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POLICY EVALUATION USING COST-BENEFIT ANALYSIS: EMPIRICAL RAMIFICATIONS FOR TWO POLICY ISSUES

Elizabeth Crouch

Clemson University, ecrouch@clemson.edu

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POLICY EVALUATION USING COST-BENEFIT ANALYSIS:
EMPIRICAL RAMIFICATIONS FOR TWO POLICY ISSUES

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy
Policy Studies

by
Elizabeth Crouch
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Accepted by:
Dr. William Bridges, Committee Chair
Dr. Holley Ulbrich
Dr. David Lamie
Dr. Lori Dickes
Dr. Ken Robinson

ABSTRACT

Using two distinct health policy issues my research examines the relevance and ramifications of using cost-benefit analysis (CBA) to demonstrate real-world impacts of the policies. My dissertation discusses how these two situations represent particular challenges to cost-benefit analysis. The challenges have specific implications for how scholars, agencies, and government entities should use CBA to evaluate policies. Specifically, my research finds that by separating CBA into four different approaches, a much more complete, and less assumption-laden, CBA can be accomplished.

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CHAPTER ONE

INTRODUCTION

THE FOUR TYPES OF COST-BENEFIT ANALYSIS

My research explores the potential policy repercussions of using cost-benefit analysis (CBA) to evaluate two social issues: the Expanded Food and Nutrition Program and child immunization. The primary objective of my research is to define several different approaches to CBA. Hopefully these different approaches will provide policy analysts “new and improved” insights into CBA, and these insights will result in better policy evaluations and decisions.

Policy evaluation is a process that involves identifying the purposes of a program, gathering information on the program’s costs and outputs, and evaluating the program through various statistical techniques. Historically, policy evaluation has been based on anecdotal evidence and thus, results have varied based on the bias of the evidence (Anderson, 2006). In the last few years, however, systematic evaluation, which uses social science methodology to measure the effectiveness of a program, has been increasingly popular. Many different types of systematic evaluation have been done (Rajgopal, 2002). The experimental design method, where program data are collected before and program implementation, is a highly valid method. However, this method may not be feasible because of the expense and time investment required. Thus, the quasi-experiment method, where the treatment group is compared to a “control” group with similar characteristics, is often used.

Rossi, Lipsey, and Freeman (2004) suggest four kinds of assessment that may be appropriate at different stages of policy evaluation: the five-tiered approach, needs assessment, cost-benefit analysis, and impact evaluation. My research utilizes CBA as one of the four kinds of assessment suggested by Rossi, Lipsey, and Freeman.

The Role of Federalism in Policy

It often makes more sense to examine policy at the state level before implementing and evaluating policy at the federal level. The implementation of policy at the state level and the evaluation of the given policy can provide a plethora of information to policymakers. States may be 1) an indicator for social problems or issues, or 2) a laboratory for implementation of a policy in order to determine whether it will work at the national level. Implementation at the state level can act as a laboratory where policy evaluation components are built into new policies to increase the ease of evaluation.

State level data may provide a better indicator of the magnitude of a problem in various socio-demographic levels than federal level data, which may provide a weaker signal. Inman and Rubinfeld describe economic federalism as “the most decentralized structure of government capable of internalizing all economic externalities,” which grants justifications to decentralization to the lowest levels of government. Economic federalism further highlights the critical importance of economic efficiency. Inman and Rubinfeld argue that relatively small communities may be able to provide many public services

more efficiently and determine the needs and wants of the public better than any other level of government. Oates (1994, p130) puts it even more clearly by arguing that “tailoring outputs to local circumstances will, in general, produce higher levels of well-being than a centralized decision to provide some uniform level of output across all jurisdictions.”

With regards to policy implementation and evaluation, science-based research and evaluation does not imply that there should be a national program that is the same from state to state. State level research can help 1) identify states that are successful, and 2) pair those states with other states that are similar in culture and participant demographics. These pairings could refine provider and administrator education and performance, leading to improved health outcomes.

Pressman and Wildavsky have noted that federalism can complicate implementation. For many national policies, successful implementation requires coordination and cooperation between national, state, and local agencies. There have been a number of policy diffusion models that have examined the role of states as a laboratory for policy innovation.

Ethical ramifications of policy analysis

As my or any other research draws conclusions about what the “correct” policy decisions should be, it is important to emphasize that researchers have an ethical obligation to the policy community and to consumers. Errors are always a reality, but

scholars should take every precaution to avoid pitfalls and maintain ethical integrity. One of the major potential benefits of this research is that the policies examined here could be used to help lift individuals out of the poverty cycle. The ethical obligation of researchers is to err on the side of not making a type I error. A type I error would say that a policy is ineffective when it has actually been very effective in improving the lives of the nation's citizens. It is perhaps better to err on the side of a type II error: stating that the policy is effective when it is not.

Compensation from the Perspective of Three Ethical Schools

The biggest ethical issue associated with free markets in providing basic needs to all citizens is equity. Democratic self-government, as in the United States, is designed to try to be fair with hopes to also be efficient. When a project or program is implemented, some individuals will be made worse off and some better off. When should compensation be given to those made worse off by the implementation of social policy? The three ethical schools all provide unique reasoning and answers.

Duty (Rule) Based Ethics:

Kantian ethics teaches us that we have a duty to do no harm, to only follow those actions that we would be willing to have universalized as general principles. These actions should be used to treat other people as ends in themselves, not as means to an end. Thus, in public life, the rule of law (such as tort law, eminent domain law, social

security law, workman's compensation law, and many other types) should be followed to ensure that people are duly compensated for any harm they incur when a change occurs (Sterba, 1998). Social contracts theorists would argue that compensation should be paid to those whose welfare has been reduced under the rule of law. Rawlsian ethics asks us to "hide behind the veil of ignorance" in making significant policy choices, ensuring that society's rules provide equality of opportunity and freedom. John Rawls argued that "justice is the first virtue of social institutions" and thus it is more important than generosity or compassion. Much earlier than Rawls, Plato wrote on the importance of justice not just for individuals but also for government. John Rawls argues for strict egalitarianism and equality of outcomes. He argues that we do not deserve rewards for our behavior just because we were naturally given attributes that others may not have (Rachels, 2003). Compensation should be paid to those whose welfare is reduced by the program simply because that provides or restores equality of outcomes.

This duty-based ethics follows the rule of the difference principle. This principle states that social and economic inequalities, such as those caused by program changes, should be arranged so that they yield the greatest benefit to the least advantaged person. Kantian ethics also calls for intergenerational equity. We have an obligation to make sure that the next generation is not made worse off by our actions. Duty-based ethicists argue that all generations should have the same rights to resources because of the discounting of the future. CBA is not particularly intergenerational.

Virtue-Based Ethics:

Traditional virtue-based ethicists such as Aristotle claim that our goal should always be to do the “right thing.” In other words, our motives for performing behaviors matter. Virtue-based justice says that individuals who have been wronged should be compensated. To these ethicists, the virtue of justice means trying to correct some previous wrong. Edmund Burke believed that government officials must be motivated outside of their office and must exhibit courage (Sterba, 1998).

The problem with virtue-based ethics is that virtues often conflict. If the measure is loyalty and the policymaker’s constituents are harmed (through paying higher taxes) when compensation is made to others, then the policymaker would be lauded for fighting compensation in the interest of his or her constituents. But if, instead, the measure is justice, praise would go to the policymaker who supported due compensation.

Outcomes-Based (Utilitarian) Ethics:

Utilitarian ideals are calculating, impersonal, and purely consequentialist. There is no place in utilitarianism for “people’s idiosyncratic preferences, histories, attachments, loyalties, or personal commitments” (Goodin, p. 8, 1995). A classical utilitarian would argue that if an action results in the greatest good for the greatest number, then it is the right action to follow. Utilitarians would claim that, “right actions are the ones that produce the most good” (Rachels, 2007).

John Stuart Mill and Jeremy Bentham believed that the goodness of outcomes is determined by the degree to which they secure the greatest benefit to all concerned. If

compensation to individuals made worse off by implementation of a project is going to raise taxes for the majority of people, utilitarians would argue that the project should not be undertaken based on the compensation principle. If the greatest benefit to all people is to be able to rely on the government to make stable and predictable choices, but the government makes unpredictable decisions that hurt people, then those who were made worse off deserve compensation.

Goodin follows a utilitarian, outcomes-based approach to compensation and redistribution. He argues that the practice of compensation is independent of any judgment about the justice of the previous distribution pattern. He states that, “If we think it is morally desirable to ensure that people are able to plan and organize their lives in a sensible fashion, we must be systematic about both compensation and redistribution” (Goodin, p. 227, 1995). Essentially, Goodin argues that people take into account the current set of laws and systems when they make plans. He believes that people’s ability to plan their lives is morally desirable. In certain situations, people should be able to count on compensation if they are harmed. Compensation should be swift and certain so that recipients can carry on their plans with minimum disruption from changes in policies and programs. If the changes that occurred to reduce welfare were predictable and expected, then Goodin believes people should not be compensated (Goodin, 1995).

Distributive Justice in Static and Dynamic Situations

Distributive justice with dynamic efficiency requires equality of outcomes. Isbister (2001) asks: To what does moral equality entitle us? With regards to static efficiency, he argues that we should provide equality in opportunities, but he realizes that over time this equality in opportunities will lead to unequal outcomes, which will then again lead to unequal opportunities. He says, “Even if a state of perfect social justice could be achieved – that is, perfect equality of opportunity, it would be unstable; over time it would descend into a state of unequal opportunity” (Isbister, p. 8, 2001). In the little red hen example, if the other animals are too lazy to help, then they should get less bread than the hen because they wouldn’t help her make it. But then the next generation may be unable to help the hen make bread, as they are too weak and unhealthy due to the decisions of their parents. Thus, Isbister illustrates that if we insist upon equality in one dimension, we will inevitably get inequality in another dimension. When people are given equal opportunities, they end up with inequalities in wealth because each has different personal attributes that help or hinder success. Isbister argues that there is a need for government intervention to provide goods and services when the private market fails (Isbister, 2001).

Another problem of distributive justice is determining how much people are willing to pay for something. The contingent valuation method used in traditional ex-ante cost-benefit analysis poses hypothetical questions to people about how much they would be willing to pay to prevent the loss of some particular object. This is troublesome as

contingent valuation has been used legally to measure the actual loss involved and an indication of the culpability of the party (Sen 2000). Moreover, the formal theory of traditional ex-ante cost-benefit analysis assumes that each individual has well-defined preferences. This is not necessarily true. As well, traditional ex-ante cost-benefit analysis weighs each individual's preferences equally. It gives large weight to high-income individuals who have a greater willingness to pay to accept or disregard policy changes. The problem with this is the neglect of distributional issues, both in the form of attaching the same weight on everyone's dollars and in not attaching any weight to distributional changes resulting from the program or project. In addition, it is difficult to get people to reveal what they are really willing to pay, especially when the question is not followed by an actual demand for that payment.

Benefits and costs of projects are often only given to individuals with standing in society. The poor are often overlooked. The benefits described in traditional ex-ante cost benefit analysis are often couched in general terms such as "growth," with negative issues such as environmental issues and congestion being overlooked. Often, analysts overestimate benefits and underestimate costs. This is particularly true in the realm of policy. Mistakes are made as analysts try to measure the benefits and costs of goods that are not traded on the open market. It is often highly difficult to predict the ramifications of a project. It is impossible to foresee the future and hard to predict how individuals will respond to change. There may be random effects from a project, and thus broad inference must be made.

Cost-benefit analysis

Cost-benefit analysis is based on the economic concept that optimal decisions require the decision maker to determine the best use of limited resources among competing uses (Levine, 1968). The main purpose of CBA is to assist in social decision-making and to facilitate the best allocation of society's resources. However, every decision presents different issues and implications for how policy analysts use CBA. Therefore there is not a "one-size-fits-all" CBA, but actually an array of CBA approaches.

The following objective function is often used as a starting point:

$$BCR = \frac{\sum_{t=1}^r \frac{B_t}{(1+r)^t}}{\sum_{t=1}^r \frac{C_t}{(1+r)^t}}$$

where BCR is the benefit cost ratio, B_t is the benefits accrued from the project or policy, C_t is the costs accrued from the project or policy, and r is the interest rate or chosen social discount rate. The policy or project with the highest BCR is chosen.

The objective function basically implies that an essential step of CBA is to place monetary values on inputs (costs) and outcomes (benefits). The attachment of monetary values to outcomes makes it possible to use economic evaluation methods to determine whether a particular program or policy offers an overall net gain to society in the sense that its total benefits exceed its total costs, (*i.e.* $BCR > 1$).

History of Cost-Benefit Analysis

CBA first became widely used in the United States during the Great Depression. Under Franklin D. Roosevelt, massive public works programs were undertaken in an attempt to spur economic growth. The National Planning Board, a board set up to implement the New Deal, hired economists to study the economics of planning public works. These economists recommended that the economic benefits provided by public works projects be measured in monetary terms where possible (Hufschdmit, 1988). The question was how to value the social worth or the value of each of the individual projects, and CBA offered a more satisfactory test of economic worth than had previous methods.

Agencies routinely tried to calculate costs and benefits of their activities in order to gain continued funding by Congress, especially since the federal court system had begun mandating cost-benefit analysis in the 1960s. In 1936, the Flood Control Act specified that projects should be undertaken if “the benefits to whomsoever they may accrue are in excess of the estimated costs.” The work done by the United States federal government in the ‘40s, ‘50s, and ‘60s extended the application of cost-benefit analysis beyond water resources to many other public investment programs and to other countries.

The 1950s saw the first major economic critiques of CBA (Hufschdmit, 1988). The problem is that no formal guidelines had been put forth for conducting analyses, nor had there been precise definitions for benefits and costs. For example, is it better to perform a CBA of a whole policy or to define all the specific projects involved, do CBA

for each project, and then “add up” the CBAs for each project to get the entire policy CBA. Is the additive form even appropriate for CBA?

Since a 1981 presidential order, federal agencies have been required to use CBA to evaluate past and future government regulations. Current governmental procedure to evaluate regulations is based on private costs, which have no basis in modern applied welfare economics (Hazilla and Kopp, 1990). As well, instead of using social costs measured as compensating variations, as the theoretical literature proposes, federal agencies use annualized engineering costs and consider operating and maintenance expenses as equivalent to social cost. The assumptions underlying CBA must be understood as well as the history of the use of CBA.

CBA Assumptions and Their Repercussions

CBA is a method of reaching policy decisions by comparing the economic costs of doing something with its benefits; it is rooted in traditional neoclassical economics. It sounds simple, but, in practice, it can easily become complicated and is much abused. With careful selection of the assumptions used in CBA, it can be made to support or oppose almost anything. This is particularly important when the decision being contemplated involves some positive or negative externality that is not fully reflected in the market price. Institutional economists criticize neo-classical economists for neglecting institutions that affect political problems, enforcement problems, and transaction costs that would arise when implementing a policy. These issues are almost

entirely overlooked when conducting traditional cost-benefit analysis. *I will identify each assumption made in cost-benefit analysis and demonstrate the flaws that are inherent when neo-institutional economics is not considered.*

Cost-benefit Analysis Assumption: Individuals are rational, self-interested

Socially Formed and Altered Preferences:

CBA has foundations in public choice theory, which begins with the critical assumption that all individuals are driven by the goal of utility maximization (Buchanan, 1984). One of the first assumptions of cost-benefit analysis is that the individuals involved are rational, self-interested individuals with stable and well-defined preferences. This is not necessarily true. Contrary to a simplistic understanding of neoclassical economic assumptions, self-interest does not necessarily mean selfish. Some economic models in the field of behavioral economics assume that self-interested individuals behave altruistically because they get some benefit, or utility, from doing so (Ariely, 2009). As well, behavioral economic literature recognizes that individuals often make decisions that “satisfice” (satisfying utility preferences), rather than maximize their utility.

Individuals have preferences and goals, but their preferences and goals are influenced or constrained by others’ behavior; Schelling refers to this type of behavior as contingent behavior (Schelling, 2006). Social norms are the behavioral expectations and cues within a society or group. This sociological term has been defined as "the rules that

a group uses for appropriate and inappropriate values, beliefs, attitudes and behaviors. Individuals conducting or evaluating cost-benefit analysis will take into account the preferences of others and will be just as influenced by social norms as market norms such as prices and wages. Furthermore, the preferences of individuals are subject to change over time along with the preferences of the people with whom they associate (Ariely, 2009). While individuals may exhibit a preference for a certain policy or program to be enacted at one point in time, that preference is just as likely to change over time as it is to remain stagnant. This propensity to change challenges the foundation of cost-benefit analysis. Preferences may change during the course of a project and may, in fact, be influenced by the project itself. Thus, preferences are endogenous.

Cost-Benefit Analysis Assumption: Individuals Identify All Alternative Projects

Availability Heuristic:

Individuals do not have the cognitive abilities or the time to evaluate all options when identifying alternative projects. The assumption that individuals identify all alternative projects does not hold with neo-institutional economics. The availability heuristic is a predisposition of people to base their judgments on the basis of information that is readily available (Matzavinos, 2001). Often, analysts overestimate benefits and underestimate costs. This is particularly true in the realm of policy. Analysts make mistakes as they try to measure the benefits and costs of goods that are not traded on the open market.

Bounded Rationality:

Bounded rationality is a theory of human decision-making that assumes that people behave rationally, but only within the limits of the information available to them. Humans make individual decisions that may appear to be irrational. The problem here is that neither decision-makers nor analysts can handle comparisons among a large number of alternatives, because resources and cognitive constraints exist. Thus, the bounded rationality assumption of CBA is highly implausible. Williamson (1981, 553) argues that, “Bounded rational agents experience limits in formulating and solving complex problems and in processing information.” Without the ability to optimize utility in every decision, individuals develop a set of second-best decision rules that result in their making constrained decisions.

Credible Commitments:

Costs and benefits are evaluated by looking at the consequences of decisions; this criterion allows the consequences to include happiness and fulfillment of desire as well as whether certain actions have been performed. The problem with this approach is that there is a lengthy tradition of taking a narrow view of what can count as consequences. In addition, explicit valuation of all costs and benefits is difficult to conjecture; it involves full explanation of the reasons for making a decision. Public decisions need to be explicit as the demands of accountability apply to choices made by project and program planners as well as those overseeing implementation (Sen, 2000), so the discrepancy between what is needed and what is realistic can be vast.

Montzavinos discusses how economic growth occurs when governments establish formal institutions that foster a credible commitment (p 245). One of the inherent issues with policy implementation is that it is difficult to do. Administrations change and the intended effects of the policy, as forecast by cost-benefit analysis, may not have time to come to fruition. There are limits to the ability of governments to make credible commitments (Stiglitz), which is sometimes a reason for policy failure.

Cost-benefit Analysis Assumption: Listing the physical impacts of the alternative projects; predicting the impact of the project during the life of the project

Meta-Preferences: Formal and Informal Institutions (Social Norms) Matter:

An individual makes choices in a context of underlying meta-preferences, or preferences about preferences – such as ethical values. As Mantzavinos (2001) discusses, these meta-preferences influence choice sets. North (1990) states that the consequent institutional framework limits the choice set of the actors. Mantzavinos (2001, p.83) defines institutions as the “rules of the game” and organizations as “corporate actors.” Individuals and groups of individuals establish solutions to common social problems and realize social objectives through the institutional environment. There is a decrease in costs when individuals have common rules to adhere to (Ostrom, 1990).

Given the cognitive constraints of individuals, Hayek (1960, p.66) argues that rules (institutions) are the “device we have learned to use because our reason is

insufficient to master the full detail of complex reality.” Hayek also states that both the formal and informal institutional environments complement each other to provide a foundation of rules, norms, values, and conventions that society uses to manage and achieve its goals and objectives.

According to Mantzavinos (2001), the informal institutional environment of a society is composed of conventions, moral rules, and social norms. These institutions emerge and persist for different reasons and in different ways, but in all societies the informal institutional environment is equally important to, if not more important than, formal institutions. However, rather than assessing their relative importance, it is more instructive to uphold that formal and informal institutions complement and provide structure for each other.

Path Dependency:

Path dependency means that where you have been in the past determines where you are now and limits your options for where you can go in future. It refers to the way in which apparently insignificant events and choices can have huge consequences for the development of a market or an economy. Path dependency makes it difficult to consider all unimplemented projects.

Cost-benefit Analysis Assumption: Choosing the social discount rate and complete property rights.

Time inconsistent Preferences and Asymmetric Information:

Time-inconsistent preferences occur when individuals put too much weight on the present when evaluating the costs and benefits of action (or inaction). The social discount rate brings all past and future costs and benefits to the present. Choice of the social discount rate for cost-benefit analysis is crucial. Subjectivity of the discount rate leads to great inconsistency in the analysis of the efficacy of programs or agencies. Because the analyst chooses the social discount rate, CBA is very susceptible to the bias of the analyst.

Property Rights:

Property Rights are essential to a market economy. For a person to trade, he or she must know that the person selling the good or service owns it and that ownership will pass to the buyer. The stronger and clearer the property rights, the more likely it is that trade will take place and that prices will be efficient. If there are no property rights pertaining to something, there can be severe consequences such as overuse of a common resource or negative externalities.

When conducting a CBA, researchers typically base decisions on the neoclassical assumption that property rights are well defined and complete. Neo-institutional economics recognizes that there will always be incomplete property rights (Barzel, 2002).

Actual property rights can be very different from perceived property rights. For example, an individual may have the legal rights to property while not holding the ability to capitalize on the property. In other words, the individual does not have the ability to consume the property directly thus must consume it indirectly through exchange (Barzel, 2002).

Pros and Cons of Cost-Benefit Analysis

In my research, I used secondary data to conduct CBA. While secondary data is often accessible and free to the general public, there are numerous challenges in using it. It took long time periods for me to acquire secondary data. Federal data were obtained, but not all that I needed were online or in readily readable formats. The secondary data collected for my research were also two to five years old. It is difficult for policy-makers to base decisions on research conducted with “old” data to solve current problems (Young and Ryu, 2001).

There were advantages to using secondary data for my research. Data collected for one purpose was used to answer questions about another research topic. As Young and Ryu note, government-collected secondary data were reliably collected and validated. As well, the fact that data were collected for a different purpose reduces the risk of it being tainted by researcher bias.

Need for Other Types of Analysis besides Cost-Benefit Analysis

CBA is sometimes inadequate to meet the needs of policy analysis. There is often a need for other types of policy evaluation in order to fully explain the policy implications of an issue. The use of qualitative research methods to evaluate a policy can provide unique and valuable insight that would otherwise be ignored with quantitative research. Qualitative research helps us focus more on the individual rather than just the collective. Qualitative research methods are often used “when the scientist is interested in obtaining detailed and rich knowledge of a specific phenomenon” (Miller and Salkind, p. 143, 2002). Narrative research, ethnography, case studies, phenomenology, and grounded theory research are all methodologies and techniques of qualitative research that can be used to demonstrate the actual reality of the interviewee in a way that cannot be stated in numbers or literal text (Miller and Salkind, 2002). Each of these five inquiry approaches provides a systematic way to conduct qualitative research. Miller and Salkind argue that qualitative research methods are not just another way to answer the same research question that could be answered by quantitative research. Rather, qualitative research methods offer a unique approach to answering new and different types of questions.

From qualitative research information, researchers gain a stronger comprehension of the audience for which a program is designed. Qualitative research may involve collecting stories of experiences, understanding the experiences surrounding a phenomenon, developing a theory grounded in data, describing or interpreting a culture

or single case, or developing an in-depth study of multiple cases (Miller and Salkind, 2002). The type of closed-ended questions used in quantitative analysis does not address all potential costs and benefits that could become evident if qualitative research were conducted.

There have been many insightful studies of policy formulation and evaluation that have engaged in little to no statistical analysis. Quantitative analysis is not always as precise as we might hope when it comes to statistical technique, data quality, or reliability of results. Anderson argues that the idea that “policy analysis is worthwhile only when it involves the analysis of quantitative data with statistical techniques... should be resisted...there is no reason to assume that if something cannot be counted, it does not count” (Anderson, 2011). The quality of the analysis, as well as the cautious and thorough use of the data, is more important than whether or not quantitative analysis is being used (Anderson, 2011).

Some policy initiatives have not lent themselves to scrupulous quantitative analysis. Numerous attributes of social welfare, as well as economic regulatory policy, are subject to such difficulties. The data gained through case studies, interviews, and questionnaires often contain precious information which would not otherwise have been provided to researchers (Anderson, 2011). At the same time, researchers using interviews and case studies must be cognizant of the need to not ask questions that would bias responses. Furthermore, the people being questioned may have their own agendas and biases, so data gained from qualitative research must be checked against other sources and used with care just as with quantitative research.

One of the first works published in the field of policy implementation was qualitative research, a case study done by Pressman and Wildavsky: *“Implementation: How Great Expectations in Washington are Dashed in Oakland; Or, Why It's Amazing that Federal Programs Work at All”* (1973). Federal policy was initiated in Oakland, California, to improve economic development. The authors examine the problems that the EDA had in the Oakland case, analyze what happened to cause the program to mostly fail, and provide insight into other policy implementation strategies. Their seminal work is a great example of how qualitative research methods can be used to test and develop new theories, provide contextual analysis of events, and deliver information to either enforce current generalizations or demonstrate deviant examples of our theoretical generalizations (Anderson, 2011).

Qualitative research provides an avenue to test theories and models and generates richer and more fully developed descriptions of the target population (Brannen, 1992; Thomas, 2006). Scholars often discuss the large divide between quantitative and qualitative social science methodologies. In order to bridge this gap, numerous scholars have advocated the use of quantitative and qualitative methods in tandem. Methodological triangulation – where one method is used to complement the other – has been touted since the 1970s (Denzin, 2004). The use of both qualitative and quantitative methodology seems to give the most effective interpretation of the research. For example, the majority of quantitative interviews typically contain at least one open-ended question. Phone interviews could be conducted with qualitative research techniques such as probing in order to gain more specific information than a typical quantitative interview

would garner (Grim, Harmon, and Gromis, 2006). Incorporating qualitative research into policy analysis makes the results easier for a lay-person to comprehend. Some stakeholders are more likely to respond to numbers while others are more likely to respond when presented with qualitative interpretation (Grim, Harmon, and Gromis, 2006).

A Unique Approach to Cost-Benefit Analysis

Historically, no research has considered CBA as consisting of four cases. A primary objective of my research is to define and consider four types of CBA: 1) Traditional CBA Ex-Ante, 2) Traditional CBA Ex-Post, 3) Empirical Ex-Ante, 4) Empirical Ex-Post. The varying assumptions and data requirements of CBA are to be discussed in detail below in the following sections.

Traditional ex-ante cost-benefit analysis

Traditional ex-ante cost-benefit analysis occurs before policy-makers decide whether or not to take on a proposed project. The first step is identifying the set of alternative projects. The problem here is that neither decision-makers nor analysts can handle comparisons among a large number of alternatives, because resources and cognitive constraints exist. Thus, analysts must decide which benefits and costs should be included, which means selection bias can be an issue. The next steps of traditional

cost-benefit analysis include listing the physical impacts of the alternative projects, predicting the impact of the project during the life of the project, attaching dollar values to the predicted impacts, aggregating the costs and benefits that arise over different years by discounting the future benefits and costs to obtain their present value, and, finally, choosing the social discount rate. The problems inherent in the assumptions of traditional cost-benefit analysis, such as path dependency and availability heuristic, were discussed earlier in this chapter.

Traditional ex-post cost-benefit analysis

Traditional ex-post cost-benefit analysis occurs after all the impacts of the implemented project have been realized. The steps of ex-post cost-benefit analysis involve the same steps as traditional ex-ante cost-benefit analysis except that this analysis involves computing the net present value of each alternative. If the net present value is greater than zero, the project exhibits positive returns.

As time (t) in the benefit-cost ratio formula increases, the variance of the estimate of the present values of net benefits will decrease. It will never equal zero because uncertainty, while reduced, is never gone. Error of traditional cost-benefit analysis can be decreased by obtaining and estimating net benefits at different times. This will provide a clue to the magnitude of the different types of traditional cost-benefit analysis forecasting error. Furthermore, the market approach to traditional cost-benefit analysis provides

sensitivity to individual preferences, which is relevant for efficiency considerations (Sen, 2000).

Pros and Cons of Traditional CBAs

The pros and cons for traditional ex-ante and traditional ex-post CBA are relatively similar. The only real difference is that fewer assumptions will be made about impact in traditional ex-post, as more information is available to measure project impact. Researchers might have survey results from the affected population to use to quantify impact, rather than simply making assumptions based on how many people were affected. The positive outcomes of both traditional analyses are numerous. Both types of traditional CBA provide a starting point from which to begin the evaluation of a project. Furthermore, both approaches force project advocates and opponents to provide quantitative data to back up qualitative arguments. They are also useful because they allow comparisons to be made between investments or projects. Since all investments are evaluated using the same method, the comparison process is easier.

There are many disadvantages to traditional ex-ante and ex-post CBA. These two approaches assume complete knowledge, requiring that each alternative project be identified and known. The problem with this assumed completeness is that it is nearly impossible to compare every alternative with every other, especially since so many considerations are involved (see discussion of bounded rationality and availability heuristic made previously in chapter). The presumption of full knowledge of the

consequences and alternatives is implausible. There are always going to be sources of ambiguity, and these could have far-reaching effects (Sen, 2000).

Once costs and benefits have been defined, controversy arises over what type of loss function to use for the computation of both. In statistics and decision theory, a loss function maps an event onto a real number intuitively representing some “cost” associated with the event. Additive accounting is the most common technique because it is simple; it simply deducts costs from benefits. But multiplicative forms have also been used (John Nash), and there has also been a strong case made for concave functions that respond positively to benefits and negatively to costs (Kuhn-Tucker Theorem) (Baguley, 2004). The debate over what kind of algebraic form for the loss function to use for calculating net benefits is a major challenge to using either type of traditional CBA.

An additional concern that ethicists have disputed is the fundamental utilitarian assumptions of traditional ex-ante and ex-post CBAs which states that the sum of individual utilities should be maximized because it is possible to trade off utility gains for utility losses for others. In essence, ethicists are critical of the theory that many CBA proponents advocate, that any policy that makes the economic pie larger should be followed, without considering the distribution of those costs and benefits.

Furthermore, traditional ex-ante and ex-post CBAs are criticized for treating risks to health and safety as commodities; they list all alternatives in terms of money, thus treating all goods as replaceable with other goods (Graham, 1981). Traditional CBAs also favor projects whose net present value is greater than zero, but use of the net present value may not be the most efficient allocation of resources because the cost-benefit

analyst may not have taken all alternative projects into consideration (see discussion of bounded rationality).

Bureaucrats and political processes have a big influence on traditional approaches. This is not an ideal situation because political and bureaucratic actors, especially policy entrepreneurs, tend to overestimate the benefits of their favored alternative and underestimate the benefits of alternatives they do not favor for the sake of convincing others to agree with them. As well, governments usually only include benefits and costs to their residents, ignoring benefits and costs that occur in adjoining countries. Traditional approaches are also very expensive. For example, in 1992, a traditional ex-post cost-benefit analysis conducted to investigate the use of lead in gasoline cost the EPA nearly \$1 million.

Traditional ex-ante cost-benefit analysis has a unique problem with the Pareto welfare criterion. The Pareto welfare criterion states that any given social policy cannot be put into action unless at least someone will be made better off and no one worse off, or unless those who are made worse off are compensated for their loss. Hubin (1994) argues that because CBA is committed to the potential Pareto improvement criterion, CBA does not give the appropriate consideration to distributive justice or intergenerational equity.

A final issue in traditional CBAs is that there are numerous problems in measuring gains – the value-added to stakeholders from the policy – and losses from the negative impact. Individuals have different preferences, valuations of goods and services, and opportunity costs; individuals also monetize impacts and choose discount rates

differently (see earlier discussion of meta-preferences). People typically want more compensation for a loss (willingness to accept compensation for a proposed change-WTA) than they would have paid for a gain (willingness to pay for a proposed change-WTP) (Hubin, 1994). When compensating with money for a policy change, money may not fully compensate the individual for losses that cannot be translated into monetary terms (Goodin, 1995). Furthermore, happiness and utility are difficult yardsticks by which to measure, and they vary from person to person.

Empirical (Regression) Approaches to Cost-Benefit Analysis

The empirical ex-ante and ex-post approaches involve isolating the population that is going to be impacted by the policy and determining the true effect of the policy on the population using statistical techniques, mainly through regression analysis. The approach still asks whether the benefits of the policy at hand outweigh the costs. It also asks, if a policy is to be put in place, how much implementation will be necessary? What form of implementation should it take? How large scale should the policy be? These approaches had not been implemented in many CBA studies.

One CBA that used the empirical ex-ante approach was “Regression modeling and meta-analysis for decision making: a cost-benefit analysis of incentives in telephone surveys” (Gelman, Stevens, and Chan 2003). It used regression techniques to measure the relationship between the level of the incentive (the policy) on the x-axis and the

number of people taking a telephone survey on the y-axis. No other studies were identified that used an empirical CBA approach.

Empirical ex-ante and ex-post cost-benefit analyses, or social return on investment, are new ways of demonstrating the value of a policy. There are numerous positives to the ex-ante empirical approach, and at first glance it appears to be a relatively easy approach to take. The ex-ante empirical approach is also useful because it helps us determine which among a series of responses a policy might impact, and it allows the choice of which responses to target in order to garner the largest amount of impact.

The strength of the ex-post empirical approach is that it is able to quantify the impact of the policy using statistical techniques. This leaves the analysis less room for subjectivity than do traditional ex-ante and ex-post approaches. The biggest disadvantage to the ex-post empirical approach is that it is extremely difficult to isolate the population the policy has reached.

Cases Through Which to Test Cost-Benefit Analysis Approaches

My study uses two distinct cases, each of which has far reaching policy implications. The chosen cases can be examined through either traditional or empirical CBA. The first case, the Expanded Food and Nutrition Education Program, is a food policy issue. Implemented in 1968, it has a long history and has only recently begun to be evaluated. It also has wide breadth in that the federally funded program is

administered in nearly every state. It is supposed to lead to improvements in nutrition and health, resulting in lower rates of cardiovascular disease, diabetes, obesity, etc.

Since its conception, there have been millions of participants in the EFNEP program. There are large amounts of data produced by the Center for Disease Control on the rates of different types of diseases and conditions over time. Data on the number of participants and information on the socio-demographic characteristics of EFNEP participants are also available. It appeared that this would be a relatively straightforward situation in which to perform empirical ex-post CBA.

The second case involves public health. Child immunization is a public health issue that has widespread ramifications on stability of a developed country. As children are required in the United States to get immunizations before starting public education, and the National Institute of Health does yearly surveys on childhood immunization and therefore data were readily available on which children in the United States were getting immunized. Billions of dollars in public and private funds are spent each year trying to incentivize parental guardians to vaccinate their children. Numerous studies have been done on the effects of policies to incentivize parents to vaccinate their children against childhood diseases such as polio and the measles.

My study will attempt to evaluate each case using the four different types of CBA. Ideally, the results will yield conclusions that can assist policy-makers in the creation of legislation that will help the nation work through these complex social problems.

CHAPTER TWO
A POLICY EVALUATION OF
THE EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

This chapter focuses on the effectiveness of one of the major nutrition policy programs in the United States – the Expanded Food and Nutrition Education Program (EFNEP). EFNEP is a federally funded program designed to help limited-resource homemakers acquire the knowledge, skills, attitudes, and practices necessary for establishing a sound diet for themselves and their families, with the long-term goal of generally improved health and disease prevention. A major drawback to effective evaluation of the policy is that the effectiveness is confounded with the implementation of the policy.

Research on the role of implementation on policy effectiveness has a rich history. In the 1970s, it became clear that implementation was a problem across all levels of government. Implementation issues have historically been ignored in theories of government action, but over time researchers have learned that agents do not always perform as instructed, and scholars have found “that the consequences of even the best planned, best supported, and most promising policy initiatives depend finally on what happens as individuals throughout the policy system interpret and act on them” (McLaughlin, 1987).

How the EFNEP program is implemented varies widely from state to state. The role of implementation on policy effectiveness is very important in the context of EFNEP for two reasons: first, it is very difficult to make policy implementation successful across varying levels of government; and second, policy implementation and outcome success depend on local and regional factors such as dedication, capability, and the intricacy of institutions (McLaughlin, 1987). EFNEP is more successful in some states than others due to local and regional factors. Extra funding to an institution can help a program's successful implementation, but dedication to the program is hard to legislate, so determining which programs should receive funding is a complex challenge. While EFNEP has received federal funding since 1968, an economic evaluation of the program did not take place until 2002 (Rajgopal, 2002). The primary objective of my research is to use different approaches to CBA to determine the actual benefit to individuals and society of EFNEP. Before discussing the different types of CBA, I will clarify the difference in CBA and CEA (cost-effectiveness analysis).

Quantitative Analysis of Health Policy Implementation and Evaluation: CBA v. CEA

There are two major types of quantitative analyses used to evaluate health policy: cost-effectiveness analysis (CEA) and cost-benefit analysis (CBA). Cost-benefit analysis is used less frequently in the health sector because many scholars are apprehensive about assigning monetary value to the outcomes, quality of life (health) and life years, both of which are highly subjective.

CEA compares different kinds of interventions in terms of the incremental cost-effectiveness ratio (ICER). ICER is the net cost to achieve a given unit of health, such as deaths prevented or life-years saved (Medeiros, Butkus, Chipman, Cox, Jones, and Little, 2005). CEA has become common in medical journals, but politicians in the United States have shown little support for its use in funding decisions. As a result, economic assessments of the performance of government programs are often of questionable quality, not used by policy-makers, or not conducted at all. Additionally, lack of time and funding for conducting these assessments and disincentives for sponsoring program assessment can be barriers to nutrition program evaluation (Grosse, Teutsch, and Haddix, 2007). In order to understand best understand the use of CBA and CEA, a discussion of the theory is needed.

Evaluation Theory

Researchers have traditionally assumed that the agents implementing and receiving the nutrition policies of ENFEP are rational individuals who are trying to maximize their own self-interests. In recent years, however, researchers have demonstrated this assumption does not always hold. In order for EFNEP to be more effective, policy implementers must realize the “bounded rationality” evident in their audience. Many of EFNEP recipients are bound by societal constraints such as poverty and limited education that may prove insurmountable when it comes to nutrition policies; i.e., recipients may lack the skills to budget money, read food labels, and perform other

life skills that the EFNEP programming promotes. Since the 1980s, researchers investigating EFNEP have found that many EFNEP recipients were indeed trying to maximize their own self-interest but without the crucial realization that self-interest included their health.

The fact that the effectiveness of EFNEP is confounded by the factors discussed above makes it difficult to perform a proper assessment of EFNEP with CBA. This may be one of the reasons that so little CBA of EFNEP had been done.

Traditional Ex-ante Cost-Benefit Analysis of EFNEP

For the traditional ex-ante CBA of EFNEP, direct benefits from the program will be measured as costs avoided or delayed as a result of positive changes made by participants. Indirect benefits will be measured as the monetary benefits accruing to society on account of increased productivity of workers who have improved health, longer life spans, and a reduction in lost work time. Some of the intangible or immeasurable benefits from the program are employability, self-esteem, and quality of life. The direct program costs are the actual expenditures for resources used in program implementation, such as salaries, equipment, travel and materials. The indirect costs will be measured as unintended expenditures such as value of participants' time lost from work and the cost of pain and discomfort that participants suffer (Rajgopal et al, 2002).

While economic evaluations of public health interventions had been taking place for years in other health arenas, until 2002 there were no economic evaluations of

nutrition education policy. Researchers in Virginia decided to conduct a traditional ex-ante CBA of Virginia EFNEP to clarify the health benefits potentially resulting from the program. Before the Virginia study, the cost efficiency of the EFNEP program had not been evaluated (Rajgopal et al, 2002).

A single measure of cost-effectiveness as net-present value was calculated in addition to numerous other efficiency measures (Burney and Haughton, 2002). The initial benefit/cost ratio of \$10.64/\$1.00 indicates that, for every dollar spent on the Virginia EFNEP program, the potential exists that over 10 dollars may be saved in future healthcare costs (Rajgopal et al, 2002, 34).

In 2002, Tennessee conducted a traditional ex-post CBA of the nutrition education program EFNEP. This study was the first to use an experimental group as well as a control group. Tennessee researchers found that subjects in both groups saved money on average family food expenditures (Burney and Haughton, 2002). This study showed a significant improvement in food resource management and nutrient intake for the experimental group, which had received the EFNEP nutrition education, compared to the control group.

No studies have been published that examine the retention of EFNEP lessons for more than a five-year period. This limited time frame may fail to capture the long-term costs and benefits that might alter the benefit/cost ratio. Additional CBAs of other nutrition programs are needed to establish the monetary value of certain benefits such as prevention of chronic disease.

Evaluation of the EFNEP program is especially important as this programming addresses an underserved population that is more likely to have poor eating habits and be at risk for a much higher incidence rate of chronic disease. In order to determine whether EFNEP really can demonstrate benefits such as prevention of chronic disease, scholars must continue to monitor participants. Long term evaluation will determine if the learned nutrition behavior persists. A longitudinal study demonstrating the validity of the EFNEP program among participants would also provide a stronger incentive to continue the funding of this national program. There are differences in how the program is administered in different states. The literature has yet to evaluate the federally funded program as a nation, which is the gap that my research hopes to fill.

Traditional Ex-post Cost-Benefit Analysis

In order to conduct a traditional ex-post CBA for 2007-2009 federal data, my research has followed the methodology set forth by the VA study (Rajgopal, 2002).

My first step was to identify behaviors taught in EFNEP that are assumed to contribute to the delay or avoidance of diet-related chronic diseases and conditions that are prevalent among low-income individuals. The direct tangible benefits of EFNEP are characterized as dollars saved on healthcare costs by the assumed delay/avoidance of the onset of chronic diseases and conditions.

EFNEP has been shown to have positive cost-benefit ratios based on potential prevention of diet-related chronic diseases and conditions (Rajgopal et al, 2002). Many

of the practices learned in EFNEP change lifestyle choices that would otherwise have led to hypertension, diabetes, or high blood pressure. Chronic diseases and health conditions cost society an estimated \$250 billion each year in medical charges and loss of productivity. The degree to which these costs might be reduced by healthy eating patterns cannot be calculated precisely. Nonetheless, numerous scholars such as Dollahite and Hershey (2001) have estimated that a proper diet might forestall at least 20 percent of the annual deaths from heart disease, cancer, and diabetes. Other studies have demonstrated that 50 percent of chronic disease mortality can be attributed to changeable lifestyle factors, such as diet (United States Department of Health and Human Services, 1990).

The behaviors taught in EFNEP are designed to improve participants' food security, food resource management, and food nutrient value. EFNEP enrollees are taught to make their own meals at home, avoid convenience store and fast foods, read labels, etc. In order to measure whether these skills do in fact increase food security, food management, and food nutrition value, the traditional ex-post CBA approach I will take will be to test the mean change in pre- and post-scores on the EFNEP behavior checklist. The food behavior checklist has questions related to food security, food resource management, and food nutrition value (Radimer, 1990). A copy of this checklist can be found at the end of this chapter.

Food Security in EFNEP

Adequate food security is defined as “access by all people to enough food for an active, healthy life” (Campbell, 1991, 408), as well as the ability to acquire food in socially acceptable ways (e.g., not through theft or begging). Food security means having a diet with sufficient energy and nutritional quality to prevent malnutrition and limited activity level. Previous approaches have demonstrated the effectiveness of ENFEP implementation on food security, but only on the state level. This research will utilize national data. The Dollahite (2001) study found that race/ethnic group, age, and place of residence were significantly associated with change in food security score from pre- to post-test. Graduates’ food security scores increased significantly over the scores of terminated participants. This indicates that education can increase food security even in the presence of economic limitations. My first formal research hypothesis is:

H₁: If individuals participate in EFNEP, then graduates will experience greater food security than non-EFNEP participant graduates.

Food Resource Management Component of EFNEP

One of the main purposes of the ENFEP program is to help people learn to utilize their income in ways that maximize their food’s nutritional value. Previous studies, such as a study by Hershey (2001), focused on evaluating the food resource management success of EFNEP participants. Food resource management is the ability to compare

prices and plan ahead so as to avoid running out of food before the end of every month. Food resource management is an important tool as many EFNEP participants are on food stamps and often run out of food assistance funds by the end of the first week of the month.

Researchers assume that before starting nutrition education programming through EFNEP, most of these households were running out of food by the end of the month because they had not learned the necessary skills. Hence, my next hypothesis is:

H₂: If individuals participate in EFNEP, then participant graduates will experience more food resource management success than non-EFNEP participant graduates.

Nutrient Uptake Component of EFNEP

Many participants in ENFEP do not understand how to monitor fat, salt, or sugar intake. Many suffer from poor nutrition, either in the form of malnourishment or obesity. Research shows that healthier nutrient intake leads to longer, more productive living. Often, healthier nutrient intake is learned through engaging in better food shopping practices, such as looking at nutrition labels or planning meals ahead of time. Before my work, studies have shown that women who said they almost always used nutrition facts on food labels had a much lower consumption of fat grams and higher consumption of vitamins than those who did not or seldom used nutrition facts. Food shopping practices can influence nutrient intake in low-income households and are key topics to nutrient education (Murphy, 1998). As a result, it would be useful to determine whether receiving

an EFNEP education leads to healthier nutrient intake. Accordingly, my study hypothesizes:

H₃: If individuals participate in EFNEP, then participant graduates will engage in healthier nutrient intake than non-EFNEP participant graduates.

Data Collection

My research utilizes national level EFNEP data collected from the federal EFNEP headquarters in Washington, D.C. Currently, the ENFEP program operates in all fifty states, as well as in American Samoa, Guam, Puerto Rico, and the Virgin Islands. The goal of the program is for participants to be able to improve their diet, increase their knowledge of essential human nutrition, increase ability to buy food that satisfies nutritional needs, improve food production practice, and increase ability to manage food budgets (United States Department of Agriculture, 2010).

My research focuses on adult, rather than younger, EFNEP participants. These participants are low-income homemakers who are responsible for the planning and preparation of their household's food (State Extension Plan of Work, 1983). Participants gain new skills in food production, safety, and sanitation. There are roughly 3,000 EFNEP participants per state each year (United States Department of Agriculture, 2010).

EFNEP is often delivered in a sequence of ten to twelve lessons over several months. The program is delivered by county extension and consumer professionals who train the peer educators and volunteers who teach the EFNEP lessons. Since the peer

educators are normally located in the same or nearby communities as the program attendees, EFNEP referrals are often made from current or previous participants, as well as local schools, churches, health centers, non-profits, and government assistance programs. Program instruction varies by state but includes and is not limited to: mailings, mass media efforts, and direct teaching in groups or one-on-one (United States Department of Agriculture, 2010).

The time period for my study is 2007-2009. The response variable used to measure EFNEP success was the food behavior score number of the participant. The predictor variable was EFNEP intervention (pre and post). The behavior score was based on the self-reported items from a federally mandated EFNEP Food Behavior Checklist. The checklist uses ten questions designed to evaluate food resource management, food safety, and nutrition practices. Each question is answered on a 1-5 scale: 1= Do not do, 2=Seldom, 3= Sometimes, 4= Most of the time, 5=Almost always. The food behavior checklist is measured pre- and post-policy. The three hypotheses were addressed by comparing the means of participants test scores pre- and post-EFNEP.

There are actually three different statistical approaches to comparing pre- and post-test means while correcting for differences among participants and co-variation of pre and post results within a participant. First, a dependent T-test could be computed. Second, a two-way Analysis of Variance with factors of participant and time could be computed. Finally, regression analysis could be used to regress the test scores onto dummy-coded variables for participant and time. Of these three approaches, this study uses the dependent t-test approach. The statistical significance level is set at $\alpha < 0.05$.

Hypothesis 1 utilizes the responses from question 3 on the survey: “How often do you run out of food before the end of the month?” Hypothesis 2 utilizes the responses from question 1 on the survey: “How often do you plan meals ahead of time?” Hypothesis 3 utilizes the responses from question 9 on the survey: “How often do you look at food labels?” These were chosen by the preeminent Virginia EFNEP study (through factor analysis and consultation with medical experts) as questions that best answered the hypotheses given.

Data Analysis

My first hypothesis (EFNEP participants increased food security) was not supported by the data (see table 1 below). The mean change in the response after the program was 0.5, which shows that participants felt less food secure after program completion. There is not sufficient evidence to conclude that EFNEP participant graduates increased food security after the program.

Table 1:

	Q3 of entry	Q3 of exit	t-ratio	P value
Mean	3.3867816873	3.8686455645	-88.41388088	<.0001
Standard error	0.005450093	0.005450093		

Table 2 shows the results from the analysis of the second hypothesis. Hypothesis two was supported by the data. There is sufficient evidence that EFNEP participant graduates increased food resource management.

Table 2:

	Q1 of entry	Q1 of exit	t-ratio	P value
Mean	2.9180817824	3.735090341	157.47930089	<.0001
Standard error	0.0051880378	0.0051880378		

Table 3 shows the results from the analysis of hypothesis 3 (EFNEP participants will engage in healthier nutrient intake). Hypothesis 3 was supported by the data. There is a significant difference between the distributions of the means, so there is sufficient evidence that EFNEP participant graduates engaged in healthier nutrient intake.

Table 3:

	Q9 of entry	Q9 of exit	t-ratio	P value
Mean	2.3661730743	3.4418149708	-197.5976525	<.0001
Standard error	0.0054435965	0.0054435965		

Empirical Ex-post Cost-Benefit Analysis

I did not perform an empirical ex-ante CBA performed as the program was already in existence. The goal of my empirical ex-post CBA study was to determine whether the EFNEP program in each state is actually decreasing the rate of chronic disease or improving the condition of participants in that state. My approach was to develop a model that relates the dependent variable (disease rate) to the independent variable (EFNEP participation rate) in a simple linear fashion. The form of this model was

$$y_i = \beta_0 + \beta_1 x_i + e_i$$

where y_i = disease rate for the i th unit (i.e., the rate of a certain disease for the EFNEP eligible population in a certain state);

β_0 = the intercept (i.e., the rate of a certain disease in a certain state when none of the EFNEP eligible population participants are in EFNEP);

β_1 = the slope (i.e., the change in the rate of a certain disease in a certain state as EFNEP participation increases by one percent);

x_i = EFNEP participation rate for a certain state; and

e_i = residual.

Basic regression techniques could be used to determine the following hypothesis: if the disease rate is related to EFNEP participation, the slope of the regression equation will be non-zero. Of particular interest is if the slope is negative, indicating that EFNEP participation is related to a reduced disease rate.

Previous traditional ex-ante and ex-post cost-benefit analysis studies of EFNEP suggested that EFNEP instruction should result in the decrease or prevention of various chronic diseases in the participants, but the only measurement used was the behavior test score. Therefore, an important step in increasing the efficacy of empirical ex-post CBA is to determine valid and reliable measures of participation (the percentage of eligible people in the state who participated in EFNEP) and chronic disease rates in EFNEP eligible populations (the percentage of people who have the chronic disease in question who were eligible for and participated in EFNEP). Finding valid and reliable data on these variables for this study proved extremely difficult. While the number of EFNEP participants in each state is readily available, information on the total number of individuals eligible for EFNEP is unavailable.

Definitions of poverty vary widely among states, the common thread being that participants are living in poverty. Therefore the first step was to use the CDC's Behavioral Risk Factor Surveillance System to measure the number of individuals eligible for EFNEP. The state of Iowa targets "low-resource individuals with children under the age of 10" for participation (Iowa EFNEP Website). The state of Connecticut targets "families with young children with incomes at or below 125% of the federal poverty level or with other resource limitations such as poor housing, inadequate access to food, limited reading skills, or physical disability" (Connecticut EFNEP Website). Ultimately, this step did not work well because eligibility through poverty hinges on several aspects beyond income alone.

A second step was to use the United States Census Bureau Current Population Survey Annual Social and Economic Supplements from 2005 and 2006 and the American Community Survey of 2005. The Census Bureau provides the percentage of individuals living in poverty categorized by state. The Census Bureau uses a set of income thresholds that vary by family size and composition to determine who is in poverty.

If a family's total income is less than the family's income threshold, then that family and every individual in it is considered to be living in poverty. The official poverty thresholds do not vary geographically, but they are updated for inflation using Consumer Price Index (CPI-U). The official poverty definition uses income before taxes and does not include capital gains or non-cash benefits (such as public housing, Medicaid, and food stamps) (United States Census Bureau, 2005). The Census Bureau data provides poverty as a percentage for each state in 2005. The number of people in the state was then multiplied by the percentage in poverty to estimate the number of eligible people in poverty in each state in a given year. From there, the number of participants in EFNEP each year was divided by the number of people in poverty in the state to estimate the independent variable (the percentage of people in poverty who participated in EFNEP).

The next step to determining the potential EFNEP population was to use the population of people in each state who are Medicaid recipients. Medicaid is health insurance that helps many people who can't afford medical care pay for some or all of their medical bills. Medicaid is available only to people with limited income, and thus it is a good proxy for the EFNEP-eligible population in each state (United States

Department of Health and Human Services, 2011). It was easy to find data for the percentage of people in each state who are on Medicaid. That percentage was then multiplied by the total population in the state to get the number of Medicaid recipients. My study uses the number of people in EFNEP in the state divided by the number of people in Medicaid, which is thought to be a good estimate of EFNEP percentage.

Finding valid and reliable dependent variables (the rate of diagnosis of the chronic disease) eligible for EFNEP also proved difficult. My first step for finding valid and reliable dependent variables was to multiply the chronic disease diagnosis/incidence rate by the number of people in poverty in the state to get the number of people EFNEP eligible who would get a certain chronic disease. This step did not work because there was too much variation. My second step was to assume that the incidence/diagnosis rate for each chronic disease or condition was the same for the poverty/low-income population of the state as the general population of the state.

My next step was to determine if the simple model could be improved by including other independent variables to reduce errors and missing variable bias. The independent variables considered to improve the model can be divided into three basic categories. The first category is access to healthcare in the state, with variables of percentage growth in healthcare spending, federally qualified health centers, healthcare employment as a percentage, healthcare spending as percentage of Gross State Product, healthcare spending per capita, registered nurses per 100,000 people, and the percentage of health expenditures on hospitals.

The second category is wealth or lack of wealth in the state. The variables used to measure wealth or lack of included the uninsured poor, the percentage of people who could not see a doctor because of cost, dentists per 1,000 people, retail drugs filled per capita, the number of people in the population who are underserved, the infant mortality rate, fruit and vegetable consumption, preterm birth percentage, uninsured population, and life expectancy.

The third category is the level of healthcare education that the people in the state obtained. The variables used to measure healthcare education include poor mental health as a percentage of the population, overweight children, adults who exercise, smokers, and teen birth rate. All independent and dependent variables were collected from either the Kaiser State Health Facts website or the Center for Disease Control.

The independent variables were also crossed with the EFNEP participation rate (i.e. interaction) to allow for changes in the relationship of EFNEP and disease as the additional independent variables changed. For example, if the importance of EFNEP increases as the value of an independent variable decreases, then the two variables should probably form an interaction term. The only disease rate that was significantly related to the EFNEP percentage was obesity. EFNEP was only significant if the model included additional terms and interactions.

Finally, the models should be compared over time and not just across states (i.e., longitudinal modeling). This approach made many regression assumptions including normality, stable variance, and independent errors.

Conclusions

The traditional ex-ante and ex-post approaches are easy to argue for, as they show the importance of EFNEP. The empirical ex-post approach has proven a much more difficult approach to take to demonstrate the importance of EFNEP. Finding valid and reliable independent and dependent variables was difficult, as was developing a model incorporating other independent variables, interactions, and time.

My study demonstrates a positive cost-benefit ratio for the federal EFNEP program. This indicates significant returns from dollars spent on the EFNEP program. The sensitivity analyses show the range of the cost-benefit ratios to some of the assumptions, and the estimates agree with the high figures found by the Virginia EFNEP study (\$10.64/\$1.00). Finding a favorable benefit/cost ratio lends weight to efforts to increase funding for such nutrition education programs in order to ultimately achieve savings in healthcare costs.

Further policy research should also take into account issues of distribution of benefits and costs. In a wealthy and developed country such as the United States, poor nutrition is nearly always associated with financial constraint. Many nutrition scholars argue that policy not only needs to be cost-effective, but also must reach underserved populations. Many nutrition programs have not yet been evaluated on these criteria.

Research on the effectiveness of programs such as EFNEP is one way to ensure that social assistance programs serve the needs of those who suffer food insecurity. Also, the consequences of food insecurity such as malnutrition and mental well-being reduce

the individual's ability to be a productive member of society individuals are able to make. Obesity, for example, is a national issue right now, yet many Americans do not understand that malnutrition in an industrialized, developed society includes a much more complex set of issues and consequences than it does in a society such as Ethiopia, where food is legitimately scarce. In the United States, an individual can be "obese and undernourished in terms of micronutrients at the same time" (Graham 1985).

Finally, the opportunity cost of policy is the value of other programs and services foregone by the use of the taxpayers' monetary and physical resources. For example, a potential health policy might not be funded because financial resources were given to another program with more prominent interest groups. More CBA should be performed in response to health policy analysis (Grosse, Teutsch, and Haddix, 2007). Making assumptions explicit and developing the epidemiologic, statistical, and economic capacity to prepare the analyses can lead to more informed decisions, with increasing capacity leading to better policy decision-making by policy creators over time.

The results of my study are particularly relevant in today's political climate due to increased general awareness of healthcare costs. Further policy research should also take issues of distribution of benefits and costs into account.

EFNEP Behavioral Checklist

EFNEP Eating Right Survey



Name: _____

Date: _____

This is a survey about ways you plan and fix foods for your family. As you read each question, think about the recent past. This is not a test! There are not any wrong answers.

For these questions, think about how you usually do things. Please put a check in the box that best answers each question.	Not Applicable 0	Do Not Do 1	Seldom 2	Sometimes 3	Most of the Time 4	Almost Always 5
1. How often do you plan meals ahead of time?						
2. How often do you compare prices before you buy food?						
3. How often do you run out of food before the end of the month?						
4. How often do you shop with a grocery list?						
5. This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?						
6. How often do you thaw frozen foods at room temperature?						
7. When deciding what to feed your family, how often do you think about healthy food choices?						
8. How often have you prepared foods without adding salt?						
9. How often do you use the "Nutrition Facts" on the food label to make food choices?						
10. How often do your children eat something in the morning within two hours of waking up?						

For Office Use Only:		
Extension Staff Member: _____	Check Type of Recall:	<input type="checkbox"/> Entry
Client ID #: _____		<input type="checkbox"/> Exit

CHAPTER THREE
AN EVALUATION OF THE POLICY IMPLICATIONS OF
IMMUNIZATION OF PRESCHOOL AGE CHILDREN

Immunizations have historically been an important component of healthcare for children in the United States, but the cultural consensus that immunizations are good for children has been eroding. Two important factors in this erosion are 1) many families are no longer personally acquainted with mortality of the diseases the immunizations prevent, and 2) certain organizations have publicized potential negative health consequences of immunization for children. The consequence of this erosion is that immunization rates among preschool-age children have been falling. It has been estimated that fewer than 50 percent of two-year-olds in the United States are fully immunized against deadly childhood diseases such as measles, polio, mumps, rubella, tetanus, and whooping cough (Khaleghian and Gupta, 2005). The 1989 measles epidemic occurred in areas of the country where the percentage of fully vaccinated children was only 17 percent (Forbes, 2005).

Both outcome- and behavior-based policies have been utilized as a means to increase the immunization of preschool-age children in the United States. For example, a child must receive a list of immunizations prior to attending public pre-school or any grade higher. However, because of loopholes and lack of compliance, this policy does not result in all public school children being vaccinated (Forbes, 2005). The question

remains: what is the best policy for the government of the United States to use in increasing the percentage of immunized children?

An overall objective of this chapter is to use CBA to evaluate how efficient immunization policies are in increasing immunization percentages. However, to use CBA, immunizations must be defined in economic and policy terms. The following section discusses immunization in terms of 1) a public good, 2) a policy issue, 3) principal-agent applications, and 4) pay for performance contracts.

Public Good Characteristics of Immunizations

A public good is both non-rival, *i.e.* consumption by one person does not restrict consumption by another, and non-excludable, *i.e.* the benefits of the good accrue to the entire population and cannot be restricted to a particular individual or group. Vaccination coverage of children has an important public good dimension, because one child's immunization precipitates health benefits for others (Khaleghian and Gupta, 2005).

Immunizations are a merit good – having both public and private good characteristics – and this has a large impact on how they should be financed and delivered to society (Zhou et al, 2005). Merit goods are goods that everyone should have regardless of ability to pay. Incentives for development of vaccines are needed for research and development to occur because providers will not recoup the true marginal costs. Families also have disincentives to bear the time and monetary cost of vaccination: those choosing not to immunize reap the benefit of protection created by those who do,

but the greater the number of unvaccinated children, the greater the chances of disease transmission (Zhou et al, 2005). Public financing and provision help to overcome these problems and ensure an optimal level of service delivery.

Despite the recent public exposure to the “dangers” of immunizations by celebrities such as Jenny McCarthy, experts in the field of health have very little disagreement about the benefits of immunizations. Demand for vaccinations is very weak in comparison to other public health initiatives, because media coverage has increased the concern over the side effects of immunization and led to decreases in vaccination coverage rates, especially in the United States and Sweden (Gauri and Khaleghian, 2002).

Policy Theory

The quality and quantity of vaccine coverage to the public relies on the monetary and political resources of different interest groups and political actors. The institutional setting in which policymakers work affects the success of the coverage rates. In this political economy framework, institutions and other “rules of the game” determine the objectives of policymakers and thus determine the flow of resources. However, this framework fails to explain the role of institutions in disseminating knowledge and motivating political actors and policy entrepreneurs. The dissemination of knowledge and the motivation of policymakers are vastly important as vaccination coverage is an

area where consumer demand is low and healthcare provide incentives are poor (Gauri and Khaleghian, 2002).

Government policymakers need to understand: establishment and dissemination of disease-burden data, vaccine effectiveness, assurance of adequate vaccine supply, and the creation of funding to supply the vaccines to low-income and underdeveloped areas (Gauri and Khaleghian, 2002).

The United States government has made numerous policy decisions to increase immunization coverage. In 1955, soon after the polio vaccine was approved, Congress passed a law to expedite state purchases of the vaccine. The Kennedy Administration launched the Immunization Assistance Act of 1962, which provided federal support to state and local immunization programs that vaccinated for polio, diphtheria, pertussis, and tetanus (Hinman, 2005). The United States government began to purchase large amounts of vaccines in the 1960s to lower the cost of vaccines to state and local agencies. In 1972, the Public Health Service Act provided grants to state and local governments for immunization development, and by the late 1980s childhood immunization rates had reached 83% (Johnson et al, 2000).

The initiative to set national vaccine policy involves multiple agencies, including the National Institute of Allergy and Infectious Diseases, Food and Drug Administration, National Immunization Program, and the Advisory Committee for Immunization Practices (Hinman, 2005). The passage of the Vaccines for Children (VFC) program in 1993 guarantees federally purchased vaccines to more than 10 million children nationwide (Hinman, 2005).

The Costs and Benefits of Childhood Immunization through the Four Approaches

Traditional Ex-ante CBA:

Traditional ex-ante cost-benefit analysis occurs before a decision is made about whether or not to invest in a proposed policy. It involves a number of steps, each of which has its challenges. The first step involves identifying the set of alternative policies that could be implemented instead of the proposed policy. It is very difficult to identify all of the alternative immunization policies that could be put into place. The subsequent steps, listing the physical impacts of the alternative projects, predicting the impact of the project throughout its lifespan, attaching dollar values to the impacts predicted, and so forth are problematic in the real world as costs and benefits are often timely and expensive to determine. Finally, the potential Pareto societal welfare criterion is nearly unreachable in government policy as many policies end up becoming redistributive in one form or another.

The federal government has played a central role in the effort to increase vaccination of children and decrease vaccine preventable childhood diseases. Spurred by the polio epidemic, government officials conducting traditional ex-ante CBA argued that short-term costs would turn into long-term savings. The studies emphasized the positive effects of vaccine coverage and began to subsidize the dissemination of vaccinations for diseases like polio (Johnson et al, 2000).

Numerous traditional ex-ante CBAs have been completed in the last sixty years due to the deep public investment in the national immunization system. These analyses

have shown that public good properties characterize vaccines. Vaccines are going to be under-produced and incentives for development of vaccines will be needed for research and development to occur. Agencies such as the Center for Disease Control have numerous policy researchers working to demonstrate positive cost-benefit ratios in order to continue to assure funding.

Traditional Ex-Post CBA:

Traditional ex-post CBA occurs after the impacts of the implemented project have been realized. The steps of ex-post CBA are the same steps as traditional ex-ante CBA, with the same issues, except that this analysis also involves computing the net present value of each alternative. If the net present value is greater than zero, the project exhibits positive returns. The main challenge of performing ex-post traditional CBA with immunization policy is valuation of health and safety. Health and safety are treated as commodities. These approaches list all alternatives in terms of money, which treats all goods as replaceable by other goods (Graham, 1981). Addressing this challenge is a critical component of this research study.

One of the big challenges of ex-post, as well as ex-ante, traditional CBA is bureaucratic and political influence. Politicians, bureaucrats, and policy entrepreneurs often overestimate the benefits of their favored policy and underestimate the benefits of policies they do not favor. Thus, those in favor of continuation of current immunization policy would overestimate the positives of immunization policy that promotes those

ideals and underestimate those of the immunization policies that reinforce opposing ideals.

Almost every society holds that the provision, requirement, and enforcement of vaccinations are tasks for the government. Societies hold this notion because vaccines are under-provided and subject to the free-rider effect. Vaccination provides a positive externality. This means that benefits are accrued to all members of society when more members of that society get vaccinated against disease. The costs of the major six childhood vaccinations are relatively low, less than a \$1 per fully immunized child. Thus, nearly all ex-post traditional CBAs have demonstrated the value of government subsidization and provision of vaccines. Ex-post traditional CBAs show that vaccination availability has a positive effect.

Empirical ex-ante CBA

My approach of empirical ex-ante CBA was to determine the probability of a preschool-age child being fully vaccinated based on various demographic and socioeconomic variables. If it can be shown the probability is high, then this can be taken as evidence that the immunization policy is effective. The National Immunization Survey (NIS) is conducted by a subdivision of the Center for Disease Control (CDC) as part of the Childhood Immunization Initiative (CII). In 1992 this initiative was established to reduce the cost of vaccines, increase vaccine usage, improve delivery of vaccines to children, and enhance awareness of vaccination and its benefits. The data used was only

for the year 2007, as the composition of the geographical areas that the CDC surveyed changes from year to year.

The NIS uses a random digit dialing (RDD) telephone survey to identify households containing children in the target age-range and interviews the adult who is most knowledgeable about the child's vaccinations. With consent of the child's parent or guardian, the NIS also contacts (by mail) the child's healthcare provider(s) to request information on vaccinations from the child's medical records. Samples of telephone numbers are drawn independently for each calendar quarter within selected geographical areas, or strata.

In 2007, there were 64 geographic strata for which vaccine coverage levels can be estimated, including 14 primarily urban city/county areas (including the District of Columbia). The remaining 50 are either an entire state or a "rest of state" area. This design makes it possible to produce annual estimates of vaccination coverage levels within each of the 64 estimation areas with a specified degree of precision (a coefficient of variation of approximately 7.5 percent). Further, by using the same data collection methodology and survey instruments in all estimation areas, the NIS produces comparable vaccination coverage levels among estimation areas and over time.

For the 2007 NIS, the household interviews began on January 4, 2007 and ended on February 14, 2008. Provider data collection extended from February 2007 to April 2008. A total sample of approximately 4.5 million telephone numbers yielded household interviews for 24,807 children, 17,017 of whom had provider data adequate to determine whether the child was up-to-date with respect to the recommended immunization

schedule. The 2007 NIS public-use data file contains data for the 24,807 children with completed household interviews, and more extensive data for the 17,017 children with adequate provider data (including 128 zero-shot children).

The design and implementation of the NIS sample involve four procedures. First, statistical models predict the number of sample telephone numbers needed in each estimation area to meet the target precision requirements. Second, the sample for an estimation area is divided into random sub-samples called replicates. By releasing replicates as needed, it is possible to spread the interviews for each sampling area evenly across the entire calendar quarter. Third, an automated procedure eliminates a portion of the non-working and non-residential telephone numbers from the sample before the interviewers dial them. Fourth, the sample telephone numbers are matched against a national database of residential telephone numbers in order to obtain usable mailing addresses for as many sample households as possible. To promote participation in the NIS, an advance letter is sent to these addresses approximately two weeks prior to the household interview. My data can be found and my study replicated through the NIS site.

The probability of immunization depends on a number of factors. The methodology taken here is to develop a model that relates the probability of a preschool age child being fully vaccinated (as verified by their vaccination provider) to several demographic factors. Logistic regression is used to analyze the model and determine which factors have a significant relationship to the probability of immunization. Higher birth order of a child is a factor highly correlated with full immunization status. The more children in the family, the less likely the later born children will receive their

childhood immunizations (Steele, 1996). Also, the benefits of immunizing another child are reduced as more children are immunized. Children born into large families have a low vaccination uptake (Levine, 2011). Thus, I included a variable in the logistic regression model for first born child versus others, *FRSTBRN*.

I include healthcare coverage in my model, as many children in the United States lack medical insurance (Zhou, 2005). The ‘free’ clinic option often involves opportunity costs that low-income families are not worth taking, such as parental time off from work, long waiting lines, and long travel time to a ‘free’ clinic. There are various types of health insurance offered in the United States ranging from employer, Medicaid, SCHIP, Indian health insurance, or military. Thus, various types of health insurance were grouped into one variable called *OVERINS* which is equal to one if the child had some form of insurance, zero otherwise.

Poverty status is also included in the model, as income and wealth are influential due to that fact that the health service fee may pose too large of a burden on lower income families (Levine, 2011). Those who are unwilling or unable to pay for vaccines via their own means or healthcare coverage will not receive them. In a study of a 12-county area of China, greater access to immunizations by means of lower fees and more immunization days were found to be significantly related to a higher rate of immunizing.

A study done in India determined that many children were only partially immunized because the parents were so engaged in livelihood activities (Zhou, 2005). A recent Medicare study found that “more education, higher income, more knowledge about and positive attitudes toward immunization, and health insurance” are all correlated

with higher rates of immunization (Levine, 2011). Income level is designated by variable *INCPOVI*, which has three categorical values. A variable equal to one, corresponds to those above poverty and having annual greater income than \$75,000; equal to two, those above poverty but below \$75,000; and equal to three, those who are below poverty level.

I broke the data into four census regions with variable *CEN_REG*. The Northeast region of the United States is region1; region 2 is the Midwest region; region 3 is the South; and region 4 is the western portion of the United States. Immunization scholars have found immunization uptake varies by region (Levine, 2011).

In China, the gender of the child is highly important. Boys are more likely to be vaccinated than girls, probably because of the cultural idea of men continuing the family line. Men also are needed in rural areas for farming in China, so this gender effect will most likely be larger in rural areas (Zhou, 2005). A similar study conducted in Malawi demonstrated that girls are less privileged in terms of accessing social services, which include health and education (Steele, 1996).

Age of the mother is also important. Teenage mothers are less likely to get their children vaccinated, probably due to lack of education. There are three groups of mother's ages called *M_AGEGRP*. "One" is assigned if the mother's age at time of survey is less than 19 years old, "two" if the mother is between the ages of twenty and twenty-nine years, and "three" if mother's age is greater than or equal to 30 years.

The higher education of the mother correlates to a higher probability that her children will be vaccinated. In Malawi in 2000, 88 percent of mothers who had a secondary school education had their children fully vaccinated compared to roughly 60

percent of mothers with no education (Steele, 1996). Uneducated mothers may not have their children immunized simply because they do not understand the importance of the shots (Levine, 2011). Mother’s education is defined as *Educ1* and is set equal to one for less than 12 years of schooling, two for 12 years of schooling, three for greater than 12 years of schooling but no college degree, and four if the mother is a college graduate.

Race is also strongly correlated with immunization rates. Race is broken into four categories, designated by variable *RACEETHK*. This variable is equal to one if the child is Hispanic, two if non-Hispanic black only, three if non-Hispanic white only, four if non-Hispanic, other, or multiple race. On average, blacks in the Medicaid immunization study in 2006 have less formal education, lower incomes, and poorer health status. Even when controlling for education, income, and insurance coverage, the immunization rates of blacks are never as high as whites (Zhou, 2005). In the table “Logistic regression results,” model terms with a p-value less than 0.05 are considered significant.

Logistic Regression Results

Parameter	Estimate	Standard Error	Wald Chi-Square	Pr >ChiSq
Intercept	0.4753	0.0722	48.2975	<0.0001
EDUC1 1	-0.1222	0.0483	6.4169	0.0113
EDUC1 2	-0.064	0.0364	3.0844	0.079
EDUC1 3	-0.0135	0.032	0.1784	0.6728
FRSTBRN 1	-0.0997	0.0182	30.0886	<0.0001
RACEETHK 1	0.1019	0.0391	6.7973	0.0091
RACEETHK 2	0.0757	0.0308	6.0291	0.0141
RACEETHK 3	-0.1291	0.0517	6.23335	0.0125
M_AGEGRP 1	-0.0852	0.0898	0.902	0.3422
M_AGEGRP 2	-0.0291	0.049	0.3516	0.5532
INCPOV1 1	0.1128	0.041	7.5706	0.0059
INCPOV1 2	-0.0425	0.0342	1.5432	0.2141

INCPOV1 3	-0.0944	0.046	4.2139	0.0401
CEN_REG 1	0.1572	0.0391	16.1894	<0.0001
CEN_REG 2	-0.0323	0.0337	0.9225	0.5368
CEN_REG 3	0.0572	0.0282	4.0987	0.0429
OVERINS	0.0742	0.0381	3.7875	0.0516

Odds Ratio Estimates

			Point Estimate	95% Confidence Limits	
EDUC1 1	vs. 4		0.725	0.627	0.837
EDUC1 2	vs. 4		0.768	0.686	0.86
EDUC1 3	vs. 4		0.808	0.738	0.885
FRSTBRN 1	vs. 2		0.819	0.763	0.88
RACEETHK 1	vs. 4		1.162	1.009	1.338
RACEETHK 2	vs. 4		1.132	1.003	1.278
RACEETHK 3	vs. 4		0.922	0.778	1.094
M_AGEGRP 1	vs. 3		0.819	0.626	1.071
M_AGEGRP 2	vs. 3		0.866	0.798	0.941
INCPOV1 1	vs. 4		1.093	0.898	1.33
INCPOV2 2	vs. 4		0.936	0.775	1.13
INCPOV1 3	vs. 4		0.888	0.728	1.084
CEN_REG 1	vs. 4		1.404	1.249	1.578
CEN_REG 2	vs. 4		1.162	1.048	1.287
CEN_REG 3	vs. 4		1.27	1.163	1.387
OVERINS			1.077	0.999	1.161

As seen in the “Logistic Regression Results” table, there are several variables that are significant or close to significant. The variables that are significant are *EDUC1 1*, *FRSTBRN 1*, *RACEETHK 1,2,3*, *INCPOV 1,3*, and *CEN_REG 1,3*. I did not include all variables that may have affected immunization status due to multicollinearity issues.

In order to understand the “Odds Ratio” table, the reader must first understand the interpretation of an odds ratio. The odds ratio is equal to the

$\frac{\text{Probability of child being immunized}}{\text{Probability of child not being immunized}}$. One of the significant variables in my analysis is child birth order. The odds ratio of a preschool-age child being fully vaccinated decreases by a factor of 0.82 when we move from a first-born child to a later-born child. If the odds ratio is less than 1, the odds of a child being vaccinated decrease as we move from first-born to a later-born child. If the odds ratio is greater than 1, the odds of a child being vaccinated increase as we move from first-born to a later-born child. For another example, the odds of a preschool-age child increase by a factor of 1.16 when we move from Hispanic child to a non-Hispanic white child. Note that this is based on a simple logistic regression. Additional analysis of the model to correct for multi-collinearity and/or interaction among the dependent variables would be interesting.

Ex-post empirical CBA

Ex-post empirical CBA is used to determine if the relationship between the immunization policy and the outcome of interest (disease reduction) is significant. Researchers conducting ex-ante and ex-post traditional CBA, as well as ex-ante empirical CBA, have frequently demonstrated that when immunization coverage increased, disease costs also decreased (Kaddar et al, 2005). However, there have been almost no research studies conducted with ex-post empirical CBA to determine the relationship between immunization policies and diseases reduction. The most important additional challenge to the empirical ex-post CBA approach is difficulty in finding data that actually reflect policy implementation change and outcome variable change on the same unit of analysis

(for example, individual, state, year, etc.). Unfortunately, this approach has not yet been used to examine the effects of immunization policy in the United States.

Results and Conclusion

The CBA approach that resulted in new insights into policy effects and implementation issues is ex-ante empirical. This CBA is a logistic analysis of a simple model. My model and analysis demonstrates that the empirical ex-ante CBA can provide more insight into immunization policy than the traditional approaches to CBA. I was not trying to do an overall CBA of immunization policy, that would take more data, more years, and a much more complicated model.

Using logistic regression, the factors that are most significant in the model are *FRSTBRN* and *CEN_REGI*. For a one unit increase in *FRSTBRN*, the odds of a preschool-age child being fully vaccinated (vs. not being fully vaccinated) increase by a factor of 0.819. This may be due to the fact that parents are more cautious with first born children and may become more carefree with the births of subsequent children. The more children in the family, the less likely the later-born children will receive their childhood immunizations (Steele 1996). Also, the benefits of immunizing another child are reduced as more children are immunized.

CEN_REGI indicates that the preschool-age child resides in the Northeast region of the United States. The odds of a child born in the Northeast being immunize versus a child born in the West are between 1.249 and 1.578. The Northeast has a higher cost of

living than the rest of the country. Due to smaller space for housing, the parents might want space away from their children. Thus, parents may choose higher quality children over quantity. With more land out West and more room for children to roam, parents may choose a higher number of children and spend less on each child in terms of healthcare. A child born in the South is between 1.163 and 1.387 times as likely to be immunized as a child born in the West.

The only level of education that is significant in influencing whether or not a child had been immunized was *EDUC1*, which indicates that the mother has less than twelve years of education. The difference between the mother having a high school education versus college and beyond is not significant. This is surprising since income levels for high school versus college graduates seem to be very different and income level was found to be significant with immunization rates.

The main finding from my study is that immunization probability actually varies widely among demographic groups. Some demographic groups have extremely low probabilities of immunization. Targeting those groups could have a big benefit in increasing immunization coverage.

CHAPTER FOUR

CONCLUSIONS AND AREAS FOR FURTHER RESEARCH

My dissertation has explored the usefulness of cost-benefit analysis in evaluating policies addressed in two social issues: the Expanded Food and Nutrition Education Program and child immunization. Examination of these social issues has provided scholarly insight into the potential uses and misuses of the four types of cost-benefit analysis outlined earlier. The application of the various types of cost-benefit analysis to each policy issue produced unique conclusions, and each issue merits further exploration for meaningful policy recommendations.

Lessons from EFNEP Policy Analysis

Numerous policy options in the community intervention literature suggest how to bridge the gap between nutrition education programs such as EFNEP and outcomes. In times of limited funding, it is essential that continuing long-term programs such as EFNEP demonstrate economic efficiency through accountability measures. Currently, all states must administer a national pre- and post-program test survey to program participants. The test involves ten summative questions all of which fail to inquire about participants' skill, knowledge, behavior, and attitude about nutrition before and after completing the program. This is a major oversight. The evaluation methods need to reflect the various facets that demonstrate participant life-style change.

It is easy to argue for the policy effectiveness of EFNEP when conducting traditional ex-ante and traditional ex-post approaches, as these are relatively straightforward to conduct. As my research demonstrates, the empirical ex-ante and ex-post approach are much more difficult approaches to demonstrating the importance of EFNEP as there are no good data sets available for the relevant independent and dependent variables.

No system has been developed or utilized by EFNEP administrators to nationally evaluate or systematically address the survey results so as to provide meaningful feedback to program practitioners. Government mandated, results-based accountability methodology would provide EFNEP practitioners and administrators tools and information to achieve outcomes. Furthermore, government funded, research-driven community trials that follow participants for at least five years following program participation would demonstrate whether EFNEP programming is having long-term desirable effects.

Research on the effectiveness of programs such as EFNEP is one way to ensure that social assistance programs are serving the needs of those who lack food security, suffer nutrient-poor diets, and are at high risk for chronic disease. The consequences of food insecurity such as malnutrition and poor mental health reduce individual's ability to be a productive member of society.

Researchers recommend the following policy evaluation tools: 1) increased accountability measures, 2) longitudinal research studies, 3) state-state comparison studies and conferences. All are crucial measures to increasing overall well-being in the

United States. The overall conclusion from my EFNEP policy analysis is that it is very difficult to show that EFNEP leads to long-term disease reduction.

Lessons learned from Immunization Policy Analysis

As discussed in the immunization chapter, the benefits to vaccination coverage are widespread and numerous. However, since only older generations can remember the infectious diseases for which we now have vaccinations, younger generations often distrust the need and value of vaccinations. It is becoming increasingly difficult to maintain the level of immunization coverage needed for herd immunity (Vernon, 2003). My research did not consider the traditional ex-ante and ex-post cost-benefit analysis approaches because numerous scholars have already thoroughly exhausted these approaches. Instead, my study follows the empirical ex-ante and ex-post methodology. Using this methodology, this research was able to determine socio-demographic groups that are least likely to get vaccinated, so that policymakers can target those groups.

Moving beyond all four types of cost-benefit analysis, most immunization scholars believe that qualitative research would be the best way to fix low vaccination rates. Roberts et al state, “The main barrier to successful combination of qualitative and quantitative research in increasing vaccination coverage is that methods for incorporation of qualitative research are underutilized” (1596, 2002). Qualitative research methods such as focus groups and ethnography draw attention to lay beliefs and identify parental concerns about exposing children to potential risk, as well as moral and religious

objections (Roberts et al, 2002). The few qualitative research studies that have been conducted so far ran focus groups with immunizers and non-immunizers. Non-immunizers were more likely to be concerned with long-term side effects of vaccines (Vernon, 2003).

Policy researchers have determined that once health service factor improvements are made (such as those mentioned in the Immunization chapter), the next best method for vaccination improvement is financial incentives for mothers (Levine et al, 2011). Furthermore, there needs to be concordance at a local and state level. Local and state communities need to have public discussions to better disseminate vaccination coverage information (Vernon, 2003).

General Conclusions

There are many findings in my research that will affect how policy analysts and scholars conduct future research is conducted by policy analysts and scholars. The first finding is that cost-benefit analysis can be separated into four approaches: ex-ante traditional, ex-post traditional, ex-ante empirical, and ex-post empirical. Separating the challenges into components associated with each approach can help identify specific and tractable solutions to the challenges. Policy analysts should consider each type before jumping into performing traditional ex-ante and ex-post or regression analysis.

The second result is that the four types of cost-benefit analysis are not equally suitable to apply to every policy or problem with policy implications. In the chapter

regarding EFNEP, traditional ex-ante and empirical ex-post were not possible to conduct. The policy had already occurred, so there was no need for traditional ex-ante analysis. Empirical ex-post analysis was impossible due to severe data restrictions. In my research regarding the problem of immunization, traditional ex-post and empirical ex-post CBA were not possible as no new policy had been enacted.

The third finding of my research is that researchers and policy scholars need to consider the advantages and disadvantages of each type of cost-benefit analysis before starting new research. Never before has there been a clear delineation of the four ways to approach cost-benefit analysis. Researchers should consider the many neo-classical economic assumptions that come into play when conducting the two types of traditional cost-benefit analysis. While the two types of empirical cost-benefit analysis do not have as many assumptions, the lack of ability to gather primary data and to manipulate secondary data often renders empirical analysis useless. Both regression approaches to EFNEP and immunization policy analysis demonstrated that it is very difficult to conduct empirical CBA of either type.

The fourth determination was that the “easiest” CBA’s to conduct are ex-ante traditional and ex-ante empirical. It is easier to hypothesize what will happen than to determine what has happened.

Given this conclusion, the fifth finding of this research is that the most useful type of CBA is ex-post empirical, because EFNEP and immunization policy analysis found new information that had not been demonstrated previously. However, realistically it is often difficult to acquire data on the population the policy is supposed to affect. The

most important challenge to the empirical ex-post cost-benefit analysis approach is difficulty in finding data that actually reflect policy implementation change and outcome variable change on the same unit of analysis (individual, state, year, etc.). It is extremely difficult to find a data set in which researchers are able to clearly designate a population that responds to the policy at hand. Little academic work has taken this approach.

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