost of office supplies used in administering EFNEP (including cost of computer software purchases, site licenses, or upgrades).

(b) The cost of printing (including the processes of composition, plate-making, press work, binding, and the end products produced by such processes) for EFNEP.

(c) The cost of teaching and educational materials for EFNEP. This would include the cost of food used in EFNEP lessons and the cost of any other demonstration or teaching materials/aids used in the lessons.

(d) The cost of direct training of EFNEP professionals and paraprofessionals (i.e., computer training, teleconferencing, training seminars, etc.).

(e) The cost for federal, state, and regional conferences and meetings for EFNEP staff, where the primary purpose of the conference/meeting was the dissemination of EFNEP information (i.e., registration fees and travel expenses not listed elsewhere).

(f) The cost of postage used in administering EFNEP (including the cost of courier services only if they were directly related to EFNEP).

(g) Telephone expenses not previously included in the cost of utilities, such as long distance charges incurred by EFNEP staff.

(h) The cost of Association services provided by Cornell University to local Extension offices for EFNEP.

(i) The cost of promotion and/or publication for EFNEP.

(j) The cost of any other supplies or training that were not included in the categories above but were incurred as part of the administration or implementation of EFNEP.

Each of these subcategories of expenses was then summed to arrive at a total for the cost of supplies/training for each EFNEP locality. The total for each locality was summed for the total cost of supplies/training for NYS EFNEP.

Staff Travel included real and in-kind dollars expended for EFNEP staff travel related to administering or implementing the Program. Travel expenditures included mileage in personal cars, mileage in motor pool/fleet vehicles, meals and lodging, and fares for public transportation. The total cost of travel for NYS EFNEP was the sum of staff travel expenditures for each EFNEP locality within New York.