

CHAPTER II

REVIEW OF THE LITERATURE

The cost-benefit analysis of the Expanded Food and Nutrition Education Program (EFNEP) in Virginia was a multifaceted research project in which a range of information from other scientific studies was incorporated. The scope of this review includes sources beyond the nutrition field such as economics, finance, public health and program evaluation. A number of sources on cost-benefit analysis (CBA) are cited from the past two decades, as CBA is not a new technique and was used more commonly in the 1970s and 1980s. The review of literature included the following: (a) history of EFNEP and program description; (b) research related to diet, disease, and economic costs; (c) economic evaluations in healthcare; and (d) framework of CBA.

History of EFNEP nationally

During the early 1960s, evidence was accumulating about the appalling living conditions endured by millions of Americans in the U.S.⁶ Vivid glimpses of poverty and squalor were constantly shown by the news media. One of the most shocking realizations was that, in the midst of a land of plenty, children were going to bed hungry. A country that provided food for millions of people in other countries had somehow managed to overlook the hunger of its own citizens. It became apparent that hunger, starvation, and malnutrition were not confined to any geographic region, but appeared in cities and rural areas. Estimates of the magnitude and pervasiveness of the problem differed, but two general conclusions were inescapable: (a) several million Americans were living at or below poverty; and (b) children and adults in low-income families were suffering from inadequate nutrition and sometimes, severe malnutrition. With the problem defined, numerous approaches to a solution were proposed. Hundreds of federal, state, and local programs sought to focus their resources appropriately. In this context, the Expanded Food and

Nutrition Education program (EFNEP) was born. In November 1968, the United States Department of Agriculture (USDA) provided a ten million dollar grant to the Cooperative Extension System, a national education network, to initiate the Expanded Food and Nutrition Program. The focus of EFNEP was nutrition education. The goal of the program was to help low-income families to improve their nutritional status by changing knowledge, skills, attitude, and behavior related to food preparation and consumption.¹⁹

EFNEP is a unique program which currently operates in all 50 states, American Samoa, Guam, Micronesia, Northern Marinas, Puerto Rico, and the Virgin Islands. It is now funded through the USDA Cooperative State Research, Education and Extension Service (USDA-CSREES) and is operated by land-grant universities in every state and several US territories. The federal appropriation to states to support EFNEP in 1995 was \$ 61,431,000. The federal allocation to the states represented 58 percent of the total funds supporting EFNEP with the remainder due to come from state and county government funds or other sources. USDA retained only 0.42 percent of the federal appropriation for oversight of the program.²⁰

EFNEP is designed to assist limited-resource audiences in acquiring the knowledge, skills, attitudes, and changed behaviors necessary for nutritionally sound diets, and to contribute to their personal development and the improvement of the total family diet and nutritional well-being.¹⁹ EFNEP targets two primary audiences: low-income youth and families with young children. Often EFNEP participants are recipients of food stamps or some other form of government food assistance, and also may participate in the Woman, Infant and Children (WIC) program. The original philosophy of EFNEP was based on three concepts: (a) that an existing home economics program can be modified to effectively reach low-income audiences; (b) professional home economists can teach and supervise paraprofessionals who, in turn, teach low-income

homemakers; and (c) that a nutrition education program tailored to the needs, interests, competencies, and economical and educational levels of low-income families, and delivered by paraprofessionals who are indigenous to the target audience, can convince participants' to change their eating habits. The objectives of EFNEP include the following:

- 1) To improve diets and nutritional well-being of the whole family.
- 2) To increase knowledge of the essentials of human nutrition.
- 3) To increase the ability to select and buy food that satisfies nutritional needs.
- 4) To improve practices in food production, storage, preparation, safety and sanitation.
- 5) To increase ability to manage food budgets and related resources such as food stamps.

Lessons are taught by the paraprofessionals to the homemaker, who is the family member most involved in selecting and preparing food for the family. National investigations of EFNEP enrollees conducted over the past years have indicated that the families were from the poorest sector of society, were of minority or ethnic backgrounds, had limited education, and were considered culturally, socially and geographically isolated.²⁰ Food stamps were used by 66% of the families which is a population shown to be at risk for poor health.²⁰ Other reports have indicated that food stamp recipients tend to have a low consumption of fruits, vegetables, milk and other key nutrients.²¹ They also tend to eat foods high in fat.²¹ Thirty percent of EFNEP families have a member enrolled in the Supplemental Food Program for Women, Infants and Children (WIC).²² Specifically related to nutrition risk factors, the EFNEP population has a tendency towards poor diet and inadequate nutrition.

Program content. National food and nutrition education curricula for youth and adults were

developed under a cooperative agreement between Extension Service, USDA, and the Michigan Cooperative Extension service. The “*Eating Right is Basic, 3rd edition*, (ERIB 3) is the curriculum currently used in Virginia for the adult phase of the program.²³ *Eating Right is Basic* has been designed to teach homemakers of low-income families how to choose and prepare healthy meals. Lessons cover basic nutrition, food resource management, food safety, and food preparation. Handouts have been specifically designed for use with limited-literacy adults. The information in the lessons has been based on current food and nutrition recommendations of the USDA, Food and Drug Administration (FDA), and other recognized national institutions. The lessons have incorporated the USDA Food Guide Pyramid, FDA and USDA food labeling regulations and USDA Dietary Guidelines for Americans.²⁴

Program delivery. The delivery of EFNEP lessons is conducted by paid paraprofessionals (program assistants) and volunteers who typically reside in the communities of the target population. The paraprofessionals are trained and supervised by Cooperative Extension professionals. Methods used in delivering the adult component include teaching enrolled families on a one-to-one basis or in small neighborhood groups.

Assessment of food-related behavior changes in EFNEP. Throughout its history, changes in food-related behaviors have been a focus of impact assessment in EFNEP. Behavior changes are assessed with two instruments, a 24-hour food recall and a food practice checklist (FPC) (see Appendix A). The food recall methodology has remained essentially the same over the years, while the food practice checklist has changed considerably in regard to number of checklist items and the specific behavior measured by those items. The first national EFNEP Food Practice Checklist, developed in 1974 by Synetics Corporation, assessed 70 behaviors.¹¹ The items were

hand-scored by EFNEP paraprofessionals and a total score was determined for each homemaker at pre- and post- intervention.

In 1992, a new computerized evaluation system, the EFNEP Evaluation/Reporting System (ERS) was implemented nationwide in EFNEP, which allowed for summation of the behavior changes in participants at the local, state, and national level. The system allows for the generation of a variety of summary reports that are useful for management purposes and for assessment of individual participant needs and progress. Among other features, this data system has a dietary analysis component for adult participants that provides information on the actual food and nutrient content of diets and how well the diets meet the national dietary recommendations. Some of the printed reports on individual eating habits were designed to be shared with participants and to encourage adoption of recommended practices. Behaviors assessed by the ERS have been divided into the domains of improved nutrition, food selection and preparation methods, food handling practices, resource management, and food security. A soon-to-be released version of this system will also be collecting perinatal data such as weight gain of a mother, birthweight of infant, and breastfeeding initiation and duration.²⁶ Other features of the system will expand its usefulness in measuring impacts of food stamp family nutrition education programs and other nutrition education efforts in the Cooperative Extension system.

A behavior checklist, administered at entry and exit, is both efficient and effective. It streamlines the processes of administration, data collection, and data processing, while effectively assessing behaviors and perceptions that go beyond the limits of the 24-hour recall. Comparing the data from entry to exit shows the changes that occur during the participant's enrollment, thereby strengthening the evidence of EFNEP's impact. An additional benefit of the entry and

exit data collection method is the built-in assessment of the participant's educational needs.

The Virginia EFNEP

The Virginia Adult EFNEP Program operated in 26 counties and cities during 1996. The counties were Amelia, Appomattox, Arlington, Bedford, Charlotte, Dickinson, Lancaster, Lee, Louisa, Mecklenberg, Pittsylvania, Pulaski, Russel, Scott, Smyth, Suffolk, Tazewell, Washington, and Wise.²¹ The cities were Chesapeake, Hampton, Newport News, Norfolk, Roanoke, Richmond and Virginia Beach. Of these EFNEP units, nine were primarily in urban areas and seventeen were primarily rural.

Characteristics of EFNEP homemakers. The demographics of a typical EFNEP target population has been described with the help of the Virginia EFNEP Annual Report of 1996.²¹ Seventy percent of the families were WIC recipients, and 57 percent were on food stamps. Forty-six percent were African-American, 48% were white, 4% were Hispanic, and 2% were Asian or Pacific Islanders. Seventeen percent of the homemakers were teenagers (aged 19 years and under). Eight percent of these teenage homemakers were pregnant. Of the homemakers aged 20 years and over, 8% were pregnant or breastfeeding. The above description fits a typical EFNEP population year after year and hence can be used to describe the generic EFNEP target population.

In Virginia and in most states, each family may stay enrolled in the program for a maximum of 12 months, though some states use a shorter enrollment period. One-to-one

instruction was the teaching mode used almost exclusively during the first ten years of EFNEPs existence. However, small group teaching has been recommended as an effective alternative because of the higher cost and heavy time involvement of individual teaching.²⁷

Documented behavioral changes in the 1996 Annual Report on Virginia EFNEP were a good example of EFNEP impacts.²¹ Of the 6,375 homemakers worked with, 3,100 met the program objectives and completed both an entry and exit 24-hour dietary recall, which assessed the intake of the several key food groups and nutrients in the Food Guide Pyramid. The average number of servings consumed, increased from entry to exit for all five of the basic food groups (breads/cereals, fruits, vegetables, calcium/dairy, and meat/alternates). About 93% of all homemakers showed positive changes in food intake from entry to exit recall.²¹

The Food Practice Checklist (FPC) also recorded a high percentage of homemakers making improvement in behaviors such as planning meals ahead before buying groceries. One-third or more of the homemakers made improvements in the 12 basic food-related behaviors taught in EFNEP and assessed by the FPC. As a result of the improvements in nutrition-related behaviors, it could be expected that better health would result and there would be savings on healthcare cost in future years.²¹

Effectiveness of EFNEP. Indicators of EFNEP's effectiveness have included program completion, curriculum or subject mastery, and improvement in food-behavior practices and dietary intake by the participants.¹⁹ The 24-hour food recall has been used to monitor the dietary intake of EFNEP homemakers since the programs inception. Various questionnaires and progression models have been used to measure changes in knowledge, skills, practices and

behaviors. Given the value and limitations of such tools,²⁸ state and national evaluations of nutrient knowledge, food behaviors, and dietary intake have consistently shown positive gains. Most program leaders agree that justification for the continued funding of nutrition education programs should be based in large measure on the extent to which participants make needed dietary changes using the knowledge and skills gained.

Several studies in EFNEP have assessed long-term retention of knowledge, skills, and recommended behaviors.^{8,13,28} Program leaders have long recognized that, if desired changes were temporary and limited to the duration of participation in the program, it could be questioned whether or not the expenditure of resources was justified. Conversely, if the desired changes remained stable after the reinforcing effects of the nutrition education program were removed, the program would not only have been beneficial to the participants, but would have implications for others who were influenced by that individual.⁸

A major constraint that has limited longitudinal evaluations in EFNEP and has increased the difficulty of measuring habits and attitudes that take a long time to change, is the transient residence of the low-income families.¹ A number of unpublished and a few published studies have examined whether the food-related and dietary changes were retained after graduation from EFNEP. The general consensus was that the improvements in nutrition knowledge and behaviors persisted after graduation.^{8,13,28-30} The most striking results were noted in Michigan, where significantly higher behavior and practice scores were reported by homemakers in a five-year follow-up assessment than at enrollment or at graduation from a nine-month EFNEP participation period.¹⁰ While it would be presumptuous to attribute the improvements at follow-up solely to EFNEP, the point is made that these homemakers showed improvement both during and after

exposure to EFNEP.

Diet and Chronic disease

If the average American had been asked about the nutritional status of families in the United States in 1965, the response might have gone something like this: “This is the richest nation in the world. Except in very isolated instances, nobody goes hungry in our country.”⁶ A booming postwar economy, resulting in a rapid increase in material wealth, had lulled the vast majority of American citizens into assuming that abject poverty and hunger had died with the Great Depression of the 1930s. However, the reality was much different. The pervasive problems of hunger and malnutrition in the United States began to surface in the 1960s. It became apparent that hunger, malnutrition, and starvation were not confined to any geographic region, but appeared in cities and rural areas.

In the 20th century, the aging of the population and certain lifestyle habits brought about an increased incidence rate of chronic disease.³¹ Due to this increase in chronic disease incidence rates, the Public Health Service of the Department of Health and Human Services became increasingly interested in the relationship between diet and disease. In the 1970s, this interest began to focus on the ways in which dietary excesses and imbalances increase the risk of chronic diseases. With the publication in 1979 of *Healthy People: The Surgeon General’s Report on Health Promotion and Disease Prevention*, attention turned toward environmental and behavioral changes that Americans might make to reduce their risks for morbidity and mortality with

nutrition being a priority area.²

Chronic disease and premature death represent a major economic cost and healthcare burden on society.³² Costs of health care and foregone alternatives can be measured in terms of direct and indirect costs. Direct costs are the value of resources (personal health care, hospital care, physicians' services, other professional services, and drugs) that could be allocated to other uses in the absence of the disease. Indirect costs are the value of lost output because of cessation or reduction of productivity caused by morbidity and mortality. Morbidity costs include wages lost by people who are unable to work because of illness and disability and an imputed value for persons too sick to perform their usual housekeeping tasks. Mortality costs include the present value of future earnings lost by people who die prematurely.

Scientific evidence has proven that diet plays an important role in the onset of disease—contributing to increased illnesses, reduced quality of life, and premature death.³³ Although there is still much that scientists do not know about how diet affects health, there is significant agreement on the components of a healthy diet. In particular, diets high in calories, fat saturated fat, cholesterol, and salt, and low in fiber-containing foods (such as fruit, vegetables, and whole grain products) have been associated with increased risk for coronary heart disease (CHD), certain types of cancer, stroke, and Type 2 diabetes. Intakes of deficient or excessive levels of certain dietary components are also known to play a role in other health conditions, such as obesity, hypertension, and osteoporosis. Of the 10 leading causes of death in the United States, four are associated with diets that are too high in calories, fat, saturated fat, cholesterol, and sodium, or too low in fiber-containing foods.³³ These conditions, coronary heart disease, cancer, stroke, and diabetes, have accounted for over half of the deaths occurring each year in the United

States.

Coronary heart disease. Coronary heart disease (CHD) is commonly associated with diet, accounting for approximately two-thirds of all deaths from diseases of the heart. In 1995, 13.5 million Americans were estimated to have CHD,³⁴ with costs in the United States amounting to \$56.3 billion in a year.³³ A diet high in saturated fat and cholesterol, and low in of fiber, has been found to increase blood cholesterol levels, which is a risk factor in CHD.^{3,35} The general recommended intake of 20-35gms per day of fiber has been found to significantly reduce the risk of CHD.³⁶

Cancer. Over 500,00 people died of cancer in the United States in 1995, averaging nearly one person every minute. The American Cancer Society estimated that the overall costs for cancer amounts to \$104 billion each year, with \$35 billion in direct medical charges, \$12 billion due to lost productivity associated with illness, and \$57 billion due to lost productivity associated with premature death.³³ Colo-rectal cancer has been a major problem in the western world and is ranked among the three most common cancers in most of these countries.³⁷

The panel of the Executive officers of the World cancer Research fund estimated that 30-40% of all cancers was preventable by feasible dietary means. By 1996, this represented between 3 and 4 million new cases of cancer each year.³⁸ The panel judged that diets high in vegetables, and low in meat together with regular physical activity and the avoidance of alcohol may decrease the incidence of colo-rectal cancer by 66-75%.³⁸ In an extensive 1981 review of the avoidable risks of cancer, Doll and Peto estimated that cancer death rates in the United States could be reduced by as much as 35% by “practicable dietary means.”³⁹ Diet is one of the most plausible

environmental factors since the large bowel is in direct, prolonged contact with the residues and metabolites of digested food.⁴⁰ A series of studies have shown that vegetables, fruits, and intestinal bulk-generating cereal fiber such as wheat fiber, have an inhibitory effect on cancer, especially colo-rectal cancer.³⁹⁻⁴⁴ However, the precise dietary changes associated with a reduced risk of cancer remain controversial. Reductions in tobacco use and dietary modifications to reduce excessive fat consumption and increase consumption of fruits, vegetables, grain products, and dietary fiber hold the greatest promise as strategies to reduce cancer incidence and ultimately cancer mortality.⁴⁵

Stroke. According to the American Heart Association, stroke is the leading cause of serious disability, and accounts for half of all patients hospitalized for acute neurological disease.⁴⁶ More than 3 million people in the United States suffer from stroke-related disabilities at annual cost of \$19.7 billion which included \$16.9 billion in direct medical costs and \$2.8 billion in lost productivity.³³ Some of the observed reduction in mortality rates from stroke in the past two decades have been associated with improvements in the detection and treatment of hypertension.

Hypertension. Hypertension, or high blood pressure, is a common and important risk factor for coronary heart disease, stroke and renal disease which affects as many as 50 million people over age six in the United States. The American Heart Association⁴⁶ estimated that more than 33,000 Americans died from high blood pressure in 1991 and of these 58 percent were women. Hypertensive disease costs an estimated \$14.9 billion each year in direct medical expenses and \$2.5 billion in lost productivity.³³ Age-related increases in blood pressure, as observed in the United States, have been associated with excessive weight and physical inactivity, high sodium and alcohol intake, and low calcium and potassium intakes.⁴⁷

Diabetes Mellitus. Diabetes is the single leading cause of kidney disease and a risk factor for coronary heart disease and stroke. It is the seventh leading cause of death in the United States, directly causing 200,000 deaths in 1995. Diabetes affects 15.7 million people in the United States, of which only two-thirds (10.3 million) have been diagnosed.⁴⁸ There are two types of diabetes. Type 1 diabetes, also called insulin dependent or juvenile-onset diabetes, is characterized by an absolute deficiency of insulin, and is not diet-related. Type 2 diabetes, (formerly called non-insulin dependent or adult-onset diabetes) appears in mid-life, most often among overweight or obese adults, and can usually be controlled by diet and exercise. Of the estimated 10.3 million diagnosed cases of diabetes in 1997, 90-95% are Type 2.⁴⁸ The total economic costs of diabetes, including direct medical costs and the indirect costs of lost productivity associated with illness and premature death, were estimated at \$92 billion in 1997.⁴⁹

Obesity. Obesity is a major risk factor for many chronic diseases, such as cardiovascular disease, diabetes, high blood pressure, arthritis, and some forms of cancer. An estimated one in three or 58 million American adults, aged 20 through 74 years, are overweight.⁵⁰ The 8% increase in the prevalence of overweight in the United States indicated by the National Health and Nutrition Examination Survey II (NHANES II) and NHANES III data has been declared alarming. As part of *Healthy People 2000: National Health Promotion and Disease Prevention*⁴⁵, a national health status objective was set to reduce overweight to a prevalence of no more than 20% by the year 2000. However, the trend among Americans has been to move away from this objective. Although some variability by race, sex, and age has been seen, increases have been shown to occur in most segments of the American population, rather than being limited to certain subgroups. Factors such as dietary knowledge, attitudes, and practices, physical activity levels,

and to some extent, social, demographic and health behavior factors, have been identified as being responsible for the increased prevalence of overweight.⁵¹

Osteoporosis. Osteoporosis is a bone disorder associated with increased susceptibility to fracture of the hip, spine, wrist, shoulder, and ribs and has afflicted an estimated 25 million people in the United States.³³ Osteoporosis accounts for approximately 1.5 million new fractures each year, with associated medical charges costing an estimated \$10 billion, according to the National Osteoporosis Foundation. Osteoporosis primarily affects the elderly. The National Osteoporosis Foundation has estimated that half of all women over the age of 50 years are affected by osteoporosis, compared with one in every five men.⁵² By age 75, 90% of women will have experienced an osteoporosis-related fracture, as opposed to only 33% of men.

As the number of Americans over the age of 65 years grows, costs of osteoporosis will increase to \$60 billion by the year 2000, and to \$200 billion by the year 2040.⁵² Hip fractures are the most serious consequence of osteoporosis. About 20% of cases of osteoporosis result in death, and those who survive often have disability and loss of independence. Osteoporosis-related hip fractures have resulted in costs ranging from \$12.8 billion to \$17.8 billion per year for medical care, extended treatment facilities, and the value of lost productivity. Rehabilitation and institutionalization costs, at about \$5.1 billion to \$7.1 billion, have accounted for 40% of the estimated total economic cost of osteoporosis-related hip fractures. The value of lost productivity due to missed work has been estimated at less than 1% of total economic costs, while value of premature death has accounted for 35.3%. Initial medical costs for hospitalization and outpatient care, at about \$3.1 billion to \$4.3 billion have accounted for 24.4% of the total economic cost of osteoporosis-related hip fractures.⁵²

Research has suggested that, among the dietary factors, calcium may play one of the most important roles in preventing or delaying the onset of osteoporosis and that higher intakes of calcium could prevent 40-60% of osteoporosis-related hip fractures.^{53,54} The Recommended Dietary Allowance (RDA) for calcium is 800 milligrams per day for children age 10 years and under, 1200 milligrams or higher is recommended for ages 11-24 years, and for most adults age 25 years and over an intake of 1000 mgs or higher is recommended.⁵⁵ Pregnant and lactating women generally have requirements higher the recommended average intake. Calcium insufficiency due to low calcium intake and reduced absorption can translate into an accelerated rate of age-related bone loss in older individuals, hence the optimal calcium intake for each age group is recommended.⁵⁵

Other health conditions

Low birth weight. Maternal diet and nutritional status have a direct impact on pregnancy course and outcome.⁵⁶ A low-birth-weight infant is one of the common results when chronic under-nutrition prevails. An infant's birth weight is a major determinant of his or her potential for survival and future development. The sequellae of low birth weight are well known, including high rates of infant mortality and morbidity and increased costs of health care and future education of children. Low birth weight (less than 2,500 grams) occurs in about 7% of all live births and is the single greatest hazard to infant health.⁴⁵ Approximately three quarters of deaths in the first month of life and 60% of all infant deaths occur among low-birth-weight infants.

A strong consistent relationship between pregnancy weight gain and birth weight has been demonstrated.⁴⁵ Low maternal weight gain is considered to be a risk factor that can be prevented by intervention. Caloric intake is associated with pregnancy weight gain and pregnancy outcome. Although a pregnant woman can gain adequate weight regardless of the nutritional quality of her diet, the goal is to promote desired weight gain through sound dietary practices and a nutritionally sound diet. Prematurely born infants often require intensive medical care at birth including a possible transfer to a neonatal intensive care unit, resulting in a longer hospital stay and greater costs of hospital care.^{57,58}

Commonly occurring infant diseases that are avoided by breastfeeding. Previous studies have shown that breastfeeding decreases the incidence of gastrointestinal and urinary tract infections, lower respiratory tract illnesses, otitis media, and meningitis in babies.⁵⁹⁻⁶³ Breastfeeding has been shown to lower infant mortality and reduce the frequency of certain

chronic diseases such as Type 1 diabetes (insulin dependent diabetes), Crohns' disease, ulcerative colitis, and certain lymphomas.⁶⁴⁻⁶⁶ According to the Kaiser Permanente's Study on Breastfeeding and Health, the additional cost of a bottle fed baby over the cost of a breastfed baby in the first year of life is \$1,435.⁶⁷ It seems logical to conclude that an increase in breastfeeding rates can save lives and can have a significant impact on the national health care budget.

Food-borne illnesses. Each year, seven food-borne pathogens, *Campylobacter jejuni*, *Clostridium perfringens*, *E.coli* O157:H7, *Listeria monocytogenes*, *Salmonella*, *Staphylococcus aureus*, and *Toxoplasma gondii*, cause an estimated 3.3 million to 12.3 million cases of food-borne illness in the United States.⁶⁸ In 1995, USDA's Economic Research Service estimated that these food-borne illnesses cost society \$5.6 billion to \$9.4 billion in medical charges and lost productivity. U.S. Food and Drug Administration researchers have stated that 1-3% of all food-borne illness cases later develop secondary illnesses or complications that could occur in any part of the body, including the nerves, joints, and heart. These complications may be chronic and may cause premature death.⁶⁸

Summary of costs related to diet-related diseases and conditions

Taken together these health conditions cost society an estimated \$250 billion every year in medical charges and lost productivity.³³ The extent to which these costs might be reduced by an improved diet cannot be calculated precisely, but some researchers have estimated that proper diet might forestall at least 20% of the annual deaths from heart disease, cancer, stroke, and diabetes.³³ The rising costs of healthcare has become an issue of paramount importance. In 1989, healthcare expenditures comprised 11.6% of the gross national product.⁶⁹ Hence, a translation of the benefits

of EFNEP, in terms of dollars saved in health care costs, is needed. High medical costs and lack of health insurance increase the urgency of reducing disease risks of the low-income population. Results from a dietary intervention on cancer prevention has indicated that low-income women will make substantial dietary changes when convinced of health benefits through effective teaching methods.⁷⁰

Continued growth of national health expenditures (NHE) has heightened the anxiety of Americans regarding the future of healthcare spending. Expenditures in 1990 were estimated to have been \$666.2 billion, an amount equal to 12.1% of the Nation's gross domestic product (GDP).⁷¹ This spending, which doubled relative to GDP over previous years, occurred during a year in which 34.7million Americans were uninsured for healthcare and another 16.7 million relied solely upon Medicaid to pay for their care.

The U.S. population growth has been projected to slow from the average rate of 1.0% per year experienced from 1965 to 1990, to 0.6% per year from 1990 to 2030.⁷¹ In addition to the overall slowing of growth, the composition of the population is expected to change over the 40-year period. In 1992, 12.4% of the population was 65 years or over, and 5.3% was 75 years of age or over. By 2015, when the first of the postwar baby boom generation has reached age 65, those proportions will have increased to 14.6% and 6.0% respectively. As the baby boomers entered their seventies and eighties, those aged 65 and over will comprise 20.1% of the total population with those 75 and over accounting for 9.0%.⁷¹ Since the use of most health care services increases sharply with age, the change in the composition of the population will have a significant impact on health care spending.

Evaluation and Health Care

Evaluation of nutrition education efforts provides information to policymakers and program leaders about the operation, implementation, and effectiveness of a program and indicates whether the program is functioning as planned and whether it is having its intended impacts. A key problem in evaluating nutrition education programs is having to specify desired outcomes. For example, to gauge the effectiveness of a nutrition education intervention, the question arises as to whether changes in a target population's attitudes, knowledge, behavior and/or health status should be measured? Can it be assumed that a discernible change in a person's knowledge about the relationship between diet and health will result in appropriate changes in behavior?

Outcomes of a nutrition education program vary to the degree that they approximate or are closely related to the intervention and this, in turn, has both measurement and policy implications.²⁵ Outcomes that occur immediately after an intervention tend to have low policy relevance, but are more likely to show a larger effect as a result of an intervention. However, it is easier to make the argument that a causal relationship exists with such immediate outcomes. On the other hand, an outcome such as improved health status, cannot be measured for a considerable time after the intervention is conducted. However, it is these longer-term outcomes that have higher policy relevance. On the other hand, these distant outcomes are more likely to show only a small effect as a result of an intervention. It is considerably more difficult to demonstrate a causal link with the intervention, because many factors could have influenced the end result between the time the intervention program was administered and the time of measurement.²⁵

Cost-benefit and Cost-effectiveness

In the field of nutrition, there is growing interest in the use of cost-benefit analysis, which quantifies the effects of a program and evaluates them relative to costs. Few cost-benefit analyses of nutrition education programs have been conducted partially because of difficulties in collecting accurate program costs and benefit outcomes. Since its inception, EFNEP leaders have conducted a number of scientific studies to make appropriate policies and effectively allocate money and resources.¹⁹ However, the current study is one of the first CBAs conducted with EFNEP.

Continuous and careful evaluation provides the foundation for program operation and educational methods to be improved for greater cost-effectiveness and time-efficiency. Efficiency assessments have increased in the health-care reform area (including nutrition) in the last decade due to healthcare reform.⁷² Rossi⁷³ stated that efficiency assessments in social programs have their analog in the business world where costs are constantly being compared with profits. The idea of judging the utility of social intervention efforts in terms of efficiency has gained widespread acceptance in the area of nutrition education. As a result of inflationary pressures and resource constraints, nutrition educators must develop strategies that will optimize program success.¹⁶

The terms “cost-benefit analysis (CBA)” and “cost-effectiveness analysis (CEA)” refer to formal analytic techniques for comparing the positive and negative consequences of alternative

ways to allocate resources.⁷⁴ Cost-benefit analysis (CBA) has been one of the most widely recognized procedures for examining program efficiency, as it provides the most comprehensive consideration of the costs and benefits of intervention programs. The results of CBA are expressed in terms of net dollars. CBA uses a common metric of dollars and, hence, provides a mechanism to compare widely disparate programs in areas such as health, education, and the development of small businesses.¹⁶

A second procedure to determine the value of a program is to determine its cost-effectiveness.¹⁶ Cost-effective analysis (CEA) produces a measure of the costs involved in a program in relation to the program's desired effects. The costs are discussed in monetary terms, but the effectiveness is described in non-monetary terms. CBA tends to de-emphasize the non-monetary aspects of a program, while CEA has the ability to consider the non-monetary benefits and the monetary costs of a program.

The main difference between CBA and other methods of economic evaluation is that CBA seeks to place a monetary value on both the inputs (costs) and outcomes (benefits) of health care. This enables the (monetary) returns on investments in health to be compared with the returns obtainable from investments in other areas of the economy. Within the health sector, the attachment of monetary values to outcomes makes it possible to say whether a particular procedure or program offers an overall net monetary gain to society, in the sense that its total benefits exceed its total costs. Cost-effectiveness does not do this because it measures costs and benefits in different units.¹⁶ Devising ways in which complex outcomes of health care can be reduced to a single monetary measure is not easy and is the main reason that cost-effectiveness has been relied on more in the health care sector.⁷³ During the last decade, studies that focus on

cost-effectiveness or cost-benefit in health care have become increasingly prominent.^{57,75-77}

CBA is probably the most frequently used systematic evaluation method and clearly has the most fully developed theoretical foundation. Yet it is usually understood mostly by economists and is not well understood by the vast majority of those who make decisions on the basis of CBA and who generally are unfamiliar with the theoretical strengths and weaknesses of the methodology. Rossi⁷³ stated that the correct procedure for actually conducting CBA remains an area of considerable controversy. Since its introduction, methods and procedures of such analyses have undergone continual refinement and the area is still referred to as an "emerging field". Rossi⁷³ noted that it may be impractical or unwise to conduct CBAs in social programs.

CBA studies have a number of limitations that are particularly noticeable in the evaluation of health and nutrition programs. A typical problem is the lack of understanding in applying the underlying economic criterion.⁷⁸ To non-economists, CBA has become a generic term embracing a wide range of evaluative procedures that lead to a statement about costs and benefits relevant to project alternatives. It appears that the theoretical foundation is misunderstood and/or ignored by the vast majority of the people conducting CBAs in the health and nutrition education fields.

Part of this misunderstanding is seen in the notion of selecting the correct perspective of analysis for whom the CBA is being conducted. Rossi⁷³ stated that three perspectives may be taken: a) individual, b) program sponsor, and c) society. The perspective of the individual is more appropriate when individuals benefit most directly from the program. The program sponsor perspective is most appropriate where there are clear policy choices involving alternative programs that a sponsor may support, under fixed budgetary conditions where new revenues will

not be generated to fund additional projects. The third perspective, societal, is acknowledged as being quite difficult to conduct and some economists suggest that this perspective should not be attempted.⁷³

Another problem in the application of CBA methodology has been the lack of research establishing and quantifying the link between nutrition education programs and changes in health status. Recognizing this problem, Tolpin¹⁷ stated that more information on this issue is required, such as identification of health problems, statement of the consequences of nutrition programs, and assessment of the technology used for calculation of program costs and benefits. Tolpin¹⁷ added that it is necessary to quantify the relationship between the change in nutritional behaviors and the resulting change (if any) in health status.

Another apparent difficulty with CBA is that the techniques appear precise and objective.¹⁶ If users are not familiar with the underlying assumptions, the results can be easily misinterpreted and misused. The results are only as good as the analysis, assumptions, and valuations used and must be skillfully interpreted when used for decision making.

According to Haddix¹⁶, the greatest problem in CBA may be the assignment of a monetary value to human life or to the change in the quality of life that results from an illness or injury. In health, this issue has been particularly sensitive, since public health programs often have a mandate to reduce unnecessary morbidity and premature mortality. If CBA is used, the savings in unnecessary morbidity and premature mortality are converted to dollar value. From an ethical and moral perspective, human life is often considered priceless, so attempting to value it is difficult.

To avoid this controversy, investigators often use CEA rather than CBA. CEA forces policymakers to impute subjectively the value of a life without specifying a dollar value. It is important to remember that, since explicit dollar values are not assigned to lives in CEA, determining a value for cost per life saved requires the user of the study, rather than the analyst, to place some value on those lives. Thus, an advantage of CBA is that it makes explicit certain assumptions that remain implicit in other types of economic analysis.

In summary, cost-benefit analysis is the most comprehensive and theoretically sound form of economic evaluation, and it has been used as an aid in decision making in many different areas of economic and social policy in the public sector during the last 50 years.⁷⁹ The main difference between CBA and other methods of evaluations, has been that CBA seeks to place monetary values on both the inputs (costs) and outcomes (benefits) of health care. Among other things, this enables the monetary returns on investments in health to be compared with the returns obtainable from investments in other areas of economy.

Use of CBA in health programs. CBA was first proposed as a technique to assist public policy decision making in 1844 in the essay “On the measurement of the utility of public works,” by Jules Dupuit.¹⁶ In the United States, the application of CBA began when the congress passed the United States Flood Control Act of 1936, which declared that “benefits to whomsoever they may accrue” of federal projects should exceed the costs. The first guidelines for conducting CBAs were issued in 1952 by the Bureau of the Budget. Since then, CBA has been widely used as a policy tool by the federal government, particularly in the funding of public works projects and environmental regulations.¹⁶

Early efforts to quantify health benefits and the value of life in monetary terms date from the seventeenth century. However, the application of CBA in the health arena did not begin in earnest until 1966, when Dorothy Rice published her work on methods to estimate the cost of illness.¹⁶ During the 1970s and early 1980s, applications of CBA for medical decision making appeared frequently in the literature.^{80,81} The controversy over the valuation of health benefits, particularly the value of life, resulted in cost-effectiveness analysis being the most widely used technique for health care decision making. Recently, because of the inability of CEA to fully capture the benefits of improved health, interest in CBA has been renewed. Current efforts have been concentrated on refining benefits valuation methodology.¹⁶

CBA methodology. Basic steps for a CBA are as follows¹⁶:

Step 1): Determine the stakeholder and the study perspective. The identification of the costs and benefits will depend on who is included in the study perspective. Three such perspectives that have been identified are the following: a) *The individual, group or organization* that receives the program perspective often produces the highest benefit-to-cost assessment (because individual program participants benefit most from social programs) but may be of limited use to the decision makers due to differences in objectives. b) *The program sponsor perspective* focuses on the objectives of the funding organization, and is most appropriate when choices involve alternative programs under constrained budgets. From the sponsor's focus, benefits are usually costs that, as a result of the program, will no longer be required (i.e. saving money, reduce suffering etc.). c) *The societal perspective* is the most comprehensive of the three, but the most difficult to apply due to the numerous and subtle ways any given program can affect individuals and institutions beyond its target audience (i.e. from program externalities).

Step 2): Describe the program to be analyzed. CBA is usually thought of as a procedure for aiding decision-makers in allocating scarce resources. This implies a choice between two or more programs, ideally before they are implemented. Thus, a thorough description of the programs, including objectives, delivery methods, and other pertinent information, needs to be constructed prior to analysis.

Step 3): Develop a list of program costs and benefits. A meaningful cost benefit analysis requires a comprehensive list of program costs and benefits. These lists would be constructed using a number of different sources, depending on the study perspective. Sources of costs and benefits would include the program description, professional literature dealing with similar programs and problems, economic theory, introspection, and scenarios developed in the initial phase of the analysis. To get a complete picture of the program, the list of program costs and benefits should be compiled with the active input of both the decision maker as well as those who have the responsibility for conducting the program.

Costs. Examples of direct costs would include personnel, facilities, equipment and materials, and other costs. Personnel costs would include all of the human resources required for the program and encompass such items as salaries and fringe benefits for specialists, managers, clerical and secretarial staff, and paraprofessionals. Facilities refer to the physical space required for the program. Equipment and materials are the furnishings, instructional equipment and other materials used for the program, whether covered by project expenditures or donated by other entities. Other costs refer to all other items that do not readily fit into the above categories such as travel, cost of training session, etc.

Indirect costs are resources not actually budgeted for or assigned to the program, but nonetheless represent a withdrawal of resources from the economy that allow the program to operate. Examples include time lost from work while participating in a program, childcare costs, and increased expenditures for foods or medication. Indirect costs are often distinguishable as

being borne by the recipient of the program and as such they may represent opportunity costs to the individual.

Program benefits. Direct benefits are the primary outcomes or consequences of the program that accrue to participants directly involved in the program. In this study, direct benefits would refer to money saved in by delaying or avoiding the onset of certain diseases. Indirect benefits are the secondary outcomes or consequences of the program. These benefits deal with improvement in productivity, which lead to lowered costs in health care. The human capital approach is usually used to determine indirect costs. This approach takes the monetary value gained in the workforce and equates it to the benefits of avoiding or delaying diseases.

Step 4): Determine the measures for costs and benefits. There are many ways to measure costs and benefits. Costs are usually straightforward; benefits are generally more complex. Those that can be easily monetized (valued in dollars) are referred to as tangible; those that cannot be easily be monetized are referred to as intangible. The time horizons, over which costs and benefits have occurred or are expected to occur (according to the study perspective) need to be indicated.

Costs. Monetary values for direct cost would be determined by using project expenditure records and documenting actual costs (market prices) and estimated costs (shadow pricing) for these items. Personnel costs would be obtained from normal payroll or expenditure accounts. Facility costs can be measured by using the current market price of the rented or leased space by the program, or by estimating what the cost would be for similar space. Equipment and material costs and other costs can be determined by using a combination of current market prices and shadow pricing (from agency records). Indirect costs are those borne by the recipients of the program, such as costs incurred to attend group meeting, travel, child care costs, wages lost from work, etc.

Benefits. First order direct outcomes of knowledge acquisition in EFNEP have been routinely measured using an entry and an exit test developed specifically for the adult curriculum. Improved diets have also been determined by pre and post 24 hour recalls of food consumption that is routinely conducted as part of the program. The economic cost of disease would help identify the savings in health care ensuing from a better diet and more positive food related practices as a result of EFNEP participation. Estimates of the intangible impacts of improved health status have been attempted previously using the human capital approach.^{83,84}

Step 5): Determine the analytic measure of the study. The analytic measure that would be generated by the CBA are the benefit cost ratio, internal rates of return and net present values. The best analytic measure to use would depend on the type of analysis being conducted, i.e. single or multiple programs and the type of information conveyed to the decision-maker. Benefit cost ratio gives the benefits obtained per dollar of cost. When benefits and /or costs extend over more than one year, they need to be valued in current dollars by reducing them using the social discount rate. In this situation, the benefit cost ratio gives the discounted benefits obtained per dollar of discounted cost. The internal rate of return (IRR) can be defined as the social discount rate that would make costs and benefits equal over the life of the program. In essence, the IRR is the break-even social discount rate. Instead of specifying the social discount rate, the IRR method is designed to determine the break-even rate of the project. This value can then be compared with either federally mandated discount rates or compared to the return rates obtained by other projects. Net present value (NPV) discounts all the future yearly net benefits (total benefits minus the total costs) and sums them to arrive at a value that reflects all future net benefits in today's dollars. A NPV greater than zero indicates the program is generating real ("deflated") returns beyond costs. This measure is highly flexible as it allows the discount rate to vary over time.

Step 6): Specify the discount rate or time preference for costs and benefits that occur in the future. Discounting reflects the time value of money. Time affects the monetary valuation of program outcomes and costs, because individuals generally weigh benefits and costs in the near

future more heavily than those in the distant future. To compute the net present value, it is necessary to discount future benefits and costs. A dollar that an individual receives this year is worth more than a dollar that will be received 10 years from now. This is because this year's dollar can be invested, so that in 10 years' time it would be worth more than a dollar. Using a discount rate in an economic analysis provides a method of adjusting the value of receiving benefits today versus receiving benefits in the future or of incurring costs in the present versus incurring costs in the future. Several economic analyses in recent years that have focused on disease and injury prevention-effectiveness, health care intervention, and public health services have used a 3% or a 5% discount rate. The choice of a discount rate has been a controversial issue that could have significant impact on the results of the analysis

Step 7): Adjusting for inflation. When an economic analysis is done, data on costs are often collected from years besides the base year of the evaluation. To ensure that all costs are comparable and that costs can be weighed against benefits that occur in the same time period, it is necessary to standardize the costs to one time unit. Cost data reported for previous years can be adjusted for a specific base year by using either a Consumer Price Index or a relevant sub-index.

Step 8): Evaluate results with sensitivity analyses. In the process of determining outcomes, many uncertainties are faced and assumptions are made to deal with the uncertainties. Sensitivity analysis uses "what if" scenarios to assess the impact of assumptions before final conclusions are made regarding the effectiveness of the various interventions. Sensitivity analysis can demonstrate the dependence of a conclusion on a particular assumption, demonstrate that an assumption does not significantly affect a study's conclusions, and can identify issues which deserve further research attention.