An Examination of Virginia's Adult SNAP-Ed Program by Cost-Effectiveness Using Program Cost and Participant Self-Evaluations

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Abstract

The Supplemental Nutrition Assistance Program Education (SNAP-Ed) is an extension of the Supplemental Nutrition Assistance Program (SNAP) that aims to promote living healthier lifestyles for low-income participants of SNAP with limited resources. This thesis aims to investigate the effectiveness of Virginia's adult SNAP-Ed program through a cost-effective analysis (CEA) for fiscal year 2013 which requires the separation of the into the costs and the effects of the program. The costs for the program are categories as the labor, capital, material, and utility costs that are required to implement the adult SNAP-Ed program. The effects are measured as the number of participants who start, graduate, and improve from the start to the end of the program. The effects were measured on a retrospective self-assessment that measured both if a participant graduated and their magnitude of improvement. The analysis showed that as the state of Virginia the adult SNAP-Ed program incurred a cost of $2,488,170.07 with 6,759 participants starting the program and 3,704 of those that graduated in fiscal year 2013. Participants that improved on at least one of the questions by a score of one were 3,609 of the 3,704 that graduated. For the state of Virginia the cost effective ratio (CER) for starting a participant was $368 and CER of $672 for each graduated participant. An improvement on at least one question saw a CER value of $689. These findings show patterns that can be used for future policy implementation and the focus of the program.

Dedication

To my wife, Maria, who was constantly there to support and push me forward in order to achieve my life and academic goals.

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Chapter 1.0 Introduction

1.1 Supplemental Nutrition Assistance Program (SNAP)

1.1.1 National Background

The Supplemental Nutrition Assistance Program (SNAP), previously known as the food stamp program, is the largest food assistance program operating in the United States (SNAP TO HEALTH, 2012). The program's name changed as a result of the 2008 Farm Bill, which set out to remove the negative connotation associated with food stamps and accomplish the following goals: increase the benefits received by households, simplify administration, strengthen integrity, improve health through education, and improve program access (United States Department of Agriculture, 2014b). At the same time that these changes were being implemented in 2008, the SNAP program participation levels were at an all time high of 29 million people per month and Federal Food Assistance programs across the nation were receiving a $10 billion dollar increase over the next ten years (United States Department of Agriculture, 2014b).

Considered a key program of the United States Department of Agriculture, SNAP is designed to assist those that meet certain requirements obtain food more easily (Stang, Bayerl, & American Dietetic, 2010; United States Department of Agriculture, 2012). Some of these requirements include income, work, countable resources, and immigration. The income requirements are straightforward values that are determined by household size and are adjusted for the number of household members (United States Department of Agriculture, 2014b). For example, a single individual must make a gross income of less than $1,265 a month to be eligible for SNAP while a household of eight must be under $4,344 per month (United States Department

of Agriculture, 2014b). Regarding the work eligibility requirements, applicants between ages 18 and 50 who do not have any dependent children may only receive SNAP benefits for a three month period if they do not actively participate in a form of workfare or employment programs with a maximum of 36 months of enrollment allowed (United States Department of Agriculture, 2014b). To meet the citizenship and immigration requirement, an individual must have lived in the United States for at least five years prior to applying for benefits (United States Department of Agriculture, 2014b). The current requirements set for fiscal year 2015 also include a resource requirement in which a savings account, considered a countable resource, must be below $2,250, with exceptions for those who are disabled and those who are above 60 years old (United States Department of Agriculture, 2014b). If individuals meet the requirements set forth an application for the SNAP benefits must be submitted and upon approval, participants can receive a designated amount of benefits based upon household size.

In order to understand the potential audience SNAP can reach with nutrition education, the participation and benefits over the past and future fiscal years can add perspective. In fiscal year 2011, over 44.7 million American participants (14.2% of U.S population) were receiving benefits from SNAP with a total benefits cost over $71 billion (United States Census Bureau, 2014; United States Department of Agriculture, 2012). In fiscal year 2012, over 46.6 million participants (14.8%) were receiving SNAP benefits with a total benefits cost over $74 billion (United States Census Bureau, 2014; United States Department of Agriculture, 2013b, 2014b). In fiscal year 2013, the year of interest for this study, there were over 47 million participants (15%) with a total benefits cost above $76 billion (United States Census Bureau, 2014; United States Department of Agriculture, 2014b). An increase of close to three percent in costs for the program from fiscal year 2012 to 2013 was observed, but an increase of less than a percent

in the participant population occurred. The average person received monthly SNAP benefits of $133.41 in fiscal year 2012 and $133.07 in fiscal year 2013 marking a slight decrease in benefits in fiscal year 2013 (United States Department of Agriculture, 2014b). The following fiscal year, 2014, saw a further decrease down to 46.5 million participants (14.5%) with a total cost of nearly $70 billion dollars and an average benefit of $125.35 per person (United States Census Bureau, 2014; United States Department of Agriculture, 2014b).

1.1.2 Virginia Background

In the state of Virginia, in fiscal year 2012 there were 913,000 enrolled participants in the SNAP program (11.1% of the Virginia population) with an increase to about 941,000 participants (11.4%) enrolled in fiscal year 2013 (United States Census Bureau, 2014; United States Department of Agriculture, 2014b). Although the participation rate increased from fiscal year 2012 to 2013, fiscal year 2014 saw a decrease in participation to around 914,000 individuals (11.0%) (United States Census Bureau, 2014; United States Department of Agriculture, 2014b). The total cost for fiscal years 2012 and 2013 was $1.4 billion in each fiscal year (United States Department of Agriculture, 2014b). No cost data for fiscal year 2014 has currently been made available at the state level so no pattern could be detected. However, it can be seen at the national level that the costs decreased significantly from fiscal year 2013 to 2014 and a similar trend would be expected at the state level. A decrease or a relatively similar cost at the state level can be associated with both a decrease in the participation for fiscal year 2014. Participants in Virginia received slightly smaller benefits than the average participant, receiving $128.00 in fiscal year 2012 and $127.75 in fiscal year 2013 (United States Department of Agriculture, 2014b).

1.2 Supplemental Nutrition Assistance Program Education (SNAP-Ed)

The Supplemental Nutrition Assistance Program Education (SNAP-Ed) is an extension of SNAP and is an optional program for those enrolled in SNAP to join. The program, originally know as Nutrition Education, was formed in 1981 as part of the food stamps program in an attempt to tackle the problem of domestic hunger by educating those with fixed benefits about how to better allocate their resources (SNAP TO HEALTH, 2012; United States Department of Agriculture, 2014c). In the late 1980s and early 1990s, grants such as The Hunger Prevention Act of 1988 and the Mickey Leland Memorial Domestic Hunger Relief Act of 1990, promoted nutritional education programs by allowing states to apply for matching funds from the federal government to deliver nutrition education programs to eligible participants (SNAP TO HEALTH, 2012; United States Department of Agriculture, 2014b). In 2008 as a result of the Farm Bill, the program underwent a revision, changing its name to SNAP-Ed and attempting to make itself more attractive to the public. SNAP-Ed aimed to improve overall health through nutritional education programs designed for low-income participants and in doing so, strived to distance itself from the negative connotation associated with the food stamps program (United States Department of Agriculture, 2014b).

Although originally formed as part of the food stamps program in 1981, SNAP-Ed itself has been around since 2008 and has been active in 52 states and territories since then (Koszewski, Sehi, Behrends, & Tuttle, 2011; SNAP TO HEALTH, 2012). The goal of SNAP-Ed is to educate participants about nutrition so they may become more knowledgeable about and capable of leading healthier lifestyles, with emphasis being placed on reducing obesity and increasing physical activity particularly in women and children (Stang et al., 2010; United States

Department of Agriculture, 2012). In order to achieve these overall goals, SNAP-Ed focuses on several intermediate goals: (United States Department of Agriculture, 2012):

- Increasing participants' consumption of fruits and vegetables;

- Decreasing the time participants spend being inactive; and

- Helping participants understand an ideal and balanced caloric intake.

However, these goals can be a challenge because participants often lack knowledge about price comparison, food preparation techniques, and how to utilize the MYPlate guide(United States Department of Agriculture, 2012). SNAP-Ed, therefore, must not only teach its participants about basic food nutrition, but it must approach the subject from a lower-income point of view. Individuals that participate in SNAP are given strict benefits in the form of food voucher in order to support their families as healthy as possible. SNAP-Ed is designed to teach its participants techniques that specifically address healthy food choices on limited budgets (Koszewski et al., 2011).

SNAP-Ed participants are not the only aspect of SNAP-Ed restricted by limited resources for specific allocation. SNAP-Ed itself faces difficulty in accomplishing its goals due to the limited funding it receives. Funding for SNAP-Ed comes from the federal government (United States Department of Agriculture, 2013a). During fiscal year 2013, SNAP-Ed nationally received $285 million to promote nutritional education. The funding for fiscal year 2013 ($285 million) was about 26% less than what was allocated in fiscal year 2012 ($388 million) and about 30% less than that allocated for the next year of fiscal year 2014 ($401 million) (United States Department of Agriculture, 2013a). Keeping on trend with national funding, fiscal year 2013 marked lower state funding for Virginia than that of 2012 and 2014. The Virginia component of SNAP-Ed received $4.2 million in fiscal year 2013, marking a 24.7% decrease

from fiscal year 2012, during which it received $5.5 million (United States Department of Agriculture, 2013a). The following fiscal year (2014) the funding increased to $6.1 million or by about 31% (United States Department of Agriculture, 2013a). The state of Virginia's SNAP-Ed program received 1.5% of the national SNAP-Ed fund of fiscal year 2013 (United States Department of Agriculture, 2013a). On average, 940,932 individuals enrolled for SNAP benefits in the state of Virginia each month in 2013, however, only 6,759 of these individuals participated in the SNAP-Ed program (United States Department of Agriculture, 2013b). Those 6,759 individuals account, on average, for less than one percent of the total participants receiving SNAP benefits. When looking at the total funding for the program ($4.2 million) as compared to the number of participants (6,759), the average /cost per participant was nearly $621.77.

1.3 Statement of Purpose and Goals of Study

Since the start of SNAP-Ed as a program, there has been no cost-effective analysis (CEA) or cost benefits analysis (CBA) completed on the adult program in the state of Virginia. A cost-effective analysis determines a numerical value for the costs of a program and divides it by the numerical value of effects such that the value of this formula yields the cost to achieve one unit of the effect (Muennig, 2008). A cost-benefit analysis takes a CEA one step further by converting the units of the effects into a monetary value (Weinstein, Siegel, Gold, Kamlet, & Russell, 1996). The importance of having a CEA can be explained when looking back at the budget cuts implemented from fiscal year 2012 to 2013. With a CEA, the program managers would have been able to present to government policy makers the effectiveness of the program in relation to its funding. That is, how much it was costing per unit to get a measured effect. The lack of such an analysis leaves a gap in the ability of both management and government officials to address funding issues, as they are unable to show the effectiveness of the program in relation

to the budget SNAP-Ed receives. Management also would have had the ability to determine what districts and individuals were being the most and least cost-effective to determine where and what types of changes needed to occur with CEA data. A CEA or CBA would allow Virginia's SNAP-Ed to determine the strength and weakness of the program that would be difficult to conclude as well as show the effectiveness in its delivery. Therefore, the purpose of this study is to perform a CEA on the adult component of the SNAP-Ed program in Virginia for fiscal year 2013. Therefore, the overall goals of our study for the adult SNAP-Ed program for Virginia are:

1. To identify the total cost of implementing the adult SNAP-Ed program at the state level in fiscal year 2013.

2. To identify the total effects produced from the adult SNAP-Ed program at the state level in fiscal year 2013.

3. To derive the cost effectiveness ratio of the adult SNAP-Ed program at the state level in fiscal year 2013.

4. To identify the total cost of implementing the adult SNAP-Ed program at the individual district levels in fiscal year 2013.

5. To identify the total effects produced from the adult SNAP-Ed program at the individual district levels in fiscal year 2013.

6. To derive the cost effectiveness ratio of the adult SNAP-Ed program at the individual district levels in fiscal year 2013.

7. To identify the total cost of implementing the adult SNAP-Ed program at the individual Para-professional (PA) levels in fiscal year 2013.

8. To identify the total effects produced from the adult SNAP-Ed program at the individual PA levels in fiscal year 2013.

9. To derive the cost effectiveness ratio of the adult SNAP-Ed program at the individual PA levels in fiscal year 2013.

10. To determine outliers, ranges, and standard deviations at each level of aggregation for costs, effects, and the cost effective ratios for the adult SNAP-Ed program in fiscal year 2013.

The following chapter, Chapter 2, will focus on the literature review that will explore the studies completed on the effects on SNAP-Ed and demonstrate which components are typically used for the costs and effects in a similar prominent nutrition related program. Chapter 3 will focus on the data and methods in which the individual components of the cost-effective ratio (CER) are examined, along with the adaption of the formula to the adult SNAP-Ed program of Virginia. The units and calculations of both costs and effects are explained in this chapter, as well as the relationships and the levels of aggregation used for the analysis. The data sources and summary statistics of the costs and effects data are also examined. Chapter 4 will focus on the results and provide several tables showing the costs and the effects along with the CER for the districts and state. Chapter 5 will focus on the sensitivity analysis in which the outlier costs associated with PAs in different cost categories are removed and the CER is re-calculated to examine the effects outliers had on the ratios. Chapter 6 will include a discussion of the results and a comparison of districts within the different effect categories. This chapter will also utilize several figures to demonstrate and emphasize key relationships and findings. Finally, the end of Chapter 6 will briefly summarize the findings while expanding ideas for future studies on the adult SNAP-Ed program and serve as the chapter for the conclusion.

Chapter 2.0 Literature Review: SNAP-Ed Studies and EFNEP

While no studies have evaluated the cost effectiveness of the SNAP-Ed program, several

studies have been completed on the effects focusing on participants' behavioral change. A study

completed of Wyoming's SNAP-Ed and Expanded Food and Nutrition programs (EFNEP)

studied the long-term effects of the program using the tests scores from the SNAP-Ed program

(Wardlaw & Baker, 2012). The Wyoming joint program known as Cent$sible Nutrition Program

(CNP) was described as targeting behavioral areas in food resource management (FRMP), food

safety (FSP), and dietary quality, also seen in many EFNEP studies as nutritional practices (NP)

(Wardlaw & Baker, 2012). The assessments used in the SNAP-Ed program are pre- and post-

tests, given in a retrospective format, to evaluate the progress of individuals from the beginning

to the end of the program. The researchers retrieved the data on the initial pre- and post-test

scores for 1,062 randomly selected participants who had completed the program anywhere from

six months to four years prior. The selected individuals were then assessed with the same tests to

see if the behavioral changes were long term (Wardlaw & Baker, 2012). Only 493 respondents

completed and returned the behavioral checklist representing a 46.4 percent response rate

(Wardlaw & Baker, 2012). The findings revealed that on average, each of the three major

behavioral areas witnesses an improvement from entry into the program until the follow-up

checklist (Wardlaw & Baker, 2012). The behavioral checklist used a similar scale as that used in

SNAP-Ed, ranging from one to five. A score of one represented the least desired response of

never engaging in the desired nutritional behavior, while a score of five represented a participant

always engaging in the desired behavior (Wardlaw & Baker, 2012). The middle of the scale, a

score of two correlating with seldom engagement in the desired behavior, three represented

engaging in the desired behavior sometimes, and four indicated a participant engaged in the

desired behavior most of the time (Wardlaw & Baker, 2012). In the case of a reverse order question, in which a score of one was the most desired response or never engaging in a certain activity, the scores were flipped to be able to relate a higher value closer to five as desirable so the scoring was the same for desired responses. The checklist questions were divided into subscales consistent with the EFENP categories. From there, the mean score of the questions was calculated within each subset (FRMP, FSP, NP) (Wardlaw & Baker, 2012). In the respective categories, the mean scores across the subscales at entry were 3.45 (FRMP), 4.15 (FSP), and 3.35 (NP) (Wardlaw & Baker, 2012). While the overall mean scores did not remain this high by the end of the program, the ending scores still remained higher than the entry assessment values being noted at: 3.80 (FRMP), 4.43 (FS), and 3.72 (NP) (Wardlaw & Baker, 2012).

Another study by Kaiser and Ganthavorn (2014) on California's SNAP-Ed program evaluated the intent of 2,472 participants to change behavior after one SNAP-Ed lesson. Participants were evaluated with a two item intent-to-change survey, compromised of questions regarding a participant's intent to incorporate more desirable dietary behavior into their lives. From their study, it was shown that 52-68% of the participants would eat more fruit, 45-62% would eat more grains, 68-75% would reduce sweetened beverage consumption, and 57-70% would shop with a list (Kaiser & Ganthavorn, 2014). These SNAP-Ed lesson participants were then compared to a control group of 784 low-income adults recruited from the same social services lobby (Kaiser & Ganthavorn, 2014). When compared to the control group, the SNAP-Ed participants were more likely to increase fruit consumption ($p<0.0001$), increase whole grain consumption ($p<0.0005$), reduce sweet beverage intake ($p<0.0001$), and shop with a list ($p>0.02$) (Kaiser & Ganthavorn, 2014).

Though no CEA or CBA study on the SNAP-Ed program has been conducted, previous studies completed on the Expanded Food and Nutrition Program (EFNEP) have used both the CEA and CBA analyses. These analyses are worth investigating due to their similar methodology to SNAP-Ed. EFNEP is a nutrition education program administered by the USDA's National Institute of Food and Agriculture (NIFA) beginning in the 1960's (NIFA, 2013). As with SNAP-Ed, EFNEP targets low-income households, particularly the caregivers, with the goals of conveying new knowledge, teaching new skills, and helping to implement behavioral changes in respect to nutritional awareness (NIFA, 2013). EFNEP manages this through courses taught by para-professionals or professional assistants (PAs) following a set curriculum. Assessments (checklists) are given to participants at the beginning and at the end as a way to evaluate for the program (Joy, Pradhan, & Goldman, 2006; NIFA, 2013). Since SNAP-Ed is so similar to EFNEP, CEA and CBA analyses would be very useful for evaluation of SNAP-Ed as well as for procedural comparison between the programs.

There have also been CBA studies completed on the Expanded Food and Nutrition Program in which the effects produced were converted to a monetary value (e.g. (Burney & Haughton, 2002; Joy et al., 2006; Rajgopal, Cox, Lambur, & Lewis, 2002). The first, completed by Rajgopal et al., (2002) examined Virginia's EFNEP program of 1996. In the study, the authors converted the effects of the participants' improvement rates into monetary values based on medical expenditures that were avoided through the delay or prevention a particular disease. A total of 3,100 participants completed both an entry and exit food-recall EFNEP test (Rajgopal et al., 2002). The diseases considered were known to be nutrition related, and the benefits calculated were based on the disease being delayed for a period of time or the disease not being

contracted at the average age of onset to the expected survival rate after treatment (Rajgopal et al., 2002).

The benefits were classified in two ways: direct and indirect. The direct benefits consisted of the medical costs avoided by the delay or prevention of a particular disease on a yearly basis for the duration of a treatment (Rajgopal et al., 2002). These values were adjusted to only reflect the participants that: graduated from the program, improved on an area of the assessment related to the disease, and would have been expected to have incurred the disease through diet-related reasons (Rajgopal et al., 2002). The indirect benefits consisted of the time a participant gains from disease avoidance or delay and, instead of spending time handling medical concerns, is able to participate in the labor market and receive income from hourly work. Rajgopal et al. (2002) calculated the total indirect benefits to be $18,223,979.90 (Rajgopal et al., 2002).

Once these benefit values were calculated the costs were broken into similar group: direct and indirect. Direct costs were viewed as resources allocated for the use of implementing the program, such as PAs' salaries, travel expenses, building expenses, and utility expenses (Rajgopal et al., 2002). The indirect costs affected participants in the form of lost wages or childcare expenses that would be required in order for participants to attend the EFNEP lessons (Rajgopal et al., 2002). These were considered to be minimal and not included in the study The total cost of the delivery of the program excluding indirect costs was calculated to be $1,713,081.00 (Rajgopal et al., 2002). Once these costs and benefits were calculated, the CBA ratio was measured. Rajgopal et al. (2002) found that for every dollar of cost incurred, $10.64 of benefits was produced.

The method and analysis used in their study to evaluate a nutrition education program has been adopted to investigate the effectiveness of EFNEP programs in other states by means of monetary values. One such study was completed on the 1998 California EFNEP program. This study used question assessments to compare and explain the benefits of the program which were defined as the medical costs avoided as a result of improved nutritional behavior (Joy et al., 2006). The benefits for the California EFNEP program were calculated through assumptions made on delaying a particular disease or avoidance of a disease. (Joy et al., 2006). The sample size consisted of 9,528 participants who completed both the EFNEP pre- and post-test (Joy et al., 2006).The direct benefits calculated considered both the direct benefits including the medical costs avoided by not having a disease for a certain time period and the indirect benefits, including the salary earned by being able to work longer. The total monetary value of all benefits was calculated to be $40,789,113.85 (Joy et al., 2006). The direct costs used for the analysis were the total costs to implement EFNEP, and the indirect costs were those costs incurred by participants who spent time in the program instead of in the workforce. The total cost of delivering the program was $2,780,550.00 (Joy et al., 2006). The California EFNEP study found that for every dollar of cost incurred for the program, $14.67 was saved from medical expenses. Realizing that this value may be high, the researchers performed a sensitivity analysis that revealed the least amount of benefits to be $3.67 per every dollar cost incurred (Joy et al., 2006).

A drawback to calculating benefits through this manner is the number and types of assumptions that must be made. For example, Joy et al. (2006) stated that EFNEP participants have only been evaluated for positive nutritional behavior change up to five years after the program. However, the benefits calculated assume that these behavioral changes are lifelong and that diseases such as diabetes and Osteoporosis can be delayed and/or completely avoided (Joy et

al., 2006; Rajgopal et al., 2002). Osteoporosis avoidance throughout life was the main source of benefits in these studies accumulating about $35 million in benefits for Joy et al. (2006) and $16 million for Rajgopal et al. (2002). Though an individual's diet is not the only factor for Osteoporosis occurrence and there are numerous other factors that cause this condition such as genetics, hormones, or smoking (Joy et al., 2006),Therefore, both the studies done on California and Virginia's CBA had a sensitivity analysis reducing the benefits of Osteoporosis delay or avoidance. For California's the benefits were reduced to 25% diet-related leading to the CBA ratio to be reduced to $5.37 instead of $14.67 (Joy et al., 2006). However, the Virginia study only reduced the benefits by 50% seeing a decrease from $10.64 to $5.91 (Rajgopal et al., 2002). These sensitivity analyses demonstrate that making assumptions surrounding incidence rate, prevention and work time, and the rate of optimal nutrition behavior can make the CBA for nutrition programs very difficult to estimate and could lead to overly optimistic results. This leads to the conclusion that while this method provides end values in a common unit of measurement, specifically monetary costs, it imbeds a great deal of uncertainty regarding the actual value that can arise. However, other types of CBA studies have used alternative methods of benefit calculations in order to reduce the necessary assumptions required when converting benefits to medical cost avoidance.

A study completed on the EFNEP program in Tennessee used changes in food expenditures as benefits for their CBA. Burney and Haughton (2002) integrated food expenditures saved as the benefits incurred from the program by examining cost data over a six-month period. A total of 371 women enrolled in EFNEP completed a 24 hour food recall and behavior study (Burney & Haughton, 2002). The women were split into three groups, two of which were treatment groups designed to receive nutritional education, and one of which was the

control designed to not receive nutritional education. The two treatment groups differed on the way cost data was collected: one with expenditures recall and the other with collected register receipts or recorded expenditures (Burney & Haughton, 2002). Burney and Haughton (2002) had selected for participants to record expenditures for a two-week period prior to the beginning of EFNEP as well as after completion of EFNEP (Burney & Haughton, 2002).   The average EFNEP cost per participant was $388 and graduating participants reported that family food expenditures decreased by $10-$20 per month totaling to $124-$234 per year (Burney & Haughton, 2002). This reduced the need for emergency food aid and allowed money to be used on other goods (Burney & Haughton, 2002). Also based on their food expenditures analysis, Burney and Haughton (2002) concluded that participants were eating in a more nutritionally optimal manner. However, even for this study, some assumptions were made in order to convert effects into a monetary measure. These included assuming that expenditures reported by participants without receipt were accurate (Burney & Haughton, 2002). Also, food away from home may not have been included which could create inaccuracies in both conclusions (Burney & Haughton, 2002). The assumptions for this study, however, were not as large as those required when considering medical costs, such as the assumptions seen in the CBA done in California and Virginia. Therefore, while the benefits for this program may be smaller when compared to health savings, these benefits could possibly be a more realistic value for EFNEP benefits.

The previous studies investigating the intermediate and long term effects of the SNAP-Ed and CBAs of the EFNEP program support the method of using post-tests as a proxy for behavioral change in the SNAP-Ed program. Similarly this proxy can also be seen from CEA, or cost effectiveness analysis, completed on the EFNEP program. A CEA on the youth EFNEP program of Virginia for the years 2011-2012 used both test scores and participation rates for

evaluation to determine the cost-effectiveness ratios (CERs) (Baral, Davis, Serrano, McFerren, & You, 2013). A CEA was chosen instead of a cost-benefit analysis (CBA), which is commonly used on the adult portion of EFNEP, due to the difficulty of assigning health benefits (effects) to youths. The difficulty arises as a longer remaining life span would cause for uncertainty in predicting health and disease occurrences for benefits (Baral, Davis, Serrano, et al., 2013). The sensitivity analyses suggest that the CBA may be quite sensitive to these assumptions. Instead of showing a medical cost avoidance due to a change in behavior from an assessment test, a CER looks at what it costs to reach that change. Therefore, this can be seen as a more realistic approach for an analysis as fewer assumptions are necessary for calculations.

For the youth EFNEP program, the average cost for reaching an participant was $89 and the average cost of an improvement in behavior, as measured by an increase in the exit assessment score on at least one question, was $149 (Baral, Davis, Serrano, et al., 2013). These average costs were representative of the average cost for a county participating in the youth EFNEP program. The average CERs reported for amount of participants reached and for improvement rate of the participants at the end of the program was given at a county level with a total of 15 counties examined. CERs ranged from $20-$243 dollars per participant while behavioral changes ranged from $24-$537 (Baral, Davis, Serrano, et al., 2013). The calculated state level CER values were $52 per participant reached and $75 per improvement on at least one question (Baral, Davis, Serrano, et al., 2013). Reporting the total and average CERs for these counties allows youth EFNEP administrators to see what counties have been the most and least effective in order to better improve the overall effectiveness (Baral, Davis, Serrano, et al., 2013). However, these results are not as easily comparable as those calculated in a CBA. A CBA shows what a program has produced in benefits such as the Virginia and California studies which

showed money that society and participants saved through medical saving. A CER only shows how cost-effective a program is in achieving results. It does not show how the program has calculated a monetary value or how the program has necessarily produced monetary gains or reduced monetary costs of society.

Another CEA study used national EFNEP data to produce for the maximum average cost (MAC) per improvement nationwide in the EFNEP behavioral categories (FRMP, FSP, NP) and per participant, as done in the youth EFNEP study (Baral, Davis, Blake, You, & Serrano, 2013). The reason the term MAC was used is due to lack of information on what portion of a state's EFNEP funding is spent on the youth or adult component and it is unknown what proportion of the state's EFNEP funding within the adult or youth component is spent on the three program goal behavioral categories (Baral, Davis, Blake, et al., 2013). Their findings showed the average MAC ratio nationwide per participant was about $520 and the average MAC for an improvement on one question in each of the categories in NP was $594, FRMP was $634, and for FS was $848 (Baral, Davis, Blake, et al., 2013). A key outcome of their study was the design of not only a state but also a national average of the states EFNEP CERs. As with Baral, et al.'s Youth EFNEP Virginia study (2013), this allows for the identification of states with high and low CER values and the ability for re-evaluation and improvement. Furthermore, it also gives insights to policy-makers for funding decisions in the future. Since these programs are government funded, the ability of these individual programs to provide evidence of success is crucial for receiving necessary funding. Table 2-1 below shows the CEA results from both the Virginia Youth EFNEP and National EFNEP studies and examines the use of comparisons for our study.

TABLE 2-1 SUMMARY OF VIRGINIA YOUTH EFNEP AND NATIONAL EFNEP STUDIES

Study	CER per Participant		Average Cost per Participant County/State[1]				
	Reached	Improve	Reach	Improve	FRMP	NP	FS
Virginia EFNEP[8]	$52.00	$75.00	$89.00 ($20-$243)[1]	$149.00 ($24-$537)	N/A[2]	N/A[3]	N/A[4]
National EFNEP Study[9]	N/A[5]	N/A[6]	$520.00 ($142-$1,953)	N/A[7]	$634.00	$594.00	$848.00

[1] The National and Youth EFNEP studies had ranges that were reported in parentheses when applicable.

[2] The Virginia Youth EFNEP study done in Virginia did not use the traditional checklist of the adult EFNEP program and so this category does not apply.

[3] The Virginia Youth EFNEP study done in Virginia did not use the traditional checklist of the adult EFNEP program and so this category does not apply.

[4] The Virginia Youth EFNEP study done in Virginia did not use the traditional checklist of the adult EFNEP program and so this category does not apply.

[5] The National EFNEP study looked at only the MAC ratio and therefore only used averages so these reported values are not applicable.

[6] The National EFNEP study looked at only the MAC ratio and therefore only used averages so these reported values are not applicable.

[7] The National EFNEP program used the traditional checklist for EFNEP participants dividing questions into effect categories so an overall improvement ratio is not applicable.

[8] Baral, R., et al. (2013). The Cost Effectiveness of Educating Limited Resource Youths on Food and Nutrition. 2013 Annual Meeting, August 4-6, 2013, Washington, DC, Agricultural and Applied Economics Association.

[9] Baral, R., et al. (2013). "Using National Data to Estimate Average Cost Effectiveness of EFNEP Outcomes by State/Territory." Journal of nutrition education and behavior 45(2): 183-187.

Table 2-1 shows the summarized results from the CEA done on the Youth EFNEP program in Virginia and the National EFNEP study. The overall purpose is to explore the inputs for the denominator and numerators for the individual studies and discuss the possibilities of a comparison from our study on the adult SNAP-Ed program of Virginia. The Virginia Youth EFNEP study has very small CER ranging from $52 a participant reached, to $75 for a statewide improvement ratio. When compared to the national study for the adult EFNEP program the participants reached was $520, with an average improvement in the three categories of $692 (Baral, Davis, Blake, et al., 2013; Baral, Davis, Serrano, et al., 2013).

The cost components for both studies are very similar as they both look at the cost of the program as whole. The Virginia Youth EFNEP study is an exception as it focuses solely on the cost to the Youth portion of the program particularly only in 15 counties, while the national study looked at the adult EFNEP program at a state level. The Virginia Youth EFNEP study also was able to use a survey method in order to gain precise costs to provide a more accurate value, which was outside of the capability of the national study. The national CER values desired an adult-only CEA, but were unable to remove youth proportions for the cost and therefore saw a higher numerator than desired. The effects measurements were designed in a very similar way for both, defined as an improvement on at least one question. On top of the fact that the programs focused on different content, meaning youth versus adult participants, the main difference between the two was that the national study consisted of three different behavioral categories. This shows that while the cost components and effects may be measured the same way and even use the same type of units, the programs and program-levels differ in aggregation and implementation. The results and methods of the two studies support that aggregation and

implementation methods must be considered before being able to compare the effectiveness of different nutrition education programs.

2.1 Literature Review Conclusion

CEA and CBA are used as policymakers' tools to allocate funds and provide aid to the nutritional education program's management in order to support educational programs. A CBA can be difficult to perform as appropriating monetary values to benefits forces critical assumptions to be made. On the other hand, a CEA can provide results with no monetary conversion. In our study, the effects are simply the participants' test scores, which can accurately represent the effectiveness of the program. However, the validity of the assessment questionnaire that participants answer having being associated with lasting effects and being used as proxies for behavior change can be questioned. To clarify the validity of these effects, Koszewski et al. (2011) conducted a study on the lasting impact of change due to the SNAP-Ed program. The results concluded that long-term retention of at least six months was seen in majority of participants re-tested. Another study showed that even after just one lesson a behavior change could already be determined and seen (Kaiser & Ganthavorn, 2014). CEA and CBA studies completed on the EFNEP program have also used exit assessment scores as proxies for behavioral change.(Baral, Davis, Blake, et al., 2013; Baral, Davis, Serrano, et al., 2013; Joy et al., 2006; Rajgopal et al., 2002). Consequently, there is evidence that this assessment format can proxy for behavior change and therefore, it will be used for the effects portion of the CEA. The fact that a CEA study has not been done on an adult SNAP-Ed program means that there is a lack of valuable information needed for funding or administrative decisions. Our study will only look at the implementation of the program in Virginia. The goal of this study is to complete a CEA on the adult SNAP-Ed program of Virginia and encourage other states' SNAP-Ed programs to

complete similar studies. This would allow for programs to compare different individual

components, such as costs and effects, but also be able to communicate effective strategies that

can be implemented nationwide.

Chapter 3.0 Methods and Data

3.1 Cost Effective Analysis - The Reason

Cost effective analysis (CEA) is a tool widely used in decision-making by policy makers, especially concerning health related issues (Muennig, 2008). A CEA aims to place the dollars associated with a cost and then relate that cost to a specific measure of program's effectiveness (Wholey, Hatry, & Newcomer, 2010). An alternative method is a cost-benefit analysis (CBA), which takes the comparison between cost and effectiveness a step further by converting the effects (benefits) into the same unit as the costs. A CBA is often desired since the monetary conversions of effects allows for a simple comparison with the same units of value (dollars). This provides policymakers with a measure of the benefits and the costs, which is easier to use in making decisions. However, this is often difficult to accomplish as shown in Rajgopal et al. (2002) and Joy et al. (2006), due to the assumptions that must be held in order for the CBA ratio to be accurate. Despite the benefits of using a CBA, the Panel on Cost-Effectiveness in Health and Medicine supports and suggests the use of a CEA for studies performed in the health sector due to the assumptions need for monetary conversion of medical benefits (Weinstein et al., 1996). For the purposes of this study, a CEA is used to determine the cost associated with meeting the overall goal of the adult SNAP-Ed program.

The cost-effectiveness ratio (CER) will be the outcome of the CEA and is calculated as (Wholey et al., 2010):

$$CER = \frac{Total\ Cost}{Units\ of\ Effectiveness} \qquad \textbf{(3.1)}$$

Equation (3.1) demonstrates how a program is analyzed when there is a single program of interest or status quo (Muennig, 2008). The numerator, total costs, represents the monetary

amount incurred by the adult SNAP-Ed program in managing and implementing the program. The denominator, units of effectiveness, is a more abstract value being viewed as the intermediate outcomes of the adult SNAP-Ed program. CEAs done on EFNEP, discussed in Chapter 2, have shown that multiple aspects of SNAP-Ed can be viewed as an effect. For the adult SNAP-Ed program, the recruitment, graduation, and overall test score improvements will be consider as potential effects.

To better understand the components of equation (3.1) it becomes important to understand the structure and implementation of the program. To clarify, the numerator of (3.1) represents the cost related to the program, but to understand the costs of the program, it is necessary to examine background material related to resources. For example, information such as PA travel reimbursement, training time and other program obligations must be known in order to obtain an accurate value for the program's cost. The same mindset can be used for the denominator, or the effects. As discussed, the effects are more abstract than the costs and are often dependent upon the goals of the program, such as the amount of participants reached or the questions asked on the assessment and when the assessment can be given. A description of the program gives more insight to the process behind the determining of the exact effects and why they are chosen.

3.2 Brief Description of the Adult SNAP-Ed Program

To qualify for the SNAP-Ed program one must meet the same requirements as the SNAP program (Stang et al., 2010). The program itself is implemented during a typical fiscal year, running form October 1st until September 30th, and consists of six core lessons with additional optional lessons that are not required for program completion. To complete the entire adult

program, a participant must have completed at least the six core lessons. Collectively these lessons are known as the Eating Smart and Moving More curriculum (Virginia Family Nutrition Program, 2014). The six lessons are as follows and are each designed to be 60 minutes in length (Virginia Family Nutrition Program, 2014):

1. **MyPlate:** Families learn how to use MyPlate as a guide for eating smarter and balancing energy from food and physical activity.

2. **Shop For Value, Check the Facts**: Families learn to use labels to compare different foods.

3. **Choosing More Fruits and Vegetables**: Families learn how to add a variety of colors of fruits and vegetables to their plates each day.

4. **Choosing to Move More Throughout the Day**: Families learn ways to move more every day.

5. **Fix it Safe**: Families learn how to keep food safe to prevent illness.

6. **Smart-Size Your Portions and Right-Size You**: Families learn how to use proper portion sizes to eat smart and be healthy.

SNAP-Ed's administration divides the state of Virginia, using the individual counties in Virginia, into five distinct districts as shown in Figure 3-1 below. In each of these counties, paraprofessionals, also known as program assistants (PAs), administer the program and are responsible for its management. The number of PAs in a county depends on the size and density of the population. These instructors, along with trained volunteers are responsible for recruiting participants and teaching the designated curriculum. Due to these responsibilities and expectations, PAs are required to undergo training upon hire in order to understand how to properly recruit and teach participants. Following the initial training, PAs undergo workshops

Figure 3-1 Virginia District Division Map

Virginia District Divisions For SNAP-ED
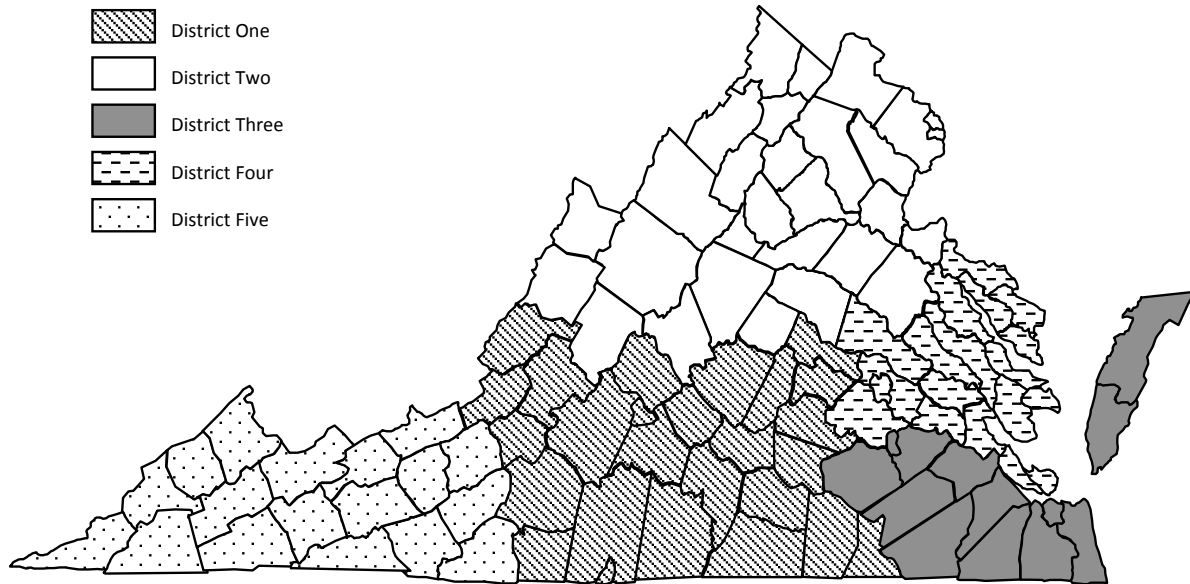
Image courtesy of the Family Nutrition program and Virginia Cooperative Extension (Family Nutrition Progam, 2015).

throughout the year to receive updates on how to better serve the participants. After the initial training has been completed, the PAs are responsible for traveling to their assigned areas, recruiting participants and beginning the education process. The PAs are also given office space in order to store equipment and to prepare for the class curriculum. Additionally, many of the PAs are responsible for other activities outside of just teaching participants. These responsibilities include recruiting participants, preparing food for teaching demonstrations, completing paperwork for administrative use, traveling to seminars and participating in other training activities. Each PA is also allocated a specific amount of money to spend on educational materials of their choices to improve the learning rate of their participants. As a further incentive to help PAs, materials such as measuring cups, cooking knives, and handouts are also provided for PAs to give to participants. This helps the participants stay motivated and focused to complete the program and graduate with an improved score. The PAs are responsible for working with the participants to set up times for classes and meetings but some PAs also hold joint appointments with other nutrition programs such as the youth EFNEP program, which is not of interest for this study. These youth responsibilities and activities for adult SNAP-Ed PAs are all considered and adjusted for later in Chapter 3 in order to represent the most accurate cost and effects data available for the adult portion of the program.

The district numbering helps identify the PAs through the District and County that they were assigned, and the PA number forming the (District-County-PA, DCP) number. The DCP numbering system is comprised of the numerical value associated with their district, then county, and then the PA within district, creating the acronym DCP. While the counties are used in the identification process, the level of aggregation was not used for calculation purposes due to the close ratio of PA to county being similar to one.

3.3 Cost-Effective Analysis Formulas and Analytics for SNAP-Ed

In Virginia, there are three different levels of aggregation that may be of interest: 1) State; 2) District; 3) PA. Equation (3.1) was the formula used to identify the components needed to calculate the CER. Equation (3.1) will be applied at the different levels of aggregation and these levels will be further connected. The most aggregate CER will be at the state level and will be referred to as the as the State Cost-Effectiveness Ratio (SCER). The SCER, as seen in equation (3.2) below, simply sums the cost and effects over all PAs and all districts and so can be written as:

$$SCER = \frac{\sum\limits_{d=1}^{N_D} \sum\limits_{p=1}^{N_P} C_{pd}}{\sum\limits_{d=1}^{N_D} \sum\limits_{p=1}^{N_P} E_{pd}} \qquad (3.2)$$

Here, C_{pd} represents the total cost of a PA (p) for the program within a district (d) and E_{pd} represents the total effects produced from the same PA within a district. The variables N_D and N_P represent the total number of districts and PAs within a specific district, respectively. The second level of aggregation that may be of interest is the district. In this case, one is simply calculating the CER for a specific district and this calculation is implicit in (3.1). Then, the district summation in equation (3.2) is dropped to yield the District Cost Effectiveness Ratio (DCER) seen in equation (3.3):

$$DCER_d = \frac{C_d}{E_d} = \frac{\sum\limits_{p=1}^{N_P} C_{pd}}{\sum\limits_{p=1}^{N_P} E_{pd}} \qquad (3.3)$$

The sums of the PAs are added together within a particular district. Once the totals for both the cost and effects are calculated, the total effects for the district then divide the total costs.

The most disaggregate level of interest may be at the PA level, and again, a CER can be

calculated for each individual PA. This effectively removes the summation sign within equation

(3.3) to produce equation 3.4:

$$PCER_{pd} = \frac{C_{pd}}{E_{pd}} \qquad \textbf{(3.4)}$$

Equation (3.4) yields the CER for an individual PA in a district. This calculation is simply the

total costs of a PA divided by the total effects produced by PA in district d.

An alternative measure of interest may be the average either across districts or PAs. For

example, the average across districts would be calculated as:

$$ACER_D = \frac{1}{N_D} \sum_{d=1}^{N_D} \frac{C_d}{E_d} \qquad \textbf{(3.5)}$$

Equation (3.5) above sums the total individual CER ratios for all the districts and then divides

the intermediate value by the total number of districts in order to derive the average CER of a

district in the state.

Care needs to be taken in using the average across districts in comparison with the state

level CER because the results may be unintuitive if one does not understand the differences.

Stated alternatively, there is no direct relationship between the state level CER and the average

district CER, as one may be greater then, less than or equal to the other depending on the relative

effect of the individual district to the average effect across districts. To see this, consider an

approach similar to the Baral et al. (2013) Youth EFNEP study, where using equations (3.2) and

(3.5) the following is produced:

$$SCER \overset{\leq}{\underset{>}{}} ACER_D$$

$$\frac{\sum_{d=1}^{N_D} \sum_{p=1}^{N_P} C_{pd}}{\sum_{d=1}^{N_D} \sum_{p=1}^{N_P} E_{pd}} \overset{\leq}{\underset{>}{}} \frac{1}{N_D} \sum_{d=1}^{N_D} \frac{C_d}{E_d}$$

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Some manipulation yields:

$$\sum_{d=1}^{N_D}\sum_{p=1}^{N_P}C_{pd}\underset{>}{\overset{\le}{=}}\bar{E}_D\sum_{d=1}^{N_D}\frac{C_d}{E_d}\ ,\text{where}\ \frac{1}{N_D}\sum_{d=1}^{N_D}\sum_{p=1}^{N_P}E_{pd}=\overline{E_D}$$

The value $\bar{E}_D$ is the mean district effect over all districts. Some final algebraic manipulation

yields the final relationship:

$$0\underset{>}{\overset{\le}{=}}\sum_{d=1}^{N_D}\frac{C_d}{E_d}(\bar{E}_D-E_d)\qquad\qquad\textbf{(3.6)}$$

Equation (3.6) defines the relationship between the SCER and the ACER. The values of

C_d and E_d will always be greater than or equal to zero for any given district. In the unlikely

scenario that the effects for a district to be zero would mean that no participants were recruited,

graduated, or improved. Therefore, the ratio $\dfrac{C_d}{E_d}$ will always be a positive value. The determining

component for the relationship comes from $(\bar{E}_D-E_d)$. $\bar{E}_D$ stands for the average effect of a

district in the state while E_d stands for the effect from a district (d). In other words, the average

effects across the districts in the state, whether greater than, equal to, or less than the effects in a

particular district (d), will influence the relationship between the SCER and the ACER$_D$. The

DCER$_d$ $(\dfrac{C_d}{E_d})$ of individual districts in the state are not the same and their individual weights

influence the relationship between the SCER and the ACER$_D$. The importance is the weighting

of the DCER$_d$ for each district can be largely different. This weighting through the ratio, when

considered in the context of the summation, influences the impact that the deviation of the

individual district effects from the average district effects $(\bar{E}_D-E_d)$. The differences in the

individual units of effects, or the values in the parenthesis, are what determine these outcomes.

The only exception being when $\bar{E}_D$ is equal to E_d which indicates that the average district is

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just as effective as district (d). However, while these do impact the relationship whether positive or negative for the district (d) the weighting of the DCER still influences determining the overall relationship of the right hand side of equation (3.6). Thus, it is not possible to predetermine the outcome of the relationship without first examining the data. As a result, ACER and SCER can have a wide variety of outcomes and meanings for the cost and effects data collected.

If the sum of the right hand side of the equation (3.6) were less than zero, it would mean that the SCER was greater than the ACER. Thus, the average district in the state is more cost effective at producing effects than the state as a whole. However, if the sum were greater than zero, then the ACER would be the greater of the two. The situation where the ACER is greater would imply that the average district in the state is less effective than the effectiveness of the state as a whole. In the final case in which the right hand side of equation (3.6) is equal to zero would imply that the average district in the state is equally effective as the state itself. Simply stated, the state level CER is a *total* measure and the average district CER is an *average*. Perhaps a simpler analogy would help with the intuition. The total number of people in the United States is a very different number than the average number of people per state. In summary, the average district CER can be quite different from the state level CER and which one is appropriate depends on the question one is trying to answer.

Equation (3.1) through (3.6) have two common measuring points, the costs and effects of the Virginia adult SNAP-Ed program. Sections 3.4 will give a thorough discussion of the effects through a description of the program and use of effects measurement tools used for adult SNAP-Ed and USDA guideline. Section 3.4 will also give different forms of effect outcome measurements that can potentially be used for the CEA as well as the ideology behind choosing certain criteria. While it may seem unusual, discussing the denominator first allows for the

abstract measurements to be explored in detail, and it further allows for easy transition from section 3.5 (calculating cost) to section 3.6 (observing the collected data). Section 3.5 examines all of the components associated with calculating the costs and also gives explanations as to the exclusion and inclusion of all cost components of interest. However, these cost components are further broken down to the specific part of program implementation each cost is to be associated with.

3.4 The Denominator-Determining the Effects of the Adult SNAP-Ed Program

The overall goal of SNAP-Ed is to teach participants how to utilize nutrition information from the US Dietary Guidelines for Americans and My Pyramid, effectively allocate limited funds, and increase physical activity (Koszewski et al., 2011). The intention is for the participants to implement broader behavioral changes in their lifestyles. The denominators for equations 3.1 through 3.6 of the CEA will be determined based on these goals of the adult SNAP-Ed program.

Upon completion of the required courses of the adult SNAP-Ed program, participants are required to take an exit retrospective assessment where the exit assessment repeats the same questions from the entry assessment. The retrospective portion of the assessment refers to the outline of the questions, providing two columns for answer with one to be completed from the participant's habits before the start of the program and the other to be completed on the participant's habits after program completion. The retrospective format requires participants at the end of the course to think back to before the beginning to address questions based on previous habits in the first column and in the second to answer the same questions from the perspective of having the course. The scores from the assessment are judged on a scale of 1

through 5, with 5 being the most desired response. For example, when "Almost Always" is the desired response a 5 is assigned to that response. On the other hand, when "Never" is the desired response, that response is assigned a score of 5. The retrospective portion allows for the teachers to determine the improvements of the participants from the start to the end of the course (Koszewski et al., 2011; SNAP, 2013). An improvement, or movement toward a more desirable response for each question, is deemed as an improvement or a change in knowledge. With this said, the effects portion of the CEA equations can be measured in two different ways described as score-based measurements and count-based measurements. The main component of interest from the exit assessment contains a list of 19 questions that the participant must answer. This list of questions can be found in table 3-1 below. Questions 5, 6,8,13, and 17 are all questions using the reverse scaling with a 1 being the desired value. The spectrum of the questions also include the main goals of SNAP-Ed consisting of a healthy lifestyle such as question 18, allocating resources efficiently as in question 2, or making healthy eating choices as in question 8. The questions are also designed in a way that participants should have either a strongly positive response ("Almost Always") or a strongly negative response ("Never") to questions about life-style and food choices (SNAP, 2013). Based on the recorded responses to these questions, a change in awareness can be documented.

TABLE 3-1 SNAP-ED ASSESSMENT QUESTIONS

Number	Question
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 foods at room temperature?
7	When deciding on what to feed your family, how often do you think about healthy food choices?
8	How often do you prepare food 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 within 2 hours of waking up in the morning?
11	When you eat bread and cereals, how often do you eat whole wheat bread and cereals?
12	How often do you use low-fat (2%), very low-fat (1%), or non-fat milk?
13	How often do you drink regular soda every day?
14	How often do you make meals that include a variety of foods from MyPlate?
15	How often do you currently eat 2 or more kinds of fruit every day?
16	How often do you eat low-fat foods instead of high-fat foods?
17	In the past 12 months, how often did you ever eat less than you felt you should because there was not enough money to buy food?
18	How often do you walk, take the stairs, run with your kids, and take other opportunities to be physically active?

| 19 | How often do you currently eat 3 or more kinds of vegetables everyday? (This includes fresh, frozen, canned, and 100% vegetable juice).[1] |

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[1]These questions all had the multiple-choice answers with response ranging on a scale of one to five. One: Never, Two: Seldom, Three: Sometimes, Four: Most of the Time, and Five: Almost Always

3.4.1 Score-Based Measurements

A score-based measurement refers to the differences between the scores noted on the assessment given pre-program and the assessment given upon completion. Each of the 19 questions for each participant will be addressed using this method to determine a score for the individual questions. A score-based assessment measures the quality of improvement by observing the numerical difference from the pre to post test scores. This is commonly used on standardized tests such as the GRE and SAT and is often used to trace academic trends and educational achievements (Koretz & United States. Congressional Budget Office., 1986, 1987).

3.4.2 Count-Based Measures

The alternative to the score-based measurement is the count-based measurement. This concept measures the quantity of participants that meet a certain level of criteria considered to be improving. An example of criteria for a count-based measurement is improving from the pre to the post-test by at least one of the 19 questions. This criteria has been described by the USDA as an effective measuring tool for outcomes of the SNAP-Ed program, including the use of a food frequency questionnaire similar to that used in SNAP-ED (United States Department of Agriculture, 2014a). Similar CEA analysis such as the Youth EFNEP study performed by Baral et al. (2013) have also adapted this form of effects measurement. Additionally, the count-based measurement is a common educational field measurement seen in the High School Assessment Program (HSAP) in South Carolina and the Standard of Learning (SOL) in Virginia, for example (Dietz, 2010).

3.4.3 The Debate: Choosing between Count-Based and Score-Based Measurements

The goal of the SNAP-Ed program is to change behavior of its participants and promote a healthier lifestyle. Therefore, quantity (count) over quality (score) would be the more preferred approach. This is supported by a publication done by the Congressional Budgets Office, which stated that while test scores remove the bias of teachers and other factors, they are still incomplete proxies for an accurate measure of improvement. The extent of the behavioral change in participants based on these scores cannot be determined, but the fact that a difference in knowledge has occurred to some extent can be determined (Koretz & United States. Congressional Budget Office., 1986, 1987). Thus, a count-based measurement is supported as being able to show a change in awareness based on some value of improvement criteria.

3.4.4 Determining the Criteria

The minimum criteria to be used in the count-based measurement for effects will be an improvement from the pre to post test in at least one of the 19 questions. The USDA states in a guide to evaluating SNAP-Ed that a measure of outcome such as a change in dietary intake can be obtained from food frequency questionnaires like that used in the adult SNAP-Ed program (United States Department of Agriculture, 2014a). Defining criteria for improvement as such allows for a count of the number of participants that are improving in some way from the program to be measured.. Alternatively, all those that enrolled, whether they completed the program or not, were counted toward the participation portion of the CEA. However, those without post scores could not be evaluated for a change in knowledge.

3.4.5 The Effects

The assessment questionnaires were given in hard copy to participants by the PA in charge of their courses at the end of the curriculum. These scores were then input manually into a

database used by the SNAP-Ed program known as Webneers (SNAP, 2013). Both pre and post-test values were exported from the Webneers database, created by Clemson University, with the participant's ID number, county and district, along with the PA's staff ID number which allowed for the pairing individual participants to a specific PA. The data was then thoroughly examined. Entries with inconsistencies (e.g., duplicates, missing pre or post test scores, incorrect IDs, or dates outside of the fiscal year of interest) were removed and the analysis dataset was created. The difference in the pre and post test scores for each individual was calculated and used to determine if a participant had improved in at least one of the 19 questions.

3.5 Calculating Total Cost - The CER Numerator

The foundation behind calculating the costs is for the cost to be reflective of only those values of the resources directly involved in implementing and managing the adult SNAP-Ed program for fiscal year 2013. The indirect costs, those not directly associated with implementation of the program, do not need to be considered. as the cost effective analysis is only completed from the program management's perspective. The comprehensive program includes the active teaching of the curriculum, recruiting expenses, office and utility expenses, and material expenses associated with the program. .The direct costs are based on the activities through which the program is implemented, including the active recruiting, teaching, and training required each year. Additionally, materials, incentives, and administration have associated costs resulting from the various types of space, utilities, and equipment needed to carry out duties, which are considered direct costs. Considering these comprehensive cost factors, SNAP-Ed's costs can be broken down into four main categories: Labor Cost, Capital Cost, Material Cost, and Utility Cost. These cost categories can be further broken down into multiple components. It is important to note as well that these costs are only reflective of the

adult SNAP-Ed program, so they do not include the youth or any other outside programs a PA may hold a joint position in. Therefore, adjustments are made to make the costs reflective of the active PAs for the adult program only and their respective responsibilities for the comprehensive program.

The remaining sections on the numerator, or the cost component of the CER, will discuss the constituents of the four individual cost categories. These four categories, Labor, Capital, Material and Utility, are further broken down into smaller factors to help further clarify and explain the inclusion of a component and the function it serves in the Virginia adult SNAP-Ed program. Throughout the remaining sections, representative equations will be thoroughly explained while examining all of the adjustments and components in calculating the individual costs.

3.5.1 Labor Costs

Labor costs can be broken down into three components that consist of salaries and benefits, training costs, and travel costs. These costs are those that are directly related to the delivery and completion of the adult SNAP-Ed program focusing on the human resources, or adult PAs, needed for the curriculum to be possible. Adult PAs are the individuals that directly implement the program and teach the curriculum to the participants. There are also administrative staff and volunteers that function as support staff for the adult SNAP-Ed program, but their contributions are small. Therefore, adult SNAP-Ed PAs are the only personnel considered for this portion of the comprehensive costs of the adult SNAP-Ed program.

3.5.1.1 Salaries and Benefits

Salaries and benefits consist of the monetary compensation and fringe benefits given to an adult PA for services to implement the adult SNAP-Ed program. As mentioned some of the

adult PAs were not only responsible for the adult SNAP-Ed portion of the program but also for the youth SNAP-Ed component. In addition, some of the PAs did not complete the entire fiscal year 2013 that was used for the data collection period. Therefore, since these proportions are known, the salaries and benefits were adjusted accordingly by the amount of time spent in the adult portion of the comprehensive program and also by the proportion of the fiscal year the PAs were active. Time spent traveling is not directly associated with the delivery of the program and will be assigned to the travel costs portion of program cost. The final adjustment to the salaries and benefits are the training costs associated with each PA. Since these costs are not reflective of the actual delivery of the program it will be assigned to the training costs portion of the program cost. These adjustments allow for the total cost amount for salaries and benefits to be reflective of the time spent by each PA on the provisions of the adult SNAP-Ed curriculum during fiscal year 2013. Therefore, the total labor costs for salaries and benefits attributed to the SNAP-Ed program are derived as follows:

Total costs of salaries and benefits=*Annual salaries and benefits of the adult PAs * Share of PA work time spent on adult SNAP-Ed * Proportion of months active in the adult SNAP-Ed program – (Annual Salaries and benefits * Proportion of time spent traveling) – (Annual Salaries and benefits * Proportion of time spent training)*　　　**(3.7)**

Equation (3.7) takes the reported annual salary and benefits of an adult PA and adjusts it based on the proportion of time-spent active in both the fiscal year and adult SNAP-Ed program. Then it removes the proportion of time the PAs spent training and traveling. Since the PAs were still paid regardless of whether they were traveling or training these proportions needed to be reallocated to the respective cost component.

3.5.1.2 Training Cost

The training costs are the costs associated with the training of an adult SNAP-Ed PA. The training costs can be divided into two main components: development cost and delivery cost. Development cost is the cost of developing the training programs used to instruct and train PAs. The training of all PAs is the responsibility of a single individual for the entire Virginia SNAP-Ed program. The salary for this individual, or the "trainer," will be used for the development cost. However, the trainer is responsible for other programs besides SNAP-Ed, such as the youth component of SNAP-Ed PA training. Since the proportion of the trainer's time is known for the adult SNAP-Ed PA training, the salary is adjusted accordingly to reflect the time spent on the specific program. The delivery costs are the salaries of the SNAP-Ed PAs adjusted for the time spent in training for the fiscal year 2013. Individuals that were newly hired received additional training in which the proportion of time-spent training was higher for these individuals. For fiscal year 2013, the amount of training a new hire received consisted of a 16-hour seminar session that spanned over two days. The travel for the seminars is taken into account in the travel cost, thus, only the hours spent in the seminar by these PAs are included in the delivery cost calculation. Adult PAs were further required to complete two online training modules on potassium and sodium, a mandatory day of training to over evaluation methods, food recall, and

using technology, and also a session of Adobe Connects for online seminars. These trainings sessions combined for a total of 10 hours spent by each adult SNAP-Ed PA with the new hires receiving 26 hours. The formula for the total costs of training is derived as follows:

Cost of training = (*Trainer's Annual salary and benefits * Proportion of time spent developing adult SNAP-Ed PA training*) + (*Annual salaries and benefits of the adult PAs * Proportion of time spent in training sessions*)   **(3.8)**

Equation (3.8) takes the reported trainer's annual salary and benefits and adjusts it based on the proportion of time spent developing training for just the adult SNAP-Ed PAs. This is then added in combination to delivery cost, which are the individual PAs salaries that were removed from equation (3.7) based on the proportion of time a PA spent in training.

3.5.1.3 Travel Cost

Travel cost includes the costs associated with managing, recruiting, and implementing the SNAP-Ed adult program. Some of the reasons for travel expenses include traveling to a participant's house for a one-on-one session, to the classroom to teach the curriculum, to stores for purchasing supplies, and to any training sessions outside of the office. Travel costs are also broken down into the mileage reimbursement rate and the proportion of the adult PA's salary spent on time traveling. The reimbursement cost is calculated from the mileage reported for travel expenses multiplied by the standard rate of per mile reimbursement for using a personal vehicle. The proportion of time spent traveling is calculated as shown below for salaries and benefits costs except this is the cost component where it is reallocated. Total travel cost is derived as follows:

Cost of travel =(*Number of miles traveled in personal vehicle * Rate of reimbursement for travel cost per mile*) + (*Annual Salaries and benefits * Proportion of time spent traveling*)   **(3.9)**

Equation (3.9) shows the calculation of travel costs for an individual PA based on the mileage the PA used directly related to the implementation of the adult SNAP-Ed program. In combination with the mileage reimbursement the salary adjustment from the PAs proportion of time spent traveling from equation (3.7) is reallocated to equation (3.9).

3.5.2 Capital Cost

Capital Cost is the cost of all capital resources that are involved with implementing and managing the adult SNAP-Ed program. The capital costs are determined at the adult PA level and are broken down into office space, rented or owned, and equipment. This allows the exclusion of costs that are outside the need for the direct implementation and management of the program. All data used for capital costs were reported in 2011 dollar values and converted to 2013 dollar values prior to calculation for total cost and are therefore not shown in equations (3.10) and (3.11) below (Bureau of Labor Statistics, 2014).

3.5.2.1 Office Space

Office space cost consists of the space, rented or owned, used by the adult PAs directly involved in the adult SNAP-Ed program. Owned office space is that owned by the local government and used by the SNAP-Ed program. Rented office spaces are not owned and are rented for use as needed. The cost for owned and rented office spaces include different factors and therefore, the costs are calculated separately.

3.5.2.1.1 Owned Office Space

The cost for an owned office space begins with the current market value of building that the SNAP-Ed program is using. However, the Office of Management and Budgeting (OMB) in Circular 87 titled "Cost Principles for State, Local, and Indian Tribal Governments" recommends

no more than 2% of total costs of owned space be allocated to an annual costs. This value is based on the concepts of service flow price, which represents the prices of the services in the offices in a given year and the stock value of the asset. The stock value of the asset is the sum of all service flow prices over the lifetime of the asset. As many of these buildings contain more than one program, an adjustment is required so that the cost is only reflective of the SNAP-Ed program. Additionally, the SNAP-Ed program may have more than just the adult PA in the office space so, the value will be adjusted further to reflect the percentage of space occupied by the individual adult PA who is directly related to the implementation of adult SNAP-Ed. The final adjustments will be for the split responsibilities for an individual PA and the proportion of the time active in the adult SNAP-Ed program for the fiscal year 2013. The cost of owned office space is calculated as:

Cost of Owned Office Space= *Current market value of the building where a SNAP-Ed office is located * annual usage fee from the OMB* (2%) ** the proportion of the building used by the SNAP-Ed program * Share of SNAP-Ed office space used by individual adult PA * Share of PA work time spent on adult SNAP-Ed * Proportion of months active in the adult SNAP -ED program* **(3.10)**

Equation (3.10) begins with the current market value of the office building used by an adult SNAP-Ed PA and adjusts the value by OMB standards. The OMB adjusted value is then further adjusted to reflect the amount of office space used by the SNAP-Ed program and the amount of personnel in the office who function as adult PAs. The final adjustment reflects the proportion of time and responsibilities a PA had concerning the adult SNAP-Ed program in fiscal year 2013.

3.5.2.1.2 Rented Office Space

Rented office space cost is calculated in a very similar manner to that of owned office space. The calculation begins with the annual cost of rent paid for the building that houses the SNAP-Ed personnel. Many of these rented buildings contain more than one program, which

requires adjustment so that the cost is only reflective of the SNAP-Ed program. As the programs space usages are known, the proportion of the building being used by the SNAP-Ed program needs to be adjusted. Since the SNAP-Ed program has more than just the adult PA in the office space, the value will be adjusted to reflect the percentage of space occupied by the individual adult PA. The final adjustments will be for the split responsibilities for an individual PA and the proportion of the time active in the adult SNAP-Ed program for the fiscal year 2013. The cost of the rented office space is calculated as:

Cost of Rented Office Space= *Annual Rent paid for the building SNAP-Ed offices are located * the proportion of the building used by the SNAP-Ed program * Share of SNAP-Ed office space used by adult PA * Share of PA work time spent on adult SNAP-Ed * Proportion of months active in the adult SNAP -ED program*   **(3.11)**

Equation (3.11) begins with the annual rent paid for the office building adjusted for only the space used by SNAP-Ed. As with equation (3.10), the space is then adjusted to represent the proportion of space, time active, and responsibilities of an adult PA directly related to the implementation of adult SNAP-Ed.

3.5.2.2 Equipment

Equipment includes the costs of the items such as computers, copy machines, fax machines, printers, and other various items used by the adult SNAP-Ed PAs to implement and manage the program. Again, the value of the equipment used as stated by the OMB Circular 87 titled "Cost Principles for State, Local, and Indian Tribal Governments" explains that no more than 6.67% of the total value of the equipment shall be used for costs annually (Office of Management and Budget, 2004). Therefore, only 6.67% of the total equipment costs will be used. As with building expenses, the proportion per individual PA must be calculated. The key difference from building expenses such as those in equations (3.10) and (3.11) is that the space

of the building used is not relevant for the calculation of the share of equipment cost. As with

capital cost, the equipment cost was reported in 2011 dollar values and converted prior to cost

calculations into 2013 dollar values. Therefore, the cost of equipment appears as:

Cost of Equipment=*Total value of all equipment used by SNAP-Ed program* at a
particular location* *annual usage fee from the OMB* (6.67%) * *Share of PA work time*   **(3.12)**
*spent on adult SNAP-Ed * Proportion of months active in the adult SNAP-Ed program*

Equation (3.12) begins with the total value of the equipment used at a particular PAs office,

adjusted to the OMB standard. After the OMB adjustment, as with other capital costs, the

equipment is adjusted further to reflect the individual PA's time and responsibilities to adult

SNAP-Ed.

3.5.3 Materials

Material costs are those associated with material resources used in the SNAP-Ed

curriculum. These costs are broken down into three components which consist of educational

materials provided by State Office, money allocated to each adult PA for education materials,

and all incentives and handouts given to each participant in the adult SNAP-Ed program.

3.5.3.1 Education Materials provided by State Office

This subset of material costs consists of the educational materials supplied by the

program to each PA in order to carry out the curriculum for adult SNAP-Ed . These materials

consist of DVDs, CDs, cookbooks, and other kitchen supplies need for teaching and performing

demonstrations. There is a fixed amount for each adult SNAP-Ed PA. This amount is taken into

account wherever an adult SNAP-Ed curriculum has been established in the state. Therefore, the

cost is incurred as a fixed cost and is not affected by the amount of time active in the fiscal year

2013. Many of these supplies are used in the youth program as well, so if the position is split

then the cost must be adjusted by the amount of time active in just the adult SNAP-Ed portion of the program. However, a PA must be present in the area for the program to be occurring. Therefore, the total cost for education materials provided by the state office is derived as follows:

Total Cost of Education Materials provided by State Office= *Sum of all supplies given by State office to an individual PA * Share of PA work time spent on adult SNAP-Ed* **(3.13)**

Equation (3.13) uses the fixed amount of supplies given to each adult SNAP-Ed PA and then adjusts this value accordingly for the responsibilities of the individual PA to the adult SNAP-Ed program.

3.5.3.2. Allowance Money for Educational Materials for each adult PA

Each adult PA in the SNAP-Ed program is given a fixed allowance to use on education materials. This money is assumed to be used each year in full. Similar to the materials supplied by the state office, the money is allocated to an area even if the PA does not complete fiscal year 2013. However, again a split position between the youth and adult SNAP-Ed would affect the money use towards the adult SNAP-Ed program and must be adjusted to show only adult SNAP-Ed use.

Cost of Allowance Money for Education Materials for an individual PA= *Money Allowance for adult SNAP-Ed PA * Share of PA work time spent on adult SNAP-Ed*. **(3.14)**

Equation (3.14), much like equation 3.13, begins with the fixed allowance money given to each SNAP-Ed PA and is then adjusted based on the responsibilities of the individual PA to adult SNAP-Ed.

3.5.3.3 Incentives and Handouts Given to Participants

The cost of incentives and handouts consists of the predetermined items to be given to participants, which may include: thermometers, measuring cups, MyPlate magnets, informational handouts for each lesson, and other various goods. The total cost of the combined items is known

and must be adjusted based on the number of participants that completed the program. The incentive and handouts total cost is derived as follows:

Cost of Incentives and Handouts given to complete Participants= *Sum of Incentive and handout cost * number of participants that completed the adult SNAP-Ed program under a individual PA* **(3.15)**

Equation (3.15) uses the fixed cost of the incentives and handouts and multiplies this value by the number of adult participants that graduated under an individual adult SNAP-Ed PA.

3.5.4 Utilities

Utilities, or energy costs, include services such as maintenance, janitorial, electric, water and sewage, telephone/communication and other services necessary to implement the SNAP-Ed program. These costs were calculated in a very similar manner to the costs of office spaces since the utility costs came directly from the cost data used for office space calculations. Many of these buildings contain more than one program, which requires adjustment so that the cost is only reflective of adult SNAP-Ed. As the proportions are known, the cost will be adjusted for space being used by adult SNAP-Ed. Since the adult SNAP-Ed program has more than just the adult PA in the office space, the value will be adjusted to reflect the percentage of utilities consumed by the individual adult PA. The final adjustments will be for the split responsibilities for an individual PA and the proportion of the time active in the adult SNAP-Ed program for the fiscal year 2013. Much like capital costs, utility costs were reported in 2011 dollar values and converted to 2013 dollar values (Bureau of Labor Statistics, 2014). Utility cost is therefore derived as follows:

Cost of Utilities=*Total annual cost of utilities per building occupied * the proportion of the building used by the SNAP-Ed program * Share of SNAP-Ed office space used by adult PA * Share of PA work time spent on adult SNAP-Ed * Proportion of months active in the adult SNAP -ED program* **(3.16)**

Equation (3.16) uses the total utility cost for a particular building in which an adult SNAP-Ed program is located and adjusts this value by the same adjustments used in office space capital costs. First, the total utility costs are adjusted to represent an individual adult PA adjusting the utility cost to the SNAP-Ed space and further down to the adult PA level. Then, the utility cost is adjusted for the amount of time and responsibilities the individual PA has with regards to the adult SNAP-Ed program.

3.5.5 Calculating the Total Costs of the Adult SNAP-Ed Program

The total costs will be calculated by summing over the categories listed above: Labor Costs, Capital Cost, Material Costs, and Utility Costs. These values were broken down to the individual PA level and can be summed to the district level as given in equation (3.3) and then over districts to the state level as in equation (3.2) Or in other words:

Total Costs of the Adult SNAP-Ed Program PA= Sum of all adult SNAP-Ed Cost for an individual PA *(Labor Cost + Capital Cost + Materials Cost + Utilities)* **(3.17)**

Equation (3.17) is simply the sum of all of the individual cost components of an adult PA after adjustments from the four categories (labor, capital, material, and utility) are factored in.

3.6 Data

Section 3.6 will begin with a discussion of the sources from which the data was collected, before proceeding on the provided the data summary statistics. Table 3-1 below shows the variables of interest and the source from which the data was collected or retrieved. Following Table 3-1 and the description, the remainder of section 3.6 will focus on the numerical data and discussing any values that appear as outliers or are considered unusual.

TABLE 3-2 DATA COLLECTION SUMMARY

Variable	Source	Units	Time Period Reported (FY 2013)
Salary, Benefits, and proportion active in adult SNAP-Ed	SNAP-Ed Salaries Report (Internal Records for VDSS[1] (USDA))	Dollars	Annual
Proportion of Time Spent Training	Survey for FNP Trainer (Internal Records for VDSS (USDA))	N/A	Annual
Training Cost (Development)	Survey FNP Trainer (Internal Records for VDSS (USDA))	Dollars	Annual
Proportion of Time Spent Traveling	SNAP-Ed Comprehensive FY 2013 Report (Internal Records for VDSS (USDA))	N/A	Annual
Travel Cost (Miles)	Comprehensive FY 2013 Report (Internal Records for VDSS (USDA))	Dollars	Annual
Capital and Utility Costs	Space Equipment Audit FY 2011 (Internal Records for VDSS (USDA))	Dollars	Annual[2]
Material Cost	Material Cost (Internal Records for VDSS (USDA))	Dollars	Annual
SNAP-Ed Scores	Webneers Database (Database used by SNAP-Ed for all participant related data and demographics)	Scores (1-4)	Annual FY

[1] Virginia Department of Social Services

[2] The data used for the costs of capital and utility costs was recorded from an audit in fiscal year 2011.

Table 3-2 shows the source and units for all of the cost and effects data collected for the SNAP-Ed program in order to perform the CEA. The cost data was mainly collected from the management of the SNAP-Ed's individual components, such as the trainer or individual district managers. All cost data with the exception of the audit information are kept in internal records with the intent to report budget expenses for funding to the USDA. While the USDA is indirectly involved as the funder, the Virginia Department of Social Services (VDSS) is responsible for actively monitoring and assessing Virginia's SNAP-Ed's program budget usage. The capital and cost data associated with the audit was collected in relation to the internal audits requirements.

The salaries for the SNAP-Ed employees were kept internally and when these values were requested access was given from the Program Support Technician with the necessary information regarding the PAs directly associated with adult SNAP-Ed. The salary data included the time PAs spent active in the fiscal year, their responsibilities concerning adult SNAP-Ed and other programs, and the total salaries and benefits received for fiscal year 2013. The salary data was all from internal files and documentation. All costs associated with training were directly requested from the SNAP-Ed trainer responsible for handling all matters of training. When the proportions and development costs were requested, the SNAP-Ed trainer calculated her time in fiscal year spent on training for adult SNAP-Ed. Additionally, the SNAP-Ed trainer is also responsible for monitoring the time each PA must spend in training and was able to report these values for calculations. The SNAP-Ed trainer was responsible for self-recording all the training data and the budget used for training kept in relation to the internal records for eventual reports to the VDSS. The travel cost data was received through an Excel spreadsheet sent from the SNAP-Ed Project Director to the individual district coordinators. The coordinators then communicated between the designated PAs and reported all mileage reimbursement and the

amount of time spent traveling. This was all done in an internal manner to receive the proper data for calculation purposes.

The capital and utility cost data was originally collected for fiscal year 2011, in which an audit was being conducted on the program. This was kept internally and at the request of capital and utility costs was sent in an Excel format containing all information on staff, building spaced used for SNAP-Ed, and equipment and utility costs. These values were reported in 2011 dollar values. The audit data was received via email from the Program Support Technician from SNAP's internal files and documentation and these values were converted to represent 2013 dollar values. The materials data was requested through the Program Coordinator. This cost data contained information on the cost of all supplies given for curriculum start up, the money allowed for each PA to spend at their discretion, and the cost of all incentives and handouts used for the cost calculations.

The effects or SNAP-Ed scores were exported directly from the Webneers database that SNAP-Ed uses to input all information directly related to participants demographics and assessments. Webneers allows for the easy manipulation and information exportation regarding demographic, assessment scores, identification numbers for PAs and participants, and other data for analysis purposes. Access to Webneers was made possible through the permission given by the SNAP-Ed Director and the programs Project Associate of Operations and Evaluations. All concerns regarding data, such as those described in the previous effects sections were also followed through, verified, and corrected by the project associate. Webneers also allowed for the confirmation of dates obtaining to guarantee that participants were enrolled in and completed the SNAP-Ed program within fiscal year 2013. Webneers allowed for easy removal of those participants listed from 2012 and 2013 outside of the October 1st to September 30th timeframe.

The remaining section of 3.6 contains Tables 3-2 through 3-4, which contain summary statistics data designed to better explore the numerical data obtained. The tables are separated by the specific variables that are present and broken apart such that all cost or effects components are grouped together for easy understanding.

3.6.1 Summary Statistics Cost Data

  To begin, the following section 3.6.1 will explore the costs and effects data and explain

any data that may appear as an outlier in terms of adult SNAP-Ed. All clarification for the data in

terms of an unusual value was verified through contact with the representative associated with

supplying the data. Table 3-2 will open with the all the components and total costs for the cost

labor category.

TABLE 3-3 SUMMARY TABLE LABOR COSTS AT THE PA LEVEL

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Total SNAP-Ed Salary ($)	50	41,668.59	4,260.17	34,273.40	49,967.40
Proportion of Active Adult PA (%)	50	0.91	0.19	0.50	1.00
Proportion of months active in Fiscal Year 2013 (%)	50	0.95	0.19	0.08	1.00
Costs of Salaries and Benefits ($)	**50**	**31,519.28**	**12,461.05**	**-1,550.90**	**51,840.15**
Development (Trainer Salary) ($)	50	869.86	0.00	869.86	869.86
Proportion For Adult Snap-ED from Development (%)	50	0.19	0.00	0.19	0.19
Development Cost ($)	50	165.27	0.00	165.27	165.27
Total Proportion Spent in Training (%)	50	0.01	0.00	0.00	0.01

Costs of Delivering Training ($)	50	232.73	90.13	142.22	519.26
Total Cost of Training ($)	**50**	**404.88**	**118.48**	**307.50**	**994.99**
Travel Cost ($)	50	1,523.97	919.78	149.25	4,031.41
Proportion of Time Spent Traveling (%)	50	0.10	0.05	0.02	0.25
Time Spent Traveling (Salary adjusted) ($)	50	4,237.44	2,284.58	692.33	11145.05
Total Costs of Travel ($)	**50**	**5843.52**	**2772.68**	**2107.08**	**15176.46**

Table 3-3 above shows the summary statistics for the data used in the calculating the CER section for labor costs. The bolded values are those that represent the total cost portion of a labor cost category. From the labor cost summary table, there are some outliers that warrant some discussion. The variable Proportion of Active Adult PA represents the PA's responsibility to adult SNAP-Ed. The mean of 0.905 is not 1.00 as some PAs have responsibilities to youth SNAP-Ed program. As a result, their salary was adjusted to represent only costs directly associated with adult SNAP-Ed. The variable Costs of Salaries and Benefits has a minimum value in the negatives, specifically $-1,550.90. This occurs from the adjustments seen in the Methods section for calculating an individual PA's salary in relation to travel and training time. Some PAs did not complete the training portion and incurred more costs in training and travel than from the PA's salary. Due to this, the PA's salary became negative as these costs were reallocated to their respective travel and training proportion sections. However, these values must remain negative in order to guarantee accurate representation of the costs and no additional costs would result from editing the negative values. The mean value for the variable Costs of Salaries and Benefits PA Level appears low at around $31,519.28, which is expected to be low due to the influence of the negative value for the minimum for the variable.

The delivery of training, the time PAs spent training and the travel costs of the PAs and trainer, are both comprised mainly of salary adjustments, as the time of PAs is the most valuable resource monetarily. For the training variable, the mean was $404.88 with a standard deviation of $118.48 explained by the varying salaries PAs received due to experience and other work-related factors. The development cost was spread evenly among each PA resulting in the uniform cost. The only component of training that changed was the proportion of those who spent time training if newly hired, but that difference was negligible. Therefore, since PAs did not have

equal salaries the difference comes from the proportion of time spent training being taken from different salary levels.

The variable for travel cost comprised of the mileage reimbursement that PAs received for traveling in their own personal vehicles directly related to adult SNAP-Ed. The PAs that spent a high proportion of time traveling would be expected to have a higher mileage reimbursement. The mean for the Travel Cost variable was $1,523.97 with a large standard deviation in relation to the average of $919.78. This is explained by some PAs with larger counties to cover and the need to travel further to teach and recruit participants while other PAs had minimal traveling within smaller counties. The range for the total cost of travel was high being around $13,000. Some PAs traveled up to 25 percent of their active time in the program. The standard deviation in relation to the mean of the proportion of time-spent traveling is large at 0.05. This implies that the range for the time PAs spent traveling is wide, 0.02 to 0.25, and indicates that some PAs needed to travel more for recruitment and teaching purposes directly related to adult SNAP-Ed, while others had little need to travel and were able to complete majority of the program in office. The proportion of time spent traveling was used for the reallocation of a PA's salary to the variable representing the cost of travel being up to a quarter of a PAs salary. Understanding that travel can encompass such a large portion of a PAs salary explains the higher maximum value of $11,145.05 for the variable Time Spent Traveling. Additionally some PAs traveled minimal amounts of only 0.02 of their time and saw a very low minimum cost of the time they spent traveling as $692.33. The variable Total Costs of Travel PA Level is the combination of the two travel components discussed previously and the values for the mean, standard deviation, minimum, and maximum values are identical.

In relation to the total cost of labor as a category shows that the PAs' salaries are the largest contributor to the costs while the training cost was the smallest. This can be discerned from the average cost values in the bolded variables of Table 3-3. There were 50 PAs active with an average salary cost of $31,519.28, which is the largest component of the labor cost category. The other two components of labor being travel and training make up a much smaller portion of the costs. With the average travel cost, $5,843.52, being about 18% of the average cost of salaries and average cost of training costs, $404.88, being about 1% of average salary cost implies that PA salaries are a crucial component not only for labor but also the overall program cost. Table 3-4 and 3-5 below continues the cost data through capital and utility cost components.

TABLE 3-4 SUMMARY TABLE OWNED AND RENTED BUILDING COST PA LEVEL

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Total Money Value of Owned Building ($)	35	11,714,574.32	28,114,378.09	25,000.00	99,000,000.00
Conversion to 2013 for Building Owned ($)	35	12,183,157.30	29,238,953.22	26,000.00	102,960,000.00
Value after OMB 2% Adjustment ($)	35	243,663.15	584,779.0643	520.00	2,059,200.00
Total Owned Building space used by SNAP-Ed (%)	35	0.12	0.16	0.00	0.64
Staff in building Owned (Individual People)	35	5.60	1.74	2.00	9.00
Costs of Owned Office Space ($)	**35**	**308.07**	**520.39**	**0.81**	**2761.44**
Yearly Rent Value VCE Space ($)	12	219,383.37	447,831.48	12,000.00	1,177,578.00
Conversion to 2013 Dollars for Yearly Rented Building ($)	12	228,158.71	465,744.74	12,480.00	1,224,681.00
Percent of Rented Space used by SNAP-Ed (%)	12	0.43	0.36	0.13	1.00
Staff of Rented Office Space	12	5.67	2.64	2.00	8.00

| Costs of Rented Office Space ($) | 12 | 15,503.98 | 31,007.34 | 322.69 | 81,645.41 |

Table 3-4 above shows the summary statistics for capital cost of owned and rented building space. The bolded values represent the total costs of the owned and rented office space at the PA level. There were a total of 35 PAs that were located in owned office buildings through the state of Virginia's adult SNAP-Ed. The owned building costs for initial values that were not adjusted had values up to $99,000,000 and as low as $25,000. These values were reported in the 2011 audit and come from building appraisals completed. In cases where the building values were very high office spaces housed multiple government agencies. The building costs conversion variable refers to the values originally reported in fiscal year 2011 dollar values, which needed to be adjusted to represent fiscal year 2013 values. The remaining variables represent those used for conversion of building cost to the PA level. To begin the adjustments was the OMB standard that reduced the owned building cost to two percent of its original value lowering the average from $11,714,574.32 down to $243,663.15. The second of these adjustments can be seen for the proportion of total building space used by the FSNE. As can be seen by the maximum for this row of 0.68, SNAP-Ed never used an entire building space and on average only used 0.12 of an owned office building. This proportion reduced the building owned cost to represent only that space occupied by SNAP-Ed. In order to reach the PA level, the SNAP-Ed staff in the building was used to convert cost down to the PA level. The variable representing the staff in and owned building was referred to in Table 3-4 as Staff in Owned Building. The staff variable was used to distribute the cost of the building across the PAs using it. The average amount of staff in an owned building was about six people with a range between two and nine people in a building. Once these adjustments were made to reach the variable Costs of Owned Office Space PA Level, the amount of time and responsibilities of the individual PA were used to estimate the overall cost at the PA level. From Table 3-3, the variables Proportion

of Active Adult PA and proportion of months active in fiscal year 2013 represent the time and responsibilities of an adult PA and were used in multiple calculations. The overall building cost based on equation (3.10) after all adjustments to the PA level had an average of $308.07, which is less than one percent of the original value of the owned buildings values. The overall range was between $81 and $2,761.44 with a standard deviation that was slightly higher at $520.39.

The rented portion of Table 3-4 above begins with the yearly value of the rented office, which had a mean of $219,383.37 with a total of 12 PAs using rented office space. The rented values were also reported from the 2011 audit and were converted from fiscal year 2011 dollar values to fiscal year 2013 dollar values. The adjustments made to these costs were identical to those in the owned building costs with the exception of the OMB standard not applying. Therefore, the reduction of these costs to the PA level was only based on the space used, the SNAP-Ed staff in rented building, and the time and responsibility a PA had to adult SNAP-Ed proportions from Table 3-2. The first adjustment for SNAP-Ed space used was considerably higher on average than the owned building space as 0.43 of rented building space being used. The maximum also included 1.00 showing that some building spaces were rented solely for the SNAP-Ed program. However, the building space being used by an individual PA was about the same with six SNAP-Ed personnel in rented office space. Considering the higher proportion of building space used and the lack of OMB adjustment, the average cost of a rented space was considerably higher than that of owned. The average cost of rented space was calculated at $15,503.98 with a very large standard deviation in relation to the mean of $31,007.34. This can be attributed to some PAs having high building space being used by SNAP-Ed yet a low staff number causing large portions of cost to be assigned. Additionally some PAs had no reported values for capital costs and were not included in these statistics.

TABLE 3-5 UTILITY AND EQUIPMENT COSTS PA LEVEL

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Cost Janitorial & Maintenance used for FSNEP OWNED ($)	35	29,533.93	76,440.97	0.00	279,929.44
Cost Utilities used for FSNEP OWNED ($)	35	22,512.17	55,302.11	0.00	203,490.00
Cost Janitorial & Maintenance used for FSNEP RENTED ($)	12	678.88	1,820.90	0.00	8,400.00
Cost Utilities used for FSNEP RENTED ($)	12	614.97	1,852.25	0.00	6,819.00
Utility Cost ($)	47	6,541.61	18,226.23	0.00	78,375.57
Total Converted Utility Cost for 2013 Dollars ($)	**47**	**6,531.69**	**18,604.01**	**0.00**	**81,510.59**
Total Equipment used by SNAP-Ed ($)	48	6,638.63	4,502.75	820.00	25,600.00
6.67% of FSNE Equip. Cost ($)	48	442.80	300.33	54.69	1,707.52
Costs of Equipment ($)	48	79.86	69.98	4.33	341.50
Cost of Equipment Converted 2013 Dollars ($)	**48**	**78.56**	**73.16**	**0.00**	**355.16**

Table 3-5 above shows the remaining capital and utility cost components for the SNAP-Ed program. The total utility costs were broken down into four components consisting of utility costs for owned and rented, and the respective maintenance and janitorial costs for owned and rented. The total cost for utility were reported as the variable Total Converted Utility Costs for 2013 dollar values. Again, as with capital costs the utility cost values were reported in the audit for fiscal year 2011 and were to converted to represent the fiscal year 2013. Also the values for these services and utilizes were also assumed to maintain the same baseline cost in relation to the current year so only the inflation value was taken into account. The average for Total Converted Utility Costs for 2013 dollar values was $6531.69 with a high standard deviation of $18,604.01. The reasons for the larger standard deviation and range for the total cost variable for utility will be further examined as the components of the total utility cost are further broken down to its individual owned and cost components. Additionally, not all PAs had a reported utility cost as these values were reported with the audit from fiscal year 2011 and as with building and rented cost, some utility cost were reported.

The variable representing the janitorial and maintenance costs for an owned building underwent the same conversions to the individual PA with the exact proportions used for the owned building costs for an individual PA with the exception of the OMB standard not included. These combined values adjusted by the conversion are located in the bolded utility cost variable. The costs for maintenance and janitorial services had a very large standard deviation of $76,440.97, which is contributed to some PAs that were housed in offices that underwent re-modeling or maintenances issues. In the instances of a $0.00, there was one PA that was housed in an office with no reported utility or maintenance costs and therefore a $0.00 was used for this value since the PA was in an owned building. The utility costs for an owned building also had a

high standard deviation at $55,3012.11 due to the large size of some building that housed

multiple agencies. These values also underwent conversions to the PA level as with owned

building costs to represent just the individual PA. However, as can be seen by the high maximum

of variable Total Converted Utility Costs for 2013 Dollars being $81,510.59 even when adjusted

the costs for some PAs was high.

     The Rented variables for utility and maintenance costs were much lower than those of an

owned building. The standard deviation for maintenance and janitorial variable was $1,820.90

and the utility cost for rented standard deviation was $1,852.25. The outlier for the minimum

values being $0.00 influenced the standard deviations for those variables. This value appeared a

few times and was accurate based on the utility costs being included in the rent cost. Since

splitting the rent to the respective utility variable accurately was not possible the cost remained

$0.00.

     The final cost calculation reported in Table 3-5 was that of the equipment costs. There

was an instance noted of a reported equipment cost with no reported office space costs associated

with a PA. This was due to the fact that the 2011 audit data had equipment data for a location but

no building value. Since ownership of office space did not affect the use of equipment, the cost

data was able to be collected and converted to the PA level in one variable instead of that of

rented and owned building space. The average cost for the total equipment variable showed

$78.56 with a standard deviation of $73.16. These values are significantly lower than that of the

original variable for equipment cost called Total Equipment used by SNAP-Ed. The reason for

the conversions being so large was mostly due to the OMB standard adjustment for equipment

cost reported. Further adjustments, as with all other capital costs, included the staff in the

building to the PA level and the responsibility and time a PA contributed to adult SNAP-Ed.

Table 3-6 represents the materials cost components reported to calculate the CER values. For the materials costs section, some PAs, due to the time employed or other reasons, did not recruit or have participants complete the program. This led to $0.00 reported for the material costs section. In instances where a $0.00 was reported for any other materials category as the minimum, this also results from the PA not recruiting any participants or not completing the training requirement. This variable was based on the exact cost of all incentives and handouts based on the number of participants each PA graduated in fiscal year 2013. In majority of the cases multiple participants graduated under a single PA. With PAs teaching multiple participants a maximum cost of $2,060.45 was seen implying a larger number of participant graduated. Unlike other variables of interest this cost is desired to be higher. The higher the handouts and incentive cost the more participants are joining and graduating adult SNAP-Ed. The money and supplies distributed by the state of Virginia to implement SNAP-Ed was a fixed amount being $567.73 also seen as the maximum value in Table 3-6 under the title State Allocated Money Amount ($). The adjustments due to a PAs responsibility to adult SNAP-Ed versus other nutrition programs with the lowest proportion adjusted as 0.50 or 50% as seen in Table 3-3. This contributes in the minimum value of $283.87. The state supplies distributed were a one time fixed cost per PA and not per participant. The money allowance each PA was given to spend in their own judgment was a set amount of $500.00, which is shown as the maximum value for the variable Allowance Money for Education Materials. The minimum for this variable was determined exactly as the one for State allocated Money Amount by the proportion as an active adult PA. Again, this resulted in the minimum being exactly half of the maximum value for the money allocated to each PA by the state and not per participant.

TABLE 3-6 SUMMARY TABLE FOR MATERIAL AND TOTAL COST AND EFFECTS PA LEVEL

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
State Allocated Money Amount ($)	50	513.80	110.65	283.87	567.73
Allowance Money for Education Materials ($)	50	452.50	97.45	250.00	500.00
Cost For Incentives and Handouts Complete ($)	50	635.63	436.33	0.00	2060.45
Total Cost by PA Completed ($)	**50**	**49,763.40**	**30,676.83**	**5,671.71**	**137,024.50**

The total cost of the PAs is represented in bold and shows a large range with some values as large as $137,024.50 and others were as low as $5,671.71. This can additionally explain the large standard deviation seen in relation to the mean being $30,676.83. The larger values are contributed to the larger capital cost that some PAs faced and the lower values are representative of short times of activeness in the program. The labor, utility, and capital cost categories are the largest contributors to the cost of implementing adult SNAP-Ed and in the case of capital and utility costs some PAs may have larger costs than may be deemed a fair representation.

3.6.2 Summary Statistics Effects Data

The effects seen in Table 3-7 include improvement rates, participants recruited, and participants that gradated. All of these effects have minimum values of zero, which simply means that some PAs, such as those that never completed training, were still counted for since costs were incurred on their behalf. In addition, some PAs did not have any participants reach completion while others did not have participants reach a certain level, or any level of improvement, resulting in zero improvement reported. The final row shows the graduation rate, which states the number of participants that started and completed the program. The average graduation rate for a PA was 53%. A critical finding surrounding a factor of the effectiveness of the program revolves around the graduation rate and should be as such noted.

TABLE 3-7 SNAP-ED EFFECTS DATA SUMMARY STATISTICS

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Total Starting Participants	50	135.18	66.96	0.00	310.00
Participants that Graduated	50	74.08	51.10	0.00	245.00
Improvement of 1	50	72.18	49.34	0.00	237.00
Improvement of 2	50	63.78	44.02	0.00	179.00
Improvement of 3	50	37.92	31.73	0.00	150.00
Improvement of 4	50	20	19.04	0.00	80.00
Graduation (%)	50	53.00	24.00	0.00	100

Chapter 4.0 Results

The reporting of the summary statistics of the data used to conduct the CEA on Virginia's SNAP-Ed concludes Chapter 3. Chapter 4 will begin the reporting of the results beginning with the costs at the state level and working through the individual districts and the PAs within each district. Following the costs section, the effects and CER values will be reported in a similar manner. All results reported in Chapter 4 were calculated by the methods described in Chapter 3. The goal of Chapter 4 will be to identify important trends and to identify and explain any outliers that may be present within each district and at the state level. However, Chapter 4 will not examine or compare any data across the districts. These comparisons will be explored numerically and graphically in Chapter 6.

4.1 Cost of Implementing the Adult SNAP-Ed program in Virginia

Table 4-1 below represents the total cost of the program at the state level represented by individual districts. The program for fiscal year 2013 incurred a total cost estimated to be $2,488,170.07, which can be broken down into the components of Labor, Capital, Material, and Utilities. Labor incurred a total cost of $1,888,383.99, accounting for the largest portion of the total cost at about 76%. Capital total cost was $199,636.90, making up about 8% of the total costs. Material costs were the lowest portion with a total cost $80,096.17 being about 3% of the total program costs. Utilities costs, at a total of $320,053.01, made up the remaining 13% of the total cost. The average cost for a typical district was estimated to be $486,434.98 with a maximum of $860,587.27 in District 2 and a minimum cost of $55,995.19 for no districts.

TABLE 4-1 STATE COSTS FOR ADULT SNAP-ED BY DISTRICT

District	Total Cost By District	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
District 1	$433,985.93	$379,205.79	87.38	$12,046.77	2.78	$16,879.85	3.89	$25,853.52	5.96
District 2	$860,587.27	$575,503.17	66.87	$169,677.18	19.72	$21,716.76	2.52	$93,690.16	10.89
District 3	$573,431.08	$382,440.30	66.69	$4,232.75	0.74	$15,483.79	2.70	$171,274.24	29.87
District 4	$267,687.31	$228,351.73	85.31	$7,824.88	2.92	$10,283.39	3.84	$21,227.32	7.93
District 5	$296,483.29	$270,365.01	91.19	$4,647.95	1.57	$13,596.93	4.59	$7,873.41	2.66
No Districts	$55,995.19	$52,517.98	93.79	$1,207.38	2.16	$2,135.46	3.81	$134.37	0.24
State Total	**$2,488,170.07**	**$1,888,383.99**	**75.89**	**$199,636.90**	**8.02**	**$80,096.17**	**3.22**	**$320,053.01**	**12.86**
Districts Summary Statistics									
Average	**$486,434.98**	**$314,730.66**	**81.87**	**$33,272.82**	**4.98**	**$13,349.36**	**3.56**	**$53,342.17**	**9.59**
Standard Deviation	**$278,797.43**	**$176,027.87**	**12.05**	**$66,925.62**	**7.26**	**$6,667.03**	**0.79**	**$66,665.44**	**10.62**
Range	**$804,592.09**	**$522,985.19**	**27.10**	**$168,469.80**	**18.98**	**$19,581.30**	**2.06**	**$171,139.87**	**29.63**

Table 4-2 below shows the average cost of implementing the program for a PA in District 1 to be $39,453.27 with a range of $53,128.52 to $22,181.75. When taking a look at the breakdown of the average cost for a PA in District 1, 87.38% comes from labor cost. The range for the salaries was the highest, which is explained particularly by DCP 10707 being responsible for a youth program position as well. This additional responsibility results in the actual salary of this PA to be adjusted, by 50% in this case, to reflect only adult program labor. The second highest range and largest standard deviation of interest can be seen for the utility costs. Utility costs had a range of over $13,579.73. The higher end of the range was represented by PA, DCP 10808, who had a utility cost of over double that of the utility cost of next highest PA. The increased utility cost is because the maintenance and janitorial services for their specific office building. The lower end of the range was represented by a cost of $0.00 for utilities. In the instance of DCP 11111 for example, the utility cost is noted as $0.00 as this cost was included in the rent of the office building and could not be separated. These low and high outliers are adjusted for in the Sensitivity Analysis section.

Following Table 4-2 is Table 4-3, which gives the data for District 2. The average cost for a PA to implement the program in District 2 was $61,470.52 with a total cost for the district being $860,587.27. Three PAs, DCPs 20101, 20911 and 20912, had higher capital and utility costs than the average. The overall range of the capital costs was $87,740.79. Included in this range were two PAs, DCP 20911 and 20912, that carried the maximum value of $81,757.55, which contributed to over 96% of the district's total capital cost.

TABLE 4-2 COSTS FOR ADULT SNAP-ED BY ADULT PA IN DISTRICT 1

DCP	Total Cost By PA	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
10101	$46,841.77	$44,048.59	94.04	$194.59	0.42	$1,454.59	3.11	$1,144.00	2.44
10202	$44,016.43	$41,144.91	93.48	$237.65	0.54	$1,244.34	2.83	$1,389.52	3.16
10303	$43,934.47	$38,950.77	88.66	$510.43	1.16	$1,782.58	4.06	$2,690.69	6.12
10404	$22,423.10	$20,897.79	93.20	$59.80	0.27	$903.91	4.03	$561.60	2.50
10505	$24,343.35	$22,859.08	93.90	$97.08	0.40	$971.19	3.99	$416.00	1.71
10606	$37,927.28	$35,524.07	93.66	$178.78	0.47	$1,622.79	4.28	$601.64	1.59
10707	$22,181.75	$19,628.67	88.49	$481.05	2.17	$1,122.57	5.06	$949.46	4.28
10808	$53,128.52	$36,773.48	69.22	$681.56	1.28	$2,093.75	3.94	$13,579.73	25.56
10909	$52,729.15	$37,807.12	71.70	$8,939.64	16.95	$1,614.38	3.06	$4,368.00	8.28
11111	$42,247.97	$39,955.68	94.57	$333.09	0.79	$1,959.19	4.64	$0.00	0.00
11112	$44,212.14	$41,615.59	94.13	$333.09	0.75	$2,110.57	4.77	$152.88	0.35
Total	**$433,985.93**	**$379,205.79**	**87.38**	**$12,046.77**	**2.78**	**$16,879.85**	**3.89**	**$25,853.52**	**5.96**
Average	**$39,453.27**	**$34,473.25**	**88.64**	**$1,095.16**	**2.29**	**$1,534.53**	**3.98**	**$2,350.32**	**7.21**
SD	**$11,437.58**	**$8,912.74**	**9.25**	**$2,608.48**	**4.89**	**$433.12**	**0.73**	**$3,936.74**	**7.21**
Range	**$30,946.77**	**$24,419.92**	**25.36**	**$8,879.84**	**16.69**	**$1,206.67**	**2.23**	**$13,579.73**	**25.56**

TABLE 4-3 COSTS FOR ADULT SNAP-ED BY ADULT PA IN DISTRICT 2

DCP	Total Cost By PA	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
20101	$120,364.01	$46,505.96	38.64	$2,820.90	2.34	$1,866.68	1.55	$69,170.47	57.47
20202	$52,353.20	$50,696.77	96.84	N/A	N/A	$1,656.43	3.16	N/A	N/A
20303	$25,669.87	$24,166.19	94.14	$16.76	0.07	$786.17	3.06	$700.75	2.73
20404	$46,777.21	$42,481.88	90.82	$335.74	0.72	$1,782.58	3.81	$2,177.01	4.65
20505	$54,905.91	$51,657.13	94.08	$697.47	1.27	$2,186.26	3.98	$365.04	0.66
20506	$18,191.78	$16,965.12	93.26	$261.55	1.44	$828.22	4.55	$136.89	0.75
20507	$23,490.44	$22,206.65	94.53	$348.74	1.48	$752.53	3.20	$182.52	0.78
20608	$54,089.22	$48,776.88	90.18	$127.57	0.24	$1,639.61	3.03	$3,545.15	6.55
20709	$38,050.13	$32,767.96	86.12	$388.61	1.02	$1,339.04	3.52	$3,554.51	9.34
20810	$47,154.19	$45,607.09	96.72	N/A	N/A	$1,547.10	3.28	N/A	N/A
20911	$136,330.04	$49,227.93	36.11	$81,757.55	59.97	$1,799.40	1.32	$3,545.15	2.60
20912	$137,024.53	$49,131.88	35.86	$81,757.55	59.67	$2,589.94	1.89	$3,545.15	2.59
21013	$46,053.37	$42,547.67	92.39	$886.90	1.93	$1,454.59	3.16	$1,164.20	2.53
21114	$60,133.37	$52,764.01	87.74	$277.82	0.46	$1,488.23	2.47	$5,603.31	9.32
Total	**$860,587.27**	**$575,503.17**	**66.87**	**$169,677.18**	**19.72**	**$21,716.76**	**2.52**	**$93,690.16**	**10.89**
Average	**$61,470.52**	**$41,107.37**	**80.53**	**$14,139.76**	**10.88**	**$1,551.20**	**3.00**	**$7,807.51**	**8.33**
SD	**$39,968.80**	**$12,020.11**	**23.86**	**$31,592.83**	**22.87**	**$520.36**	**0.92**	**$19,403.78**	**15.77**
Range	**$118,832.75**	**$35,798.89**	**60.98**	**$81,740.79**	**59.91**	**$1,837.42**	**3.23**	**$69,033.58**	**56.80**

These PAs shared identical costs, as both PAs were located in the same office building. Additionally, it is worth noting that the capital cost standard deviation was also extremely high being $31,592.83 compared to the average of $14,139.76. The two PAs with the largest capital cost values represented majority of the buildings value due to the low staff number and the respective space used by SNAP-Ed. The utility costs average for District 2 was $7,807.51 with a standard deviation of $19,403.78. A range of $69,033.58 was reported for the utility cost as well, which is also considerably high in the context of the average. On the higher end of that range, DCP 20101 had a lower staff number in the building and a higher proportion of building use leading to an increase in the allocation of the total cost per individual. Therefore, with a larger maintenance costs, the majority of the utility costs of the building were allocated to this PA. DCPs 20911 and 20912 also had elevated capital and utility costs attributed to the building combined with a low volume of SNAP-Ed personnel present, which lead to a higher amount of costs distributed to these PAs as well. Therefore, these outliers mentioned are accurate values and used for cost calculations. Lastly, the non-applicable (N/A) values are the three PAs for which no capital or utility costs were reported and, as a result, they were excluded from the respective cost category calculations.

Table 4-4 below shows the total cost for the adult SNAP-Ed program reported in District 3 to be $573,431.08, with the average for a PA to implement the program in that district being $57,343.11. Labor and utility cost generated over 95% of the district's cost with utility being 29.87%, a close to 16 percentage points higher than the average utility cost for the state, and labor being 66.69%.

TABLE 4-4 COSTS FOR ADULT SNAP-ED BY ADULT PA IN DISTRICT 3

DCP	Total Cost By PA	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
30101	$52,582.16	$47,144.95	89.66	$320.01	0.61	$1,622.79	3.09	$3,494.40	6.65
30202	$22,901.50	$22,148.97	96.71	N/A	N/A	$752.53	3.29	N/A	N/A
30303	$22,383.11	$20,381.87	91.06	$122.18	0.55	$1,177.06	5.26	$702.00	3.14
30505	$131,378.00	$46,601.42	35.47	$1,365.66	1.04	$1,900.32	1.45	$81,510.59	62.04
30506	$132,676.21	$47,891.22	36.10	$1,365.66	1.03	$1,908.73	1.44	$81,510.59	61.44
30607	$39,666.32	$37,534.40	94.63	$147.41	0.37	$1,555.51	3.92	$429.00	1.08
30808	$47,885.18	$45,973.76	96.01	$296.65	0.62	$1,261.16	2.63	$353.60	0.74
30909	$39,247.68	$35,817.61	91.26	$144.87	0.37	$1,959.19	4.99	$1,326.00	3.38
31010	$32,456.47	$29,502.77	90.90	$172.67	0.53	$1,227.52	3.78	$1,553.50	4.79
31211	$52,254.47	$49,443.29	94.62	$297.64	0.57	$2,118.98	4.06	$394.55	0.76
Total	**$573,431.08**	**$382,440.30**	**66.69**	**$4,232.75**	**0.74**	**$15,483.79**	**2.70**	**$171,274.24**	**29.87**
Average	**$57,343.11**	**$38,244.03**	**81.64**	**$470.31**	**0.63**	**$1,548.38**	**3.39**	**$19,030.47**	**16.00**
SD	**$40,773.00**	**$10,996.07**	**24.29**	**$513.06**	**0.25**	**$435.94**	**1.30**	**$35,436.32**	**26.01**

| Range | $110,293.10 | $29,061.42 | 61.24 | $1,243.48 | 0.67 | $1,366.46 | 3.82 | $81,156.99 | 61.30 |

TABLE 4-5 COSTS FOR ADULT SNAP-ED BY ADULT PA IN DISTRICT 4

DCP	Total Cost By PA	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
40101	$8,515.81	$7,357.92	86.40	$37.14	0.44	$1,067.73	12.54	$53.01	0.62
40302	$25,405.23	$24,418.73	96.12	$47.40	0.19	$752.53	2.96	$186.58	0.73
40403	$47,471.09	$44,789.90	94.35	$587.43	1.24	$2,093.75	4.41	$0.00	0.00
40504	$24,798.77	$23,742.60	95.74	$379.33	1.53	$676.84	2.73	$0.00	0.00
40605	$61,866.43	$43,846.45	70.87	$347.28	0.56	$1,412.54	2.28	$16,260.16	26.28
40806	$48,069.91	$44,562.10	92.70	$116.23	0.24	$2,304.00	4.79	$1,087.57	2.26
40807	$51,560.08	$39,634.00	76.87	$6,310.06	12.24	$1,976.01	3.83	$3,640.00	7.06
Total	**$267,687.31**	**$228,351.73**	**85.31**	**$7,824.88**	**2.92**	**$10,283.39**	**3.84**	**$21,227.32**	**7.93**
Average	**$38,241.04**	**$32,621.68**	**87.58**	**$1,117.84**	**2.35**	**$1,469.06**	**4.79**	**$3,032.47**	**5.28**
SD	**$18,913.83**	**$14,434.86**	**10.06**	**$2,298.43**	**4.39**	**$664.54**	**3.53**	**$5,979.01**	**9.59**
Range	**$53,350.62**	**$37,431.98**	**25.24**	**$6,272.92**	**12.05**	**$1,627.17**	**10.25**	**$16,260.16**	**26.28**

As with District 2, the larger utility costs were generated from high maintenance costs and low staff numbers causing the costs to accumulate on the PAs specifically with DCPs 30505 and 30506. The range for utility costs was $81,156.99 with a standard deviation of $35,436,32, which can be considered high when compared to Table 4-1. It is important to note that on the lower end of costs, DCP 30202 is missing both utility and capital cost information, which were excluded from the calculations. Similarly DCP 30607 is missing building expenses. However, as the equipment and utility expenses were known, those were used in calculations.

Table 4-5 above shows the total costs for District 4's adult SNAP-Ed. The total implementation cost for SNAP-Ed in District 4 was $267,687.31 with the average cost for a PA totaling $38,241.04. As can be seen, the utility cost for DCPs 40403 and 40504 were noted to be $0.00 because these costs were included in the rent for the buildings in which the offices were located. The highest values in the range row reported in Table 4-5 can also be seen in labor with a range of $37,431.98 and utility with a range of $16,260.16. When examining labor, the costs for DCP 40101 were affected by the DCP being terminated prior to the end of the fiscal year and therefore PA salary was adjusted accordingly by the amount of time they were active in fiscal year 2013 resulting in the minimum cost of $7,357.92 and the large range. Labor cost in this district was close to 85% of the districts total cost to implement the program. Utilities were the second highest cost as seen in District1 and District 3. In context of the range, the minimum value of $0.00 was reported for two PAs due to lack of being able to separate utilities from rent or lack of building utility information. The maximum for utility costs was $16,260.16, which comprised of high maintenance cost and the lack of additional staff and office space used by SNAP-Ed.

The final cost table found below, Table 4-6, represents the total cost of adult SNAP-Ed in

District 5 along with those PAs that were not assigned a district. For District 5 the average cost

for a PA in to implement the program was $49,413.88, which was below the state average PA

cost. Labor costs were 91.19% of the total cost for the district. Material costs, being the second

highest percentage, accounted for 4.59% of the total. The range of labor costs was the largest at

$23,657.36. This can be attributed to DCP 50606, which had a replacement in which one PA

replaced the original PA leaving a slightly inflated labor cost due to training and adjusted

salaries. The cost categories of most interest are utility and capital costs. For District 5 the total

utility cost was $7,873.41 and the total capital cost was $4,647.95, which were the lowest in the

state for both categories. The DCPs No1 and No2 are two PAs that were not assigned a district.

DCP No2 did not complete training, resulting in the low overall total cost. DCP No1 was an

individual with no participants on the effects side that completed the program, and therefore they

were not assigned a county or a DCP.

TABLE 4-6 COSTS FOR ADULT SNAP-ED BY ADULT PA IN DISTRICT 5 AND NO DISTRICTS

DCP	Total Cost By PA	Total Cost of Labor		Total Cost of Capital		Total Cost of Materials		Total Converted Utility Cost	
	Cost	Cost	% Total	Cost	% Total	Cost	% Total	Cost	% Total
50101	$44,691.42	$36,979.23	82.74	$319.32	0.71	$2,026.47	4.53	$5,366.40	12.01
50202	$48,218.91	$44,184.97	91.63	$94.55	0.20	$3,128.18	6.49	$811.20	1.68
50303	$48,165.92	$45,887.37	95.27	$133.34	0.28	$2,043.29	4.24	$101.92	0.21
50404	$46,240.02	$43,147.57	93.31	$351.12	0.76	$2,741.32	5.93	$0.00	0.00
50505	$42,288.10	$39,529.26	93.48	$313.02	0.74	$1,748.94	4.14	$696.89	1.65
50606	$66,878.91	$60,636.60	90.67	$3,436.59	5.14	$1,908.73	2.85	$897.00	1.34
Total	**$296,483.29**	**$270,365.01**	**91.19**	**$4,647.95**	**1.57**	**$13,596.93**	**4.59**	**$7,873.41**	**2.66**
Average	**$49,413.88**	**$45,060.84**	**91.18**	**$774.66**	**1.30**	**$2,266.16**	**4.70**	**$1,312.23**	**2.82**
SD	**$8,844.94**	**$8,290.06**	**4.43**	**$1,308.40**	**1.89**	**$542.45**	**1.32**	**$2,021.15**	**4.56**
Range	**$24,590.81**	**$23,657.36**	**12.53**	**$3,342.03**	**4.94**	**$1,379.24**	**3.63**	**$5,366.40**	**12.01**
No District[1]									
No1	$50,323.48	$48,929.62	97.23	$191.76	0.38	$1,067.73	2.12	$134.37	0.27
No2	$5,671.71	$3,588.36	63.27	$1,015.62	17.91	$1,067.73	18.83	$0.00	0.00
Total	**$55,995.19**	**$52,517.98**	**93.79**	**$1,207.38**	**2.16**	**$2,135.46**	**3.81**	**$134.37**	**0.24**
Average	**$27,997.59**	**$26,258.99**	**80.25**	**$603.69**	**9.14**	**$1,067.73**	**10.47**	**$67.18**	**0.13**
SD	**$31,573.57**	**$32,061.12**	**24.02**	**$582.56**	**12.39**	**$0.00**	**11.81**	**$95.01**	**0.19**
Range	**$44,651.77**	**$45,341.27**	**33.96**	**$823.86**	**17.53**	**$0.00**	**16.70**	**$134.37**	**0.27**

[1] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

The next section in Chapter 4 will focus on the reporting of the effects achieved in the state and districts of Virginia's adult SNAP-Ed. The format of the tables in Section 4.2 will be slightly different as the categories for effects differ from those of the costs. However, the number of tables will be the same as the state and each district will have their own tables for effect report values.

4.2 The Effects of Implementing the Adult SNAP-Ed Program in Virginia

The effects for the SNAP-Ed program per district can be seen in Tables 4-7 through 4-12 below. The effects can be considered from two approaches: the outreach of the program and the change in behavior of students that completed the program. Participants that started and graduated from the program make up the outreach portion of the effects. Table 4-7 below shows the effects at the state level by districts.

TABLE 4-7 STATE EFFECTS FOR ADULT SNAP-ED BY DISTRICT

District	Program Outreach			Change in Knowledge (Effects[1])				
	Starting	Graduated	% Graduated	1	2	3	4	% Change
District 1	1,301	746	57	728	643	392	203	98
District 2	2,094	1,027	49	1,021	929	562	327	99
District 3	1,290	630	49	607	531	338	199	96
District 4	853	448	53	438	404	261	127	98
District 5	1,129	853	76	815	682	343	144	96
No district	92	0	0	0	0	0	0	N/A
State Effect	**6,759**	**3,704**	**55**	**3,609**	**3,189**	**1,896**	**1,000**	**97**
Average Effect	**1,333**	**741**	**57**	**722**	**638**	**379**	**200**	**97**
SD	**654**	**361**	**25**	**354**	**314**	**185**	**108**	**1**
Range	**2,002**	**1,027**	**76**	**1,021**	**929**	**562**	**327**	**3**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

As a state, the SNAP-Ed program had 6,759 participants start the program. A total of 3,704 out of those starting participants graduated, resulting in a 55% graduation rate for the state. The effects were measured by the change in behavior improvement rates based on at least one question on the scale of 1-4. There were 3,609 of the 3,704 graduates that improved on at least one question, which is an improvement rate of 97% of graduating participants. A total of 3,189 participants, or 86% of the graduates, saw an improvement of two on at least one question. These effect values steadily decreased to a full-scale improvement of four on at least one question, which was achieved by only 27% of graduating participants. The percentage for graduating participants achieving higher scores is not always possible depending on the pre-test score values. For example, if a participant chooses less desired response then the deviation from the desired response constrains the amount a participant can improve. Therefore, it can be said that some participants did not improve or were unable to improve by four. The standard deviations and ranges are high for all improvement categories due to the fact two PAs were without a district and had much smaller and no effects produced for the fiscal year. In the tables below, the districts of Virginia are examined in the following tables.

TABLE 4-8 EFFECTS FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 1

| DCP | Program Outreach | | | Change in Knowledge (Effects[1]) | | | | |
	Starting	Graduated	% Graduated	1	2	3	4	% Change
10101	107	46	43	46	24	4	3	100
10202	78	21	27	21	16	5	0	100
10303	150	85	57	84	81	61	36	99
10404	44	44	100	43	40	35	13	98
10505	66	52	79	49	43	28	21	94
10606	106	62	58	59	53	31	16	95
10707	65	59	91	57	56	28	4	97
10808	183	99	54	99	89	46	22	100
10909	176	64	36	63	55	27	14	98
11111	143	99	69	95	82	52	32	96
11112	183	115	63	112	104	75	42	97
Total Effect	**1,301**	**746**	**57**	**728**	**643**	**392**	**203**	**98**
Average Effect	**118**	**68**	**62**	**66**	**58**	**36**	**18**	**98**
SD	**51**	**28**	**22**	**28**	**28**	**22**	**14**	**2**
Range	**139**	**94**	**73**	**91**	**88**	**71**	**42**	**6**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table 4-8 above shows that the total effects seen in District 1 are about 98% of

graduating participants that show signs of behavioral change at the district and PA level, or those

that had an improved test score for at least one question. However, the average percentage of

graduated participants for the district was about 57% while the average PA had about 66% of

participants that graduated. The total effects achieving a change in knowledge in District 1 was

728, with 1,301 participants starting SNAP-Ed. However, with only 57% graduated, only 746

participants could be measured for a change in knowledge. The standard deviation for the

starting effect category was higher, around 51, while the graduating standard deviation was only

28. This is a result of fewer graduates than participants. Since the retention rate was low the

standard deviation as well as the ranges decreased. The range for graduation and improvement of

1 were almost identical. This was also the case for the standard deviation. This is because the

high 98% improvement rate for those who graduated.

Table 4-9 below shows the effects achieved through adult SNAP-Ed in District 2. The

total effects seen in District 2 show that about 99% of participants improved by at least one on a

at least a single question on the assessment. District 2 showed less than half of the participants

completing the program while the average PA in the district had about 50% of their participants

complete the program. Numerically, this appeared as 2,094 participants starting adult SNAP-Ed

for fiscal year 2013 with only 1,027 graduating and completing the retrospective assessment.

This marked one of the lowest graduation rates in the state. DCPs 20202, 21114, and 20608 in

particular had unusually low graduation rates. These PAs had very low retention rates and

several hundred starting participants failed to graduate. No clear reason for a low retention rate

can be identified as the PAs were active the entire fiscal year and were only responsible for the

implementation of adult SNAP-Ed. However, of the 1,027 participants that graduated, each

graduate improved on at least one question on the exit assessment. The standard deviation and ranges were lower for those graduating compared to those starting. The graduation and an improvement of 1 had steady values for both the range and standard deviations. This can also be explained by the low graduation rate in District 2.

TABLE 4-9 EFFECTS FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 2

DCP #	Program Outreach			Change in Knowledge (Effects[1])				
	Starting	Graduated	% Graduated	1	2	3	4	% Change
20101	173	95	55	95	86	31	16	100
20202	249	70	28	70	58	31	28	100
20303	87	30	34	30	29	21	7	100
20404	199	85	43	83	69	43	25	98
20505	240	133	55	133	130	70	23	100
20506	54	35	65	35	26	10	5	100
20507	47	26	55	26	25	11	5	100
20608	175	68	39	68	65	30	13	100
20709	87	64	74	63	56	11	2	98
20810	126	57	45	57	45	26	20	100
20911	149	87	58	87	87	87	74	100
20912	192	181	94	181	179	150	80	100
21013	161	46	29	46	36	15	10	100
21114	155	50	32	47	38	26	19	94
Total Effect	2,094	1,027	49	1,021	929	562	327	99
Average Effect	150	73	50	73	66	40	23	99
SD	63	42	19	42	44	39	24	2
Range	202	155	66	155	154	140	78	6

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

TABLE 4-10 EFFECTS FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 3

DCP #	Program Outreach			Change in Knowledge (Effects[1])				
	Starting	Graduated	% Graduated	1	2	3	4	% Change
30101	157	66	42	66	63	55	51	100
30202	68	26	38	24	21	13	6	92
30303	27	13	48	13	13	7	3	100
30505	210	99	47	96	78	38	15	97
30506	199	100	50	98	86	64	43	98
30607	92	58	63	53	46	23	14	91
30808	96	23	24	22	22	20	20	96
30909	121	101	83	99	92	61	13	98
31010	62	19	31	16	11	4	2	84
31211	258	125	48	120	99	53	32	96
Total Effect	1,290	630	49	607	531	338	199	96
Average Effect	129	63	48	61	53	34	20	95
SD	75	41	17	41	35	23	17	5
Range	231	112	59	107	88	60	49	16

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table 4-10 above gives the data for District 3. The total effects seen in District 3 are about 96% of graduated participants that demonstrated a change in knowledge at the district and PA level, or an improved test score for at least one question. However, the average effect for a PA in District 3 was 95%. Numerically, 630 participants graduated and 607 of those showed an improvement in at least one question. Also as in District 2, the amount of participants completing the program was less than 50% for the district. The average PA only attained a 48% graduation rate. In total, out of the 1,290 participants that began adult SNAP-Ed, only 630 graduated and completed the exit assessment. This also caused the standard deviations and ranges to be vastly different from starting to graduated participants. The difference from starting standard deviation of 75 to 41 graduating standard deviation can be explained through the low retention rate. Several PAs can be noted for contributing to a lower graduation rate, in particular DCPs 30202, 30808, and 31010. DCP 30202 was responsible for the implementation of the youth SNAP-Ed program and therefore had additional responsibilities, which may have caused a lower graduation rate. Additionally, DCP 31010 was not active for the entire fiscal year and may not have been able to graduate as many participants for this reason. DCP 30808 has no clear reason for a low retention rate as they were active for the full fiscal year and had no additional responsibilities.

The following district, District 4, shown in Table 4-11 below achieved effects showing 98% of participants that graduated showed signs of a change of knowledge. In other words at the district and PA level, an improvement in the assessment score for at least one question was achieved. However, the average effect for a PA in District 4 was a very low at 84%. This appears numerically as 438 of the 448 graduating participants achieving a positive change in knowledge.

TABLE 4-11 EFFECTS FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 4

DCP #	Program Outreach			Change in Knowledge (Effects[1])				
	Starting	Graduated	% Graduated	1	2	3	4	% Change
40101	58	0	0	0	0	0	0	0
40302	102	26	25	26	24	15	6	100
40403	170	109	64	104	87	48	25	95
40504	23	17	74	17	17	10	2	100
40605	150	41	27	40	32	25	13	98
40806	200	147	74	144	137	93	55	98
40807	150	108	72	107	107	70	26	99
Total Effect	**853**	**448**	**53**	**438**	**404**	**261**	**127**	**98**
Average Effect	**122**	**64**	**48**	**63**	**58**	**37**	**18**	**84**
SD	**64**	**56**	**30**	**55**	**52**	**34**	**19**	**37**
Range	**177**	**147**	**74**	**144**	**137**	**93**	**55**	**100**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

This implies an outlier that can be accounted for in the case of DCP 40101 who did not graduate a single participant. In this case DCP 40101 resigned from the position and none of their participants that started adult SNAP-Ed graduated during fiscal year 2013. Also as in District 2 and District 3, the amount of participants completing the program was low but still above 50% for the district. However, the average PA was only attaining a 48% graduation rate. Numerically District 4 had 853 participants start the program and 448 participants graduate. However, PA 40101 was a major factor in the explanation for the average and total graduation rates and effects being lower than expected. Removing this PA from calculation results in an average graduation rate of about 56%. Considering the lower graduation rate at 48%, the graduated group has a lower standard deviation and range in comparison to the starting group. However, the effects for this District was smaller compared to others, with a standard deviation for starting participants of 64 and a range of 177 across the PAs. After graduation these values decreased to 56 for standard deviation with a range of 147.

Table 4-12 below represents the effect for adult SNAP-Ed for the final district, District 5, and also those PAs that were never assigned a district. In District 5 about 96% of participants that graduated showed signs of a change in knowledge at the district and PA level. The total effect for the district was the exact same as the average effect of a PA in District 5 for an improvement by at least one. The improvement rate shown by the numerical values demonstrate that in District 5, 815 of the 853 participants that graduated did so with an improvement on at least one assessment question. The total graduation rate was 76% with an average PA having a 74% graduation rate. District 5 had 1,129 participants start and 853 participants graduate with an average PA graduating 142 participants. Many of the PAs in District 5 had large recruitment and graduation values making outliers difficult to identify. However, all PAs had a graduation rate

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higher than 50%. A higher graduation rate caused the standard deviations and range to not change much from start to graduation. The starting participants standard deviation for District 5 was 67 with a range of 175 while the standard deviation of the graduation group decreased to 64 with a range of 164. The bottom portion of table 4-12 represents those PA with no assigned district or county. Since these PA's had no participants graduate no effects of improvement could be measured.

TABLE 4-12 EFFECTS FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 5

| DCP # | Program Outreach | | | Change in Knowledge (Effects[1]) | | | | |
	Starting	Graduated	% Graduated	1	2	3	4	% Change
50101	135	114	84	111	72	21	11	97
50202	310	245	79	237	175	109	48	97
50303	155	116	75	116	116	22	2	100
50404	225	199	88	178	162	100	21	89
50505	149	81	54	76	68	29	8	94
50606	155	98	63	97	89	62	54	99
Total Effect	**1,129**	**853**	**76**	**815**	**682**	**343**	**144**	**96**
Average Effect	**188**	**142**	**74**	**117**	**98**	**49**	**21**	**96**
SD	**67**	**65**	**13**	**60**	**46**	**40**	**22**	**4**
Range	**175**	**164**	**34**	**161**	**107**	**88**	**52**	**11**
No District[2]								
No1	92	0	0	0	0	0	0	0
No2	0	0	0	0	0	0	0	0
Total Effect	**92**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Average Effect	**46**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
SD	**65**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Range	**92**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

The remainder of Chapter 4 will consist of the calculated CER values from both the state

level down to the PA level in each individual district. The format of the tables in section 4.3 will

be very similar to those of section 4.2 which reported the effects. The number of tables reported

will be the same as those in section 4.1 and 4.2 with the state and each district having their own

reported table. The focus of section 4.3 will be to identify the CERs in the relation to the

different effects categories at both the state, districts, and PAs within the districts.

4.3 The Cost-Effective Ratio (CER) of the SNAP-Ed program

Using the cost and effects data collected from the PAs of the 5 districts, the CERs for the

adult SNAP-Ed program of Virginia were calculated and reported in tables 14-19 with each table

representing a separate district. Table 4-13 below is a summary table of the CER values across

the districts for the categories of interest. This table can also be use for comparison purposes of

the sensitivity analysis. For the state (SCER) overall, participants reached had a cost per

participant of $367 while the cost per participant graduated was $671. In terms of improvement,

the cost per participant to improve on one question by at least one was $688, improvement of

two was $779, improvement by three was $1,311, and an improvement of four was $2,486. As

stated in the effects section, not all participants had the ability to improve from a full scale of 4

so it would be expected to incur a higher SCER value for an improvement as it increases past an

improvement of one. The average CER for the districts ($ACER_D$) in the state were lower than the

CER value when aggregated at the state level (SCER). This implies the average effects of the

districts in the state were less than the individual districts across the state for all effects

categories when scaled by the CER value of the district. The ranges and standard deviations are

high across all categories for table 4-13 due to the inclusion PAs that achieved no effects.

Additionally, the number of participants that graduated influenced the remaining ranges and

standard deviations in terms of the retention rate. To avoid repetition from section 4.2, the range

and standard deviations were not explored in as much depth due to the similarities. However, in

Chapter 6 the topics surrounding the changes across effect categories will be further examined.

TABLE 4-13 SUMMARY CER TABLE ACROSS THE DISTRICTS

District	Program Outreach CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
District 1	$334	$582	$596	$675	$1,107	$2,138
District 2	$411	$838	$843	$926	$1,531	$2,632
District 3	$445	$910	$945	$1,080	$1,697	$2,882
District 4	$314	$598	$611	$663	$1,026	$2,108
District 5	$263	$348	$364	$435	$864	$2,059
No District	$609	N/A	N/A	N/A	N/A	N/A
SCER	**$368**	**$672**	**$689**	**$780**	**$1,312**	**$2,488**
ACER$_D$	**$353**	**$655**	**$672**	**$756**	**$1,245**	**$2,364**
SD	**$123**	**$224**	**$228**	**$251**	**$353**	**$371**
Range	**$346**	**$562**	**$581**	**$645**	**$833**	**$823**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

The remaining tables of section 4.3 are the calculated CER values for each individual district and the PAs within the districts. To reiterate, the DCP numbers represent the individual PA and the values in each of the categories are CER values for that individual PA's cost effective ratio (PCER). The districts cost effective ratio (DCER) represents the total costs for that district divided by the total effect of the district per effects category. The average of the PA cost effective ratio ($ACER_P$) is also reported and represents the standard average from the different categories. Table 4-14 begins the district CER calculated for District 1.

TABLE 4-14 CER FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 1

DCP #	Outreach CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
10101	$438	$1,018	$1,018	$1,952	$11,710	$15,614
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10404	$510	$510	$521	$561	$641	$1,725
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10707	$341	$376	$389	$396	$792	$5,545
10808	$290	$537	$537	$597	$1,155	$2,415
10909	$300	$824	$837	$959	$1,953	$3,766
11111	$295	$427	$445	$515	$812	$1,320
11112	$242	$384	$395	$425	$589	$1,053
DCER	**$334**	**$582**	**$596**	**$675**	**$1,107**	**$2,138**
ACER$_P$	**$364**	**$706**	**$718**	**$907**	**$2,661**	**$3,619**
SD	**$101**	**$500**	**$495**	**$751**	**$3,830**	**$4,446**
Range	**$322**	**$1,720**	**$1,707**	**$2,355**	**$11,121**	**$14,561**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

The DCER for District 1 was $334 for participants that were recruited to start the program. This means that the cost to recruit a participant into the program was $334 per person recruited while the average PA had an average ratio of about $364 per participant recruited in District 1. An area marked by N/A means that there were no participants for this PA that satisfied that columns criteria. The total and average ratios for graduating participants that completed the program increased significantly to about $582 per participant that graduated in the district with the average PA ratio being $718 per participant graduated. This increase in cost per effect can be explained by the low graduation rates seen in Table 4-8 at about 57%. As a result, it is expected that the DCER would almost double from start to graduation. For an improvement rate of one the $ACER_P$ was $718 while the DCER was only $596. These costs increased for each level of improvement as expected. It can also be seen that the cost for improvement rate of at least one is larger than that of the graduation rate. This implies that fewer participants than those that graduated improved by one and that no change of knowledge occurred. However, this is not necessarily the case as an individual already practicing the desired behavior prior to the program would show no improvement so the pre to post test scores would be identical.

District 2, seen in Table 4-15 below, shows a DCER for starting participants of $411 with the $ACER_P$ in the district having a cost of $423 per participant recruited. District 2 had a graduation rate around 50%. The graduation rate being below 50% explains costs per participant graduating increasing by its total value for the district and the average PA in the district. The reason that this is noticeable is that the effects are the denominator value for the CER formulas and therefore, when this value decreases by half the ratio will double. Regarding improvements, it should be noted that the cost of an improvement of at least one is very similar to the graduation DCER and $ACER_P$ values.

TABLE 4-15 CER FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 2

DCP #	Outreach CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20101	$696	$1,267	$1,267	$1,400	$3,883	$7,523
20202	$210	$748	$748	$903	$1,689	$1,870
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20506	$337	$520	$520	$700	$1,819	$3,638
20507	$500	$903	$903	$940	$2,135	$4,698
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
20810	$374	$827	$827	$1,048	$1,814	$2,358
20911	$915	$1,567	$1,567	$1,567	$1,567	$1,842
20912	$714	$757	$757	$766	$913	$1,713
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
21114	$388	$1,203	$1,279	$1,582	$2,313	$3,165
DCER	**$411**	**$838**	**$843**	**$926**	**$1,531**	**$2,632**
ACER_P	**$423**	**$857**	**$864**	**$977**	**$1,969**	**$4,466**
SD	**$212**	**$318**	**$323**	**$354**	**$937**	**$4,482**
Range	**$705**	**$1,154**	**$1,154**	**$1,160**	**$3,099**	**$17,312**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

This similarity is due to the high behavioral change percentage calculated for the district at about 99% for District 2. However, the cost of an increased improvement rate past one increases the cost for each improvement value. Although, an improvement of at least one shows a DCER of $843 per participant that improved while the $ACER_P$ in the district was at about $864. In this district each PA had at least one participant that graduated and had an improvement in each category leading to N/A reported for District 2.

District 3, shown in Table 4-16 below, showed a DCER of $445 and the $ACER_P$ for the district of $477 per participant recruited. District 3 also had a graduation rate less than 50%. The cost per participant graduated in District 3 was calculated as $910, which was 8% higher than the second highest reported cost per participant graduated. On the improvement side of the program, an improvement of at least one is comparable to graduation DCER and $ACER_P$ values. However, the cost of an increased improvement rate past one increases the cost for each improvement value substantially past an improvement of two. The CER value of an improvement of one being higher than the graduation ratio implies that some participants showed no improvement throughout the program. Again, this does not mean that the participants did not improve, but that many may have already been practicing optimal behavior prior to the program. The cost the district faced to improve a participant by at least one score was $945 while $ACER_P$ was $1,198. Much like District 2, there was at least one participant in each improvement rate hence no N/As is recorded.

TABLE 4-16 CER FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 3

DCP #	Outreach CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
30101	$335	$797	$797	$835	$956	$1,031
30202	$337	$881	$954	$1,091	$1,762	$3,817
30303	$829	$1,722	$1,722	$1,722	$3,198	$7,461
30505	$626	$1,327	$1,369	$1,684	$3,457	$8,759
30506	$667	$1,327	$1,354	$1,543	$2,073	$3,085
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
31211	$203	$418	$435	$528	$986	$1,633
DCER	**$445**	**$910**	**$945**	**$1,080**	**$1,697**	**$2,882**
ACER_P	**$477**	**$1,133**	**$1,198**	**$1,382**	**$2,531**	**$5,026**
SD	**$174**	**$562**	**$610**	**$776**	**$2,228**	**$4,757**
Range	**$505**	**$1,693**	**$1,781**	**$2,524**	**$7,471**	**$15,197**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

District 4, seen in Table 4-17, had a recruiting cost per participant of about $314 with the average PA recruitment cost of $393. District 4 had a graduation rate slightly higher than 50%. However the average PA's graduation rate was less than 50%. The graduation rate lead to an increase from recruitment to graduation to $598 with the average PA having a participant graduation cost $864. While the cost per recruiting effect was lower than many of the other districts, this does not translate to more effects achieved. Instead, District 4 had some of the closest recruiting and graduation numbers in the state but yielded one of the lowest ratios observed for these categories. These low ratios can be seen across the improvement as well with an improvement of 1 DCER at $611 and the $ACER_P$ being $876. It should also be noted that DCP 40101 had no participants that graduated and none that showed improvement since this particular PA did not complete the program and resigned early.

TABLE 4-17 CER FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 4

DCP #	Outreach CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
40101	$147	N/A	N/A	N/A	N/A	N/A
40302	$249	$977	$977	$1,059	$1,694	$4,234
40403	$279	$436	$456	$546	$989	$1,899
40504	$1,078	$1,459	$1,459	$1,459	$2,480	$12,399
40605	$412	$1,509	$1,547	$1,933	$2,475	$4,759
40806	$240	$327	$334	$351	$517	$874
40807	$344	$477	$482	$482	$737	$1,983
DCER	**$314**	**$598**	**$611**	**$663**	**$1,026**	**$2,108**
ACER$_P$	**$393**	**$864**	**$876**	**$972**	**$1,482**	**$4,358**
SD	**$313**	**$530**	**$534**	**$629**	**$867**	**$4,211**
Range	**$931**	**$1,182**	**$1,213**	**$1,582**	**$1,963**	**$11,525**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

District 5's DCER, as seen in Table 4-18 below, was about $263 with the $ACER_P$ calculated at $286 per participant. Like District 4, District 5 had a graduation rate much higher than 50%. The higher graduation rate led to CER values across the improvement as well with an improvement of 1 DCER at $364 and the $ACER_P$ having $361. Table 4-18 also includes the No1 and No2 PAs located at the bottom, which represent the PAs with no assigned district. The only reportable value that has meaning is No1 having a cost of $547 per participant recruited. The average and total effects are based off of small changes in cost from the No2 PA. However, this cost was extremely small so the effect on the values was small.

TABLE 4-18 CER FOR THE ADULT SNAP-ED BY ADULT PA IN DISTRICT 5

DCP #	Outreach CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
50101	$331	$392	$403	$621	$2,128	$4,063
50202	$156	$197	$203	$276	$442	$1,005
50303	$311	$415	$415	$415	$2,189	$24,083
50404	$206	$232	$260	$285	$462	$2,202
50505	$284	$522	$556	$622	$1,458	$5,286
50606	$431	$682	$689	$751	$1,079	$1,238
DCER	**$263**	**$350**	**$364**	**$435**	**$864**	**$2,059**
ACERP	**$286**	**$407**	**$361**	**$425**	**$1,109**	**$5,412**
SD	**$97**	**$181**	**$181**	**$198**	**$773**	**$8,863**
Range	**$275**	**$485**	**$486**	**$475**	**$1,747**	**$23,078**
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	0	N/A	N/A	N/A	N/A	N/A
DCER	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
ACERP	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Range	**$547**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

So in conclusion, PAs throughout the state were subject to costs, particularly utility costs that drove the total cost and CER values higher than what may be considered accurate. Therefore, the sensitivity analysis in Chapter 5 will focus on removing the PAs with outlier costs, both low and high, and will recalculate the state level CER values. This will determine the impact that such cost outliers had on the reported CER values in section 4.3 in Chapter 4. Following Chapter 5, Chapter 6 will focus on a discussion of the results, the relationships seen between the cost and effects data, and what factors would effectively lower the CER ratio for Virginia's adult SNAP-ED.

Chapter 5.0 Sensitivity Analysis

In both Chapter 3 and Chapter 4, outliers were present for PAs that could potentially influence the calculated CER values. These outliers were observed particularly in the capital and utility costs portions of the data but also in the other cost categories. The values used in calculating these costs were sometimes unrealistically high for a single PA due to maintenance and capital cost values. On the other hand, some individuals had no costs reported and saw lower total costs than the other PAs, which may be unrealistic as well.

In order to examine the sensitivity of the effects to these outliers, the PAs with the maximum and minimum cost for each cost category (Labor, Capital, Materials, and Utility) were removed in each district. In the case of costs being equal or identical, both PAs were removed for the adjusted category. When removing the costs associated with these outliers, one must also remove the corresponding effects. Consequently, this sensitivity analysis amounts to completely removing those PAs with extreme cost values from the analysis. All the categories were adjusted to see if any specific category had an overbearing effect when outliers were removed. The adjustments examined are not only the individual categories but also the Total Cost (summation of all costs) category. To reference the individual adjustments that were made, new tables with outlier removal by district (Appendix Tables B-1 through B-25) are presented. The differences between each Effect Category (starting rate, graduation rate, and improvement of one at least question) in relation to the CER formula presented in Tables 5-2 through 5-4 are the values used the denominator (effects) in the for the calculations in equation 3.1. In Table 5-2 the starting number of participants for each PA will be used as effects, Table 5-3 will use the graduated number of participants, and Table 5-4 will use the number of participants who improvement by one . The PAs removed from each district with respect to each adjustment will remain the same

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for each table. For example, the PAs removed from District 1 with respect to the total costs adjustment in Table 5-2 will be the same PAs removed for District 1 Total Cost adjustment in Table 5-3 and 5-4.

Tables 5-1 through 5-4 will show the sensitivity results for the CER values by the starting rate, graduation rate, and improvement of one on at least question, respectively. The overall goal of this chapter will be to explore the effect that outliers have on the CER values. Comparing the values across the districts and categories will allow for an analysis of the cost categories with the largest influences in each district along with each effects category. The analysis first will be broken down by state and then across districts.

5.1 State Level Sensitivity Analysis

Table 5-1 below shows all the recalculated CER values with outlier removals by category for the state. The state values were calculated using the PAs that remained after each district had the highest and lowest outliers removed for the respective category. In situations of identical cost outliers for two PAs, both PAs were removed. The number of PAs dropped for each category is dependent on the category. The numbers dropped for each category are as follows: total 11, labor 11, capital 13, material 10, and utility 13.

TABLE 5-1 SUMMARY STATE LEVEL SENSITIVITY ANALYSIS BY COST CATEGORY

Effects	Original State CER	Total Cost Adjusted State CER	Labor Adjustment State CER	Capital Adjustment State CER	Material Adjusted State CER	Utility Adjusted State CER
Starting	$368	$412	$449	$338	$433	$353
Graduation	$672	$762	$831	$625	$801	$644
Improvement of 1	$689	$785	$857	$644	$826	$658

The start, graduation, and improvement of one effect categories all showed change in the CER being within 8% of their original respective values for capital and utility costs. The remaining cost adjustments, total, labor, and material cost all saw increases in the CER being within 20% of the original unadjusted values. The total, labor, and materials cost categories all increased their state level CERs indicating that the achieved effects of the removed PAs (starting participants, graduated, and improvement counts) outweighed the costs associated with their removal

At the state level, the starting effects, total cost adjustment calculated an increase of $44 per starting participant while the largest increase was seen by labor cost of $81. The largest decrease was $30 per starting participant as seen in the capital adjustment portion The second highest increase was seen by materials cost calculate as an increase of $65 per starting participant. The lowest decrease from the unadjusted starting effects CER was a $15 decrease for the Utility adjustment. As the effect categories are explored for CER changes from cost adjustments a pattern becomes apparent that will be expanded on for the graduation effect category. So in sum, total, labor, and material show an increase and capital and utility show a decrease in the starting CER as a result of the outlier removal.

The pattern for the graduation effect is very similar to that of the starting effect. The smallest increase was seen in the total cost adjustment which saw only a $90 increase while the largest increase was seen in the labor cost adjustment, which had increase of $159 per graduate. The capital cost adjustments for graduation again saw the highest decrease of $47 per graduate participant. Materials cost saw the second largest increase of $129 per graduated participant while utility cost adjustments calculated a $28 decrease.

The final effect category for an improvement of 1 saw the same pattern as the other two effects categories. Total cost saw the lowest increase of only $96 whereas labor cost showed largest increase of $168 per improvement. Utility and capital cost adjustments both saw decreases in the CER values with capital cost showing a $45 decrease per improvement. Material cost showed increases, as with the other effect categories, saw an increase of $137. Utility adjustments showed only a $31 decrease for the improvement effect category. As with the other effect categories the capital and utility cost adjustments were the only adjustments that showed a decrease in state level CER values. The total, labor, and material costs, all showed increases. In summary, capital and utility costs were the only adjustments leading to decreases in CER while total cost, labor, and material cost adjustments all saw CER increases as a result of outlier removal.

If we look across effect categories, the Capital cost column showed the largest decrease in CER values. This is particularly interesting when compared to the total cost effect category. The total cost category removed the highest and lowest cost PAs in each district regardless of the category. One reason that the CER values were the lowest for capital cost is because the PAs dropped for the other category adjustments had higher effects that were also dropped. The capital cost adjustments ranged from a decrease of $30 per effect to the maximum of $47 per effect achieved. The labor cost adjustments showed the highest increase for each effect category. This would imply that the costs associated with those considered outliers were much lower compared to the effects achieved. In other words, the denominator (effects) of the CER formula has a greater influence on the CER ratio. However, these results are not necessarily common in terms of cost category CER values in each district.

5.2 District Level Sensitivity Analysis

Tables 5-2 through 5-4 will look at the district values for the three cost effect categories by cost adjustments Table 5-2 below shows the values of the CER at the district levels for adjustment across all categories for starting participants. The effects for the CER values reported are the number of starting participants recorded in each district. No discernable pattern could be detected from Table 5-2 for starting effects cost adjustments such that no cost adjustment category saw only increase of decreases per cost adjustment in each district.

Total cost adjustments saw decreases in all the Districts except District 1 which saw a $7 increase per starting participant. District 4 had the smallest decrease of only $8, while District 3 had the largest decrease of $52. Districts 2 and 5 had similar decreases being $29 and $36, respectively. District 1 CER for starting participants decreased the most when adjusted for labor cost outliers. In Table 5-1 the opposite was true for all effects categories. The decrease was $11 less per starting participant. This implies that PAs with significant cost and smaller effects were present in District 1. The same result was seen in District 5 with a CER value $43 dollars less than the original unadjusted value for labor cost adjustments. Districts 2, 3, and 4 all saw an increase in CER values for labor cost adjustments. The smallest increase was seen in District 2 with only $4 increase per participant, while the largest increase was seen in District 3 with a $51 increase per participant.

TABLE 5- 2 SUMMARY OF DISTRICT SENSITIVITY ANALYSIS FOR CER BY COST CATEGORY FOR STARTING PARTICIPANTS

District	Unadjusted	Total Adjusted	Labor adjusted	Capital adjusted	Materials adjusted	Utilities adjusted
District 1	$334	$341	$323	$332	$342	$347
District 2	$411	$382	$415	$354	$377	$414
District 3	$445	$393	$496	$352	$517	$352
District 4	$314	$306	$339	$322	$309	$262
District 5	$263	$227	$220	$273	$307	$267
No District[1]	$609	$609	$609	$609	$609	$609

[1] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

The capital cost adjustment category showed Districts 2 and 3 having the lowest adjusted CER values with a decrease in District 2 of $57 and $93 in District 3. District 1 also had a decrease but only by $2 from the original unadjusted value per starting participant. Districts 1 and 5 saw increases of $8 and $10 respectively when the capital cost adjustments were made.

The materials cost adjustments saw increases in CER values in Districts 1, 3, and 5. The lowest of these increases was seen in District 1 with only an $8 increase per participant recruited. District 3 saw the largest increase of $72 and District 5 saw an increase of $44 per starting participant. Districts 2 and 4 saw decreases in CER values or material adjustments of $34 and $5 respectively. For utility cost adjustments Districts 3 and 4 were the only two districts to see decreases in the CER values. District 4 had the lowest CER value from its unadjusted value when the utility cost adjustment was made. The decrease was by $52 from the original unadjusted value. District 3 saw the same decrease of $93 dollars as seen with the capital cost adjustments. This isn't necessarily unusual for District 3 but suggests that the same two PAs were dropped for calculations, which is indeed the case. District 1 saw an increase of $13 per starting participant, District 2 had a $3 increase, and District 5 had an increase of $4. Finally, the total cost adjustments saw decreases in all the Districts except District 1 which saw a $7 increase per starting participant. District 4 had the smallest decrease of only $8, while District 3 had the largest decrease of $52. Districts 2 and 5 had similar decreases being $29 and $36, respectively. The remaining no district PAs shared the same CER across all adjustments, as these PAs were not adjusted since only two were present for the data.

So summarizing these results across districts we do not find any real consistent pattern. For example, there is no case where all districts move in the same direction with respect to the adjustment. The closest case is for total cost where all districts expect District 1 show a decrease

in the CER. However, for the other categories some districts show an increase and some show a decrease for the adjustment. District 4 and 5, which had two of the largest retention rates in the state, saw increases in CER values in the capital cost adjustment category and showed the largest decrease at the state levels for this effect category. Additionally, District 5 saw the largest decrease in CER value for starting participants when adjusted for labor cost. This was again the opposite seen at the state level which made this more noticeable. District 5 had the lowest reported CER values in the State but did not see a reduced CER value in either of the cost categories noted for outliers. This could imply that with higher retention rates, the CER values influence by cost could be different by cost category. However, another explanation could be the other Districts were in higher cost areas of the state. This would lead to higher capital but not necessarily labor costs. A final explanation would be that those PAs in District 5 were producing effects comparable to offsetting the effect capital costs had on the CER values in comparison to other Districts. These same conclusions can be applied to District 4 as well.

TABLE 5-3 SUMMARY OF DISTRICT SENSITIVITY ANALYSIS FOR CER BY COST CATEGORY FOR

GRADUATING PARTICIPANTS

District	Unadjusted	Total Adjusted	Labor adjusted	Capital adjusted	Materials adjusted	Utilities adjusted
District 1	$582	$610	$569	$562	$626	$618
District 2	$838	$870	$830	$772	$854	$796
District 3	$910	$809	$1,014	$707	$1,040	$707
District 4	$598	$485	$624	$611	$686	$475
District 5	$348	$278	$288	$356	$391	$381
No District[1]	N/A	N/A	N/A	N/A	N/A	N/A

[1] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

For the total cost adjustments, Districts 1 and 2 showed increases in their CER values of $28 and $32 for a graduated participant. District 3 showed a decrease of $101, District 4 had a decrease of $113, and District 5 had a decrease of $70. As with starting participants, Districts 4 and 5 still saw an increase in CER values for the capital cost adjustments. This again was the opposite of what was seen at the state level as capital cost adjustments saw the largest decrease in each effects category. District 5 saw its largest decrease in CER from labor cost adjustments.

The labor cost adjustments were similar to those of Table 5-2 in respect to which districts saw increases and decreases with the exception of District 2. District 2 went from an increase with starting effects to a decrease of $8 per participant that graduated. Districts 1 and 5 saw decreases of $13 and $70 respectively for a graduated participant, whereas Districts 3 and 4 saw increases of $104 and $26 per graduated participant. District 2 having a lower CER value for labor adjusted implies that the PAs that were dropped had high wages (the major component of labor costs) and low graduation numbers. This allowed for the value to decrease slightly below the unadjusted value.

 Districts 1, 2, and 3 had the lowest CER values when the capital cost values were adjusted. The range for the differences from the original unadjusted district CERs was $66 (District 1) to $203 (District 3) per participant graduated. The difference seen by District 3 from capital adjustments has been the largest thus far being about a 22% change from the original unadjusted value. Therefore, it can be assumed that some large capital cost PAs were present in District 3. Upon their removal the CER decreased by close to a fourth its original value. Districts 4 and 5 saw increases in the CER values for capital cost by $13 and $8 per graduated participant.

The materials cost adjustments saw an increase for every district in the state. The reason for this similarity was the method by which material costs were calculated. In order to have

consistent cost calculation, the material cost, as seen in Section 3.5, was only calculated using those participants that graduated from the program. The costs values for the materials were only 3% of the calculated state total cost. Therefore, when the highest and lowest PAs costs were removed so were the highest and lowest effects. This can be further understood from reference of equation 3.15. Since this component of the materials cost was based on the number of participants, the cost increased based on the number of participants. Therefore, the highest materials cost was also the highest producer of effects. This caused the effect values to be changed from a dropped PA, decreasing the denominator of the CER equation leading to an increase in the overall CER. The utility cost adjustments saw increases in CER values in Districts 1 and 5. The increases were $36 for District 1 and $33 for District 5. For District 4, the utility cost adjustments led to a $123 per effect achievement which was the second largest decrease achieved behind District 3 with $203. District 2 saw the smallest decrease for utility cost adjustments of only $42.

Table 5-3 below shows the new district CER values and state level values when the only those of the respective districts and state graduation effects are used. Therefore, the adjustments and outliers that were removed from the calculations remained the same and therefore the numerators for each District remained the same for each cost adjustment. A CER value being lower in a different cost category than in Table 5-1 would be based on the retention rates on the different PAs that were removed. For example, in District 1 the labor cost adjustments was the lowest CER for starting participants; however, at graduation the PAs included in the capital adjusted portion produce higher effects. To emphasize, the cost values in each adjusted categories has not changed from Table 5-2 but the effects of these PAs have. Therefore, it is

possible for the lowest CER cost category to change. However, the CER values will not be lower for any effects category past starting due to retention rates below 100%.

Table 5-4 shows the sensitivity analysis for an improvement of 1 and these CER values as with Table 5-3 are expected to be higher than those of Table 5-2. As with table 5-2 the improvement rate is strictly less than the graduation rate and starting participant count. Therefore, the denominators for the CER formula are lower for these calculations. The change that the cost adjustments had for this effect category were all very similar to those of Table 5-3. All the changes in terms of increases and decreases are identical to those of Table 5-3. So while no unique cost adjustment had similar changes in all districts, two effect categories, graduation and improvement, showed identical changes for district responses to each cost adjustments. Due to the lack of change that will be seen from Table 5-3 to Table 5-4 the depth of the examination of differences from adjusted to unadjusted will not be heavily explored numerically. The explanation for the lack of change is seen through the improvement rates found in Section 4.2 showing a 97% improvement rate in the state. A 97% improvement rate implies that a small margin of participants that graduated did not improve (3%). This causes the effects for an improvement of one on a single question to be very similar to the number of participants that graduated. Districts 1, 2, and 3 all saw the smallest CER values in the capital cost adjustment categories, while Districts 4 was the utility cost adjustments and District 5's lowest CER was from labor cost adjustment.

TABLE 5-4 SUMMARY OF DISTRICT SENSITIVITY ANALYSIS FOR CER BY COST CATEGORY FOR

PARTICIPANTS THAT IMPROVED BY 1.

District	Unadjusted	Total Adjusted	Labor adjusted	Capital adjusted	Materials adjusted	Utilities adjusted
District 1	$596	$627	$584	$577	$641	$634
District 2	$843	$876	$833	$779	$860	$802
District 3	$945	$843	$1,052	$736	$1,076	$736
District 4	$611	$496	$634	$627	$703	$482
District 5	$364	$292	$305	$377	$410	$391
No District[1]	N/A	N/A	N/A	N/A	N/A	N/A

[1] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

The sensitivity analysis revealed that capital cost Adjustments showed the largest decrease in CER values at the state level for each effects category, as was expected. This has shown that some of the costs that were associated with some PAs might have been important in terms of the effects achieved. Additionally when looking at the individual districts, it was noticed that the districts with higher retention rates seemed to have the opposite reactions to cost adjustments as those districts with lower retention rates. This was seen in all three of the district effects tables (5-2 to 5-4) particularly for the capital, utility, and labor cost adjustment categories. The importance of the retention rates of participants becomes apparent particularly from Tables 5-3 and 5-4. The difference between graduation and improvement CERs when compared to those of starting to graduation emphasizes the importance. Therefore, Chapter 6 will focus on the relationships seen for improvement, starting participants, and graduation for Virginia's SNAP-Ed program.
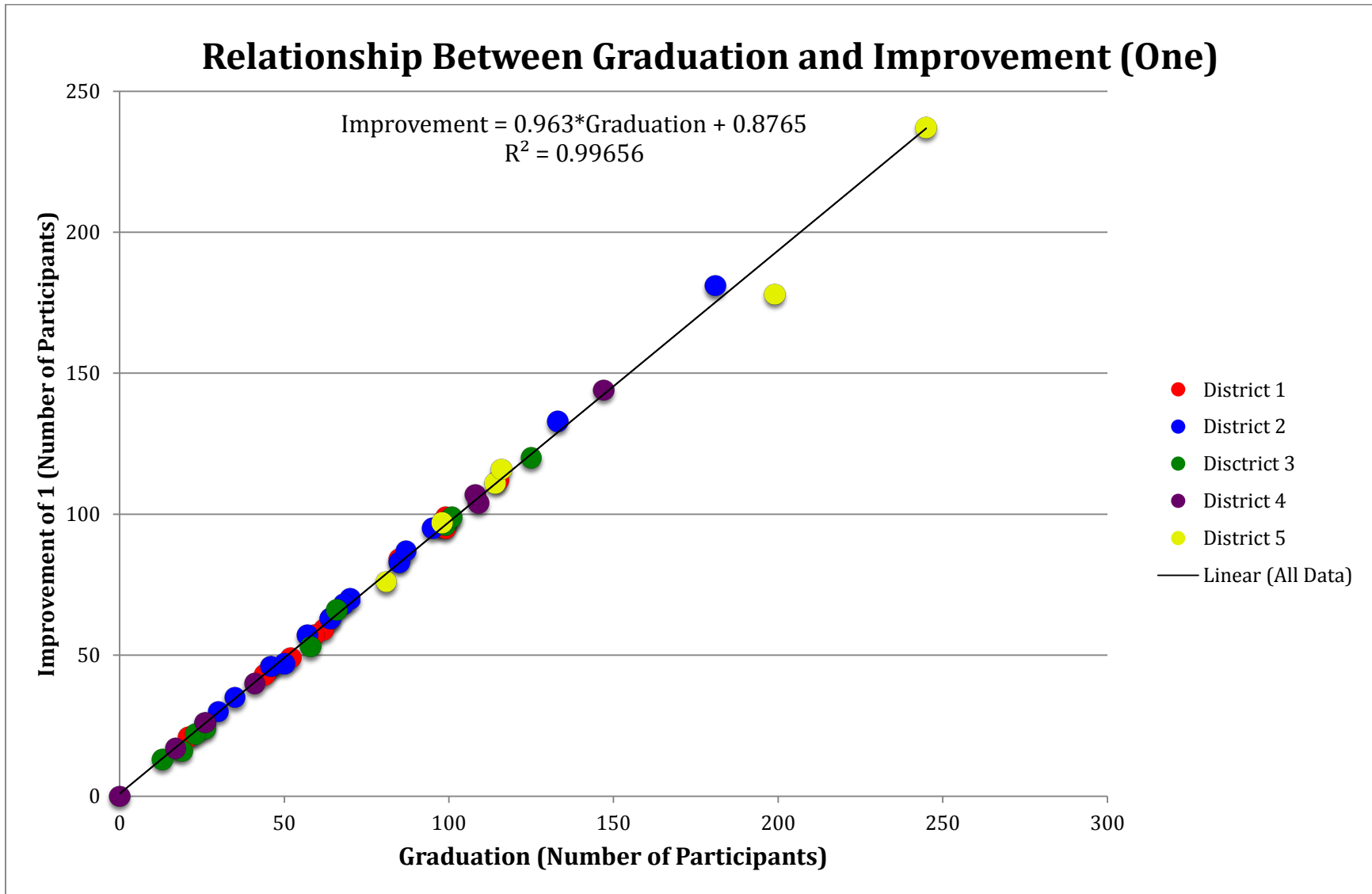
Chapter 6.0 Discussion and Conclusion

Three CER ratios have been calculated throughout this thesis with the only difference being what type of effect is being considered in the denominator: the starting participants, the graduation rate, and the number improving by one. Clearly if all these numbers were the same then all the CER values would be the same because all have the same numerator (cost) values. Consequently a closer look at how these variables are related will shed some light on why the CER values differ. Section 6.1 first centers on the relationship between the number of participants that graduated and the numbered that improved. The relationship between the CER for graduation and improvement is then also considered. Section 6.2 focuses on the factors that led to higher and lower CER ratios with emphasis on the starting, graduation, and improvement CER values. Finally section 6.3 gives a summary of the thesis with conclusions and some limitations and suggestions for future studies.

6.1 Graduation and Improvement Rate Relationship

Figure 6-1 shows a linear regression on graduating participants (predictor) with those that improved by at least one question (response). The points on the graph represent each individual PA highlighted by the color representing the district that the PA was assigned. The black line is the fitted linear regression relating the numbers of participants that graduated to the number of participants that improved. The R^2 value is 0.99 meaning that the number of participants that graduated can explain 99% of the variation of participants that improved by 1.
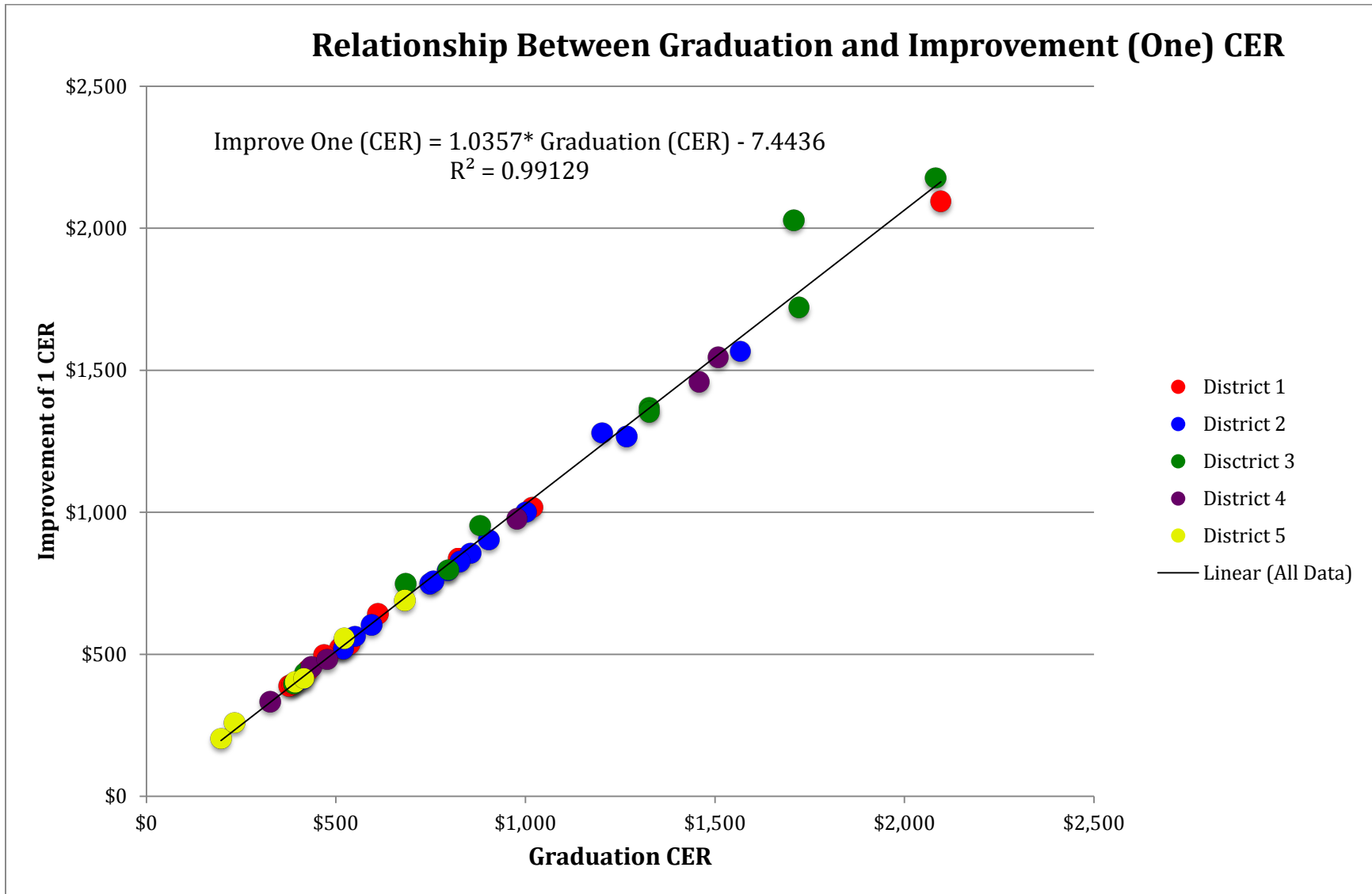
Figure 6-1 Linear Relationship between Graduation and Improvement (One)

Relationship Between Graduation and Improvement (One)

Improvement = 0.963*Graduation + 0.8765
$R^2 = 0.99656$

Improvement of 1 (Number of Participants)

Graduation (Number of Participants)

- District 1
- District 2
- Disctrict 3
- District 4
- District 5
- Linear (All Data)

Given the different CER values only differ by their denominator and from Figure 6-1 there is very little difference between the graduation rate and the improvement rate, the graduation CER should be very similar to the improvement CER. Figure 6-2 confirms this conjecture. The values of the points are the individual PA CER (PCER) values. The linear equation at the top of the graph relates the graduation CER and improvement of one CER. It shows that a one-dollar increase in graduation CER results in a 1.04 increase in the improvement of one CER. This agrees with the results seen in Chapter 4 that the CER values for improvement were equal to or higher than the CER values for graduation for any PA. The graduation rates influence is further supported by the values reported for the R^2 of 0.99. The R^2 value implies that 99% of the variation in improvement by one CER can be explained by graduation CER. The trend line on the figure goes through most of the plotted PCER values in the state and shows that the graduation rate is an important influential component of the CER that can be improved in order to increase effectiveness. Section 6.2 will further expand on the effect graduation rate had on CERs across the districts.

**Figure 6-2 Linear Relationship between Graduation Rate and Improvement CER**

Relationship Between Graduation and Improvement (One) CER

Improve One (CER) = 1.0357* Graduation (CER) - 7.4436
$R^2 = 0.99129$

Improvement of 1 CER (y-axis)

Graduation CER (x-axis)

District 1
District 2
Disctrict 3
District 4
District 5
Linear (All Data)

6.2 Cross-District Comparisons

While Figure 6-1 and 6-2 show the overall relationship between graduation rate and improvement and the corresponding CERs, they do not reveal how the CERs compare across districts and for the administrator trying to identify the most productive (efficient) districts that information is vital. This section digs into the results a little deeper by comparing CERs across districts starting with a comparison of recruitment versus graduation and then graduation versus improvement. Figure 6-3 is shows all the comparisons and is used for discussion in each subsection.

6.2.1 Recruitment and Graduation

The blue bars in Figure 6-3 represent the district CER values (DCER) for an individual district in recruitment while the red bars represents the DCER values per participant graduating in an individual district. The CER for recruitment will always be lower than that for graduation because the graduation rates are strictly lower than recruitment rates, which is confirmed in Figure 6-3. It can be noted that District 3 had the highest CER values for both recruiting and graduation followed by District 2 with the second highest CER values. The DCER values for both districts were about $100 per effect over the closest district and over $200 more per participant graduating. The average DCER values or $ACER_D$ for recruiting and graduating were $353.10 and $655.54, respectively. When compared to the average district values in the state, Districts 2 and 3 are the only two that are greater than the average values implying that these two districts drove the averages to greater values. More specifically, when compared to the average district, District 2 was $58 higher in recruiting and $183 higher in graduation cost per effect. District 3 produced even larger CER values with a recruitment CER $92 and a graduation CER $255 higher than the average district. Districts 1 and 4 were lower than the average but remained

similar. The starting (recruitment) CER for District 1 was $19 lower than the average district and District 1 had a Graduation CER $73 lower than the average district. District 4 had a Starting CER value $39 lower than the average district and a Graduation CER $57 lower than the average district. Finally, District 5 saw the lowest CER values with a Recruiting CER value $90 less than the average district and a Graduation CER $307 less than the average district.

Figure 6-3 District CER Comparison For Behavioral Change and Outreach
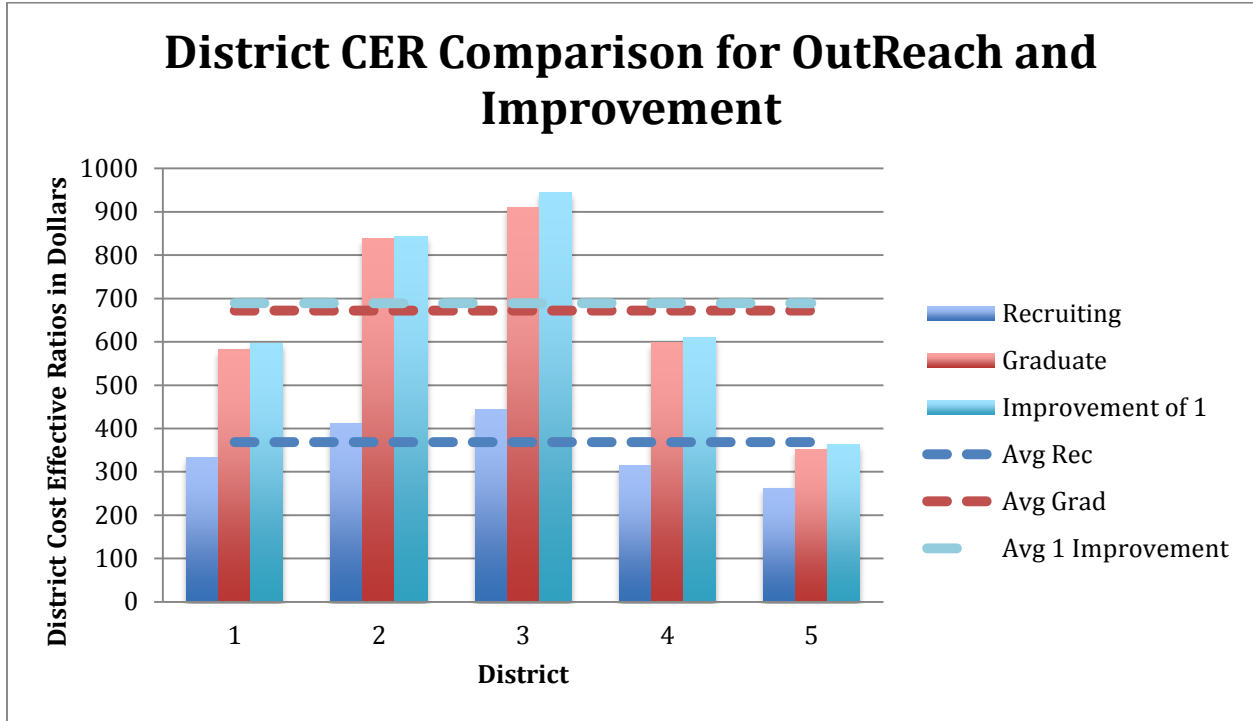
In Figure 6-2 above, a factor seen in both Districts 2 and 3 that heavily influenced the CERs was the retention rate. Districts 2 and 3 both had graduation rates of 49%. The dark blue and red bars in Figure 6-2, which shows the graduation CER values for both districts double, demonstrates the retention rates effect. District 5 showed the effect of a higher retention rate on CER as it had the most cost-effective (lowest) results for outreach in both graduation and recruiting. While having one of the lowest recruitment effects values the district maintained the highest graduation rate (76%), which significantly decreased the graduation DCER as compared to the other districts. Even with a low recruiting class, the DCER values across improvement remained the lowest, which is an optimal outcome. When compared to the average district for the state of Virginia, District 5 was significantly lower for each cost category. Districts 1 and 4 both maintained CER values for each Effect category below the averages that can be partially credited to the higher retention rates. District 1 had a retention rate of 57% while District 4 had a retention rate of 53%. Another reason for having lower CER value for District 4 was due to the low participant count. A lower participant count and PAs in the district lowers the cost. Combined with a higher retention rate kept CER values low.

6.2.2 Graduation and Improvement

Figure 6-3 above also shows that graduation rate has a large impact on the CER value for an improvement of one. This further supports that a key factor in determining the CER value across the categories of behavioral change is the retention rate of the SNAP-Ed participants from recruitment to graduation. The improvement of one CER bars, the light blue bars, for each district is very similar to the graduation CER values. This outcome can also be predicted from the results in Figure 6-1 and Figure 6-2 that shows that there is a relationship between the CER values. The explanation for the relationship for the improvement side of the Effects categories

further supports the fact that retention rate drives the CER values for the program. Any change to the graduation rate, increase or decrease, would almost identically affect both graduation and improvement CER values.

6.3 Conclusion

The purpose of this thesis was to complete a cost-effective analysis (CEA) on Virginia's adult Supplemental Nutrition Assistance Program Education (SNAP-Ed). SNAP-Ed is an extension of SNAP with the goal to provide nutrition education to low-income participants (United States Department of Agriculture, 2012). In Virginia, the adult SNAP-Ed program is separated into five separate districts by the counties of Virginia. Para-Professionals, also known as program assistants (PAs), are tasked in each district with the mission of recruiting, graduating, and improving SNAP-Ed participants. Officially, SNAP-Ed started in 2008 but no cost-effective (CEA) or cost-benefit analyses (CBA) have been conducted on this program. Completing a CEA would allow program administers and policy-makers to be informed on both the costs and effects being produced by the program.

Conducting a CEA on Virginia's adult SNAP-Ed requires identifying all the costs and effects, then using these to calculate cost-effective ratios for all PAs, districts, and the state as a whole. Identifying the cost was done with four cost categories used including labor, capital, materials, and utility costs. These costs were all collected at the PA level from SNAP-Ed internal sources. The effects were collected from a database used by SNAP-Ed that tracks all participants' assessment data. The collected data used as effects in this study were recruitment, graduation, and improvement by one. The recruitment effects were the number of participants that started and completed at least one lesson of SNAP-Ed. The graduation effects were the number of participants that completed at least the six required core lessons and the improvement

of one effects were those of participants that improved by at least one point on one of the 19 retrospective assessment questions. Finally, using the collected cost and effects date the cost-effective ratios were calculated.

The total cost of the state to implement the SNAP-Ed program was $2,488,170.07 with labor costs being the most prominent cost. Salaries accounted for 76% of the total implementation cost. The total effects seen by the state were 6,759 participants recruited, 3,704 participants graduating, 3,609 (97%) graduating participants improving by at least one, 3,189 (86%) improved by at least two, and 1,000 (27%) graduating participants improving by four. The state CER value (SCER) for recruitment into the program was $367.84 per participants that joined, $671.24 for those that graduated, $688.91 for an improvement of one, and $2,486.26 for an improvement of four.

When broken down to the district level factors that are affecting the CERs become much easier to identify. Costs of the program may be an obvious key factor; however, graduation rate implies the actual actions of the PAs. By focusing on retaining participants, the CER values across the improvement and outreach categories decreased substantially. Therefore, a heavier emphasis on participant retention would be a more beneficial approach than solely looking at costs. Concluding that only the PA is responsible for the retention rate or high cost values is not necessarily accurate. The reasons for avoiding this conclusion are the different outside influences that could affect both the costs and the retention rate. One such influence was the costs that were seen as outliers and considered in the sensitivity analysis. The sensitivity analysis showed the removal of outlier costs reduced cost by 8% for Capital Cost adjustments while Labor Cost adjustments increased costs up by 20% at the state level. Furthermore, Capital and Labor costs had the largest decrease and increase in CER values over all the adjustments made.

Since no previous CEA analysis has been performed on the adult SNAP-Ed program, no discussion or comparison can be done in relation to other states' programs. Completion of CEA studies on adult SNAP-Ed in other states would promote comparisons and the transfer of strategies to improve adult SNAP-Ed as a whole. A limitation on the study was on the inability to convert effect to monetary values as done in a Cost Benefit Analysis. Without this conversion the effect are left in an abstract unit and lack an easy interpretation and comparison for both political and internal use in SNAP-Ed program. Further studies could be done focusing on the adaptation of nutritional education programs to monetary benefits from participant medical procedures, quality of life, and disease expense avoidance.

Overall results show that District 5 was the most effective in the state but a CEA does not identify the causes of this greater effectiveness. A CEA is a tool for identifying effectiveness, not for identifying reasons and this is a limitation of a CEA. To determine why District 5 is more cost effective requires looking at other factors. For example, a simple point would be the cost of living in the areas. District 5 was in an area with a lower population when compared to a district such as District 2. This is supported by the fact that the number of PAs in District 2 is nearly double the number of PAs in District 5. When population increases or an area is more urban the costs of living may increase along with the costs incurred by the program particularly those of capital, labor and utility costs. While this may not be the case or only explanation for the two districts (2 and 5) it is a potential factor to explain the difference in the CER outcomes

Another outside influence to consider would be the individual relationship that PAs have with their communities and the individuals within the districts. A simple example that could be considered is the classroom size. A smaller classroom size allows more time to be devoted to each participant where stronger relationships can be built. However, a larger class may see a PA

spending less time with every participant resulting in a weaker student-teacher relationship. Relationships are important because retention of participants is a key factor the CEA performed on Virginia's adult SNAP-Ed and relationships between PAs and participants could be a powerful influence. A way that this could be evaluated would a be an econometric analysis, possibly a probit model, that could evaluated demographic characteristics of the PAs, participants taught by the PA, and the type of environment the PA and participant are located (urban, rural, etc.). Other demographic data should also be included which could give useful information to explore the reasons for the effectiveness of District 5. However, one cannot conclude in this study that the reason a district is more or less effective only being contributed by costs or the individual efforts of a PA. Since the approach to the analysis is observational all outside influences are not taken into thus these influences should be approached in further studies.

While the outside influences affecting the CER values of the PAs and districts are important the measurements of the type of effects used to evaluate the effectiveness of adult SNAP-Ed should be further examined. The goal of SNAP-Ed is educate low-income individual to allocating limited budgets to healthier food and lifestyle choices. Therefore, the overall outcome of the program can be considered as the health outcome of the participants. In terms of a CEA a positive health outcome can be considered as the true desired effect. This study only served to evaluate the CER values of the outreach, retention of the program and also the positive or improvement in the change of knowledge for participants. However, a change in knowledge is not equivalent to a CER measuring a final positive health outcome. Also a positive health outcome can be measured in several ways as shown in the aforementioned CBA studies completed on EFNEP. Consequently, many intermediate steps between the health outcome and

the change of knowledge are present. To provide some clarity, Figure 6-4 below aims to provide an example of the some of the different ways adult SNAP-Ed can be measured. The steps in Figure 6-4 are considered at the participant levels. In other words, a change in behavior deemed as a positive change or effect produced would count as a single participant or effect. Counting individual participants as effects is the same as done in this study on Virginia's adult SNAP-Ed. The main goal of Figure 6-4 is to outline the potential building steps for achieving the evaluation of adult SNAP-Ed's intended goal.

Figure 6-4 Steps of Nutrition Education Measure and Alternative CERs
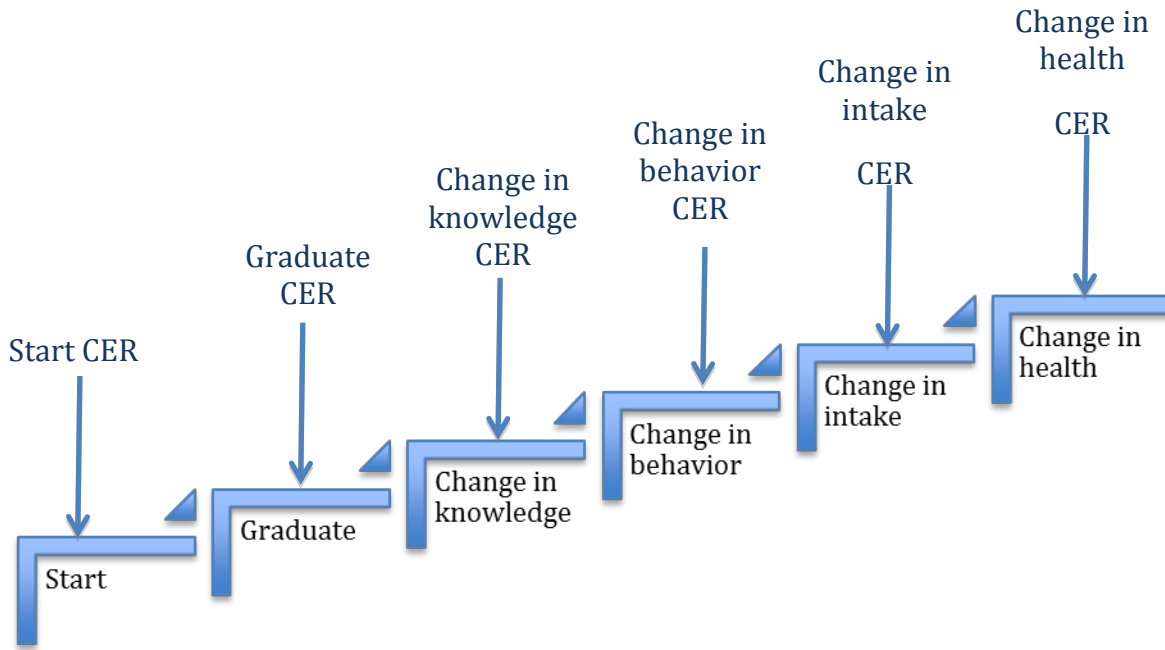
Starting from the left of Figure 6-4 a participant would be in the pre-education actions and state of an adult participant enrolling in SNAP-Ed. In relation to the CEA, this is the position to calculate the starting CER value of a participant. Following the order of the completed analysis of this study the next step would be when a participant completed the entirety of the program, or graduation CER of the program. The next step and final calculated CER of this study (change in knowledge CER) was if the participants improved on the assessment, or a showed a change of knowledge. A participant's reach of this status, or a change in knowledge, is simply the assimilation of new information, which is the extent the collected data for this study can be applied. However, that does not mean that further steps are not infeasible that could put the program closer to evaluating the final health outcome of participants.

Continuing beyond the classroom, the next step a participant could begin was labeled as a change in behavior and can be considered the application of knowledge learned from the adult SNAP-Ed program. A change in behavior could be measure in multiple ways but a few examples could be the ways participants shop such as the amount of fruit and vegetables bought, using a list, more ingredients bought associated meal preparations, etc. This measurement can be taken further to the next step shown of nutritional outcome. Nutritional outcome in Figure 6-4 means the actual measure of food intake and consumption taking place. This could be measured in several different ways such as nutrition log or food expenditures. For this step, a participant's increase in desired nutritional food and beverages could be considered as an effect.

The participants statuses represented in Figure 6-4 are not the only steps that can be considered as many intermediate steps between starting and the final health outcome exist and have the potential to a measure of the programs effectiveness. The determining factor depends on the specific health outcome of interest. However, many difficulties would become apparent when

measuring these intermediate steps especially when considering outside influence to the participants nutritional choices. In other words, assumptions must be made in terms of the programs total influence over participant behavior but it would show a more informative response of the programs effectiveness towards its goals.

Another limitation to this study was the method to measure improvement. To count an effect for improvement the participant simply had to improve on at least one of 19 total questions. Using this method, the result was a 97% improvement rate seen in the state. This may mean that the standard for improvement may be held at a lower bar and that an improvement of such a low threshold (one) is not effectively evaluating the program. To determine if the threshold may be too low would require determining the probability of participants randomly answering the assessments and still improving on at least one question. The CEA completed on Virginia's Youth EFNEP study explored the idea of using a low improvement threshold and found the probability of improving will converge to one even without nutritional education (Baral, Davis, Serrano, et al., 2013). In other words, as the number of questions on the nutrition assessment increases so does the probability of every participant improving on at least one question (Baral, Davis, Serrano, et al., 2013). Their evaluation is further supported by the 97% improvement rate seen in this current study. Therefore, a possible route to improve CER values for Virginia's adult SNAP-Ed is to improve the graduation rate through participant retention. Since the proportion of participants who improved by one to graduated is nearly one, the strategy to decrease CER is to recruit and graduate more participants. Future studies should look more deeply into the effect that graduation has on CER based on the current threshold used for improvement.

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Appendices

Appendix A Program Outline

A.1 SNAP-Ed Entry, Exit and Testing Form

Virginia Cooperative Extension
Virginia Tech • Virginia State University

Program Assistant _____   Unit Name _____

Individual or Group Name _____   Date Enrolled _____   End Date _____

Weight Control Lessons taught? ☐ Yes ☐ No

Eating Smart and Moving More					
Title of Lesson	Check if needed	Date taught	Teaching Methods		Comments
			Indiv	Group	
Intro Lesson: Entry Family Record					
Core Lessons:					
MyPlate					
Shop for Value: Get the Facts					
More Fruits and Vegetables					
Plan: Know What's for Dinner					
Fix It Safe					
Smart-size Your Portions					
Optional Lessons:					
Move More Throughout the Day					
Shop: Get the Best for Less					
Fix it Fast, Eat at Home					
Smart Breakfast Choices					
Making Smart Lunch Choices					
Smart Choices When Eating Out					
Smart Choices - Fast Food					
Making Smart Drink Choices					
Choose, Plan, and Do					
Limit TV					
Lifecycle Lessons:					
Pregnancy					
Breastfeeding					
Infants					
Children					
Exit Family Record					

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Virginia Cooperative Extension

SNAP-Ed Entry

Name: _____

Street: _____

City: _____ Zip: _____

Phone: (_____) _____

Email: _____

Age: _____ Check one: ☐ Female ☐ Male

If female: Are you pregnant? ☐ Yes ☐ No

Are you breastfeeding? ☐ Yes ☐ No

Check the ethnicity you identify with
(All answers are voluntary):

☐ Hispanic/Latino ☐ Non-Hispanic/Non-Latino

Check the race category you identify with
(You may check more than one. All answers are voluntary):

☐ American Indian or Native American

☐ Asian

☐ Black or African American

☐ Hawaiian Islander or Other Pacific Islander

☐ White

Highest grade completed (check one):

☐ Grade 6 or less   ☐ Grade 12

☐ Grade 7   ☐ GED

☐ Grade 8   ☐ Some college

☐ Grade 9   ☐ Graduated 2-year college

☐ Grade 10   ☐ Graduated college

☐ Grade 11   ☐ Post graduate

Programs that you and your family participate in
(check all that apply):

☐ Free or reduced school lunch or breakfast

☐ Head Start

☐ Other (please specify): _____

☐ **SNAP Benefits (Virginia EBT card)**

☐ **TANF (Temporary Assistance for Needy Families)**

☐ **Food Pantries or Commodities**

☐ WIC

☐ **Public Housing**

Monthly Household Income: $_____ /month

Household Members - List the first names and ages of people who live with you:

First Name	Age
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____

FOR FAMILY NUTRITION PROGRAM USE ONLY:

Residence: ☐ Farm ☐ Town < 10,000 or Rural Non-farm

☐ Town or City 10,000-50,000 ☐ Central City > 50,000

☐ Suburb of City > 50,000

Lesson Type: ☐ Individual ☐ Group ☐ Both

Unit Name _____

Entry Date: _____ Group Name _____

Subgroups:

☐ 20+ Pregnant/Breastfeeding ☐ SNAP Recipient

☐ Teen Pregnant/Breastfeeding ☐ Non-English Speaking

☐ Fast Track ☐ Food Bank Recipient

☐ Families with children age 12 and younger OR women age 45 or younger

Program Assistant Name: _____

Participant ID#: _____

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VIRGINIA STATE

Virginia Cooperative Extension

Reporting year Oct. 1 2012 Sept. 30 2013

Family Nutrition Program
Family Record

SNAP-Ed Exit

Name: _____

Street: _____

City: _____ Zip: _____

Phone: (_____) _____

Email: _____

☐ Yes! I would like Family Nutrition Program to contact me by e-mail.

If female: Are you pregnant? ☐ Yes ☐ No

Are you breastfeeding? ☐ Yes ☐ No

Programs that you and your family participate in as a result of a referral from the Family Nutrition Program (check all that apply):

☐ Free or reduced school lunch or breakfast

☐ Head Start

☐ Other (please specify): _____

☐ **SNAP Benefits (Virginia EBT card)**

☐ **TANF (Temporary Assistance for Needy Families)**

☐ **Food Pantries or Commodities**

☐ WIC

Household Members - List the first names and ages of people who live with you since you enrolled in the Family Nutrition Program:

	First Name	Age
1.	_____	_____
2.	_____	_____
3.	_____	_____

FOR FAMILY NUTRITION PROGRAM USE ONLY:

Exit Date _____ # of Lessons: _____ # of Contacts: _____ # of Hours: _____

☐ **Educational Objective Met**   Program Assistant Name: _____

Termination Reason: Group Name: _____

☐ Returned to School ☐ Took Job

☐ Family Concerns ☐ Staff Vacancy ☐ Moved   Participant ID#: _____

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VIRGINIA STATE

Please tell us what you think by completing this survey.

This is a survey about ways you plan and fix foods for yourself and what you think about health issues. For each question, please check one box in the "Before Class" column and one box in the "Now" column. In the "Before Class" column answer the question on what you did prior to your experiences in the Family Nutrition Program. In the "Now" column, answer the same question on what you do now after your experiences in the Family Nutrition Program. Be as honest as you can. There are no right or wrong answers. Your responses are important and will be used to improve future classes. ***Thank you!***

1. How often do you plan meals ahead of time?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

2. How often do you compare prices before you buy food?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

3. How often do you run out of food before the end of the month?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

4. How often do you shop with a grocery list?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

5. This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

6. How often do you thaw foods at room temperature?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

7. When deciding on what to feed your family, how often do you think about healthy food choices?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

8. How often do you prepare food without adding salt?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

9. How often do you use the "Nutrition Facts" on the food label to make food choices?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

10. How often do your children eat something within 2 hours of waking up in the morning?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

049 11. When you eat bread and cereals, how often do you eat whole wheat bread and cereals?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

1047 12. How often do you use low-fat (2%), very low-fat (1%), or non-fat milk?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

044 13. How often do you drink regular soda every day?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

A102 14. How often do you make meals that include a variety of foods from MyPlate?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

002 15. How often do you currently eat 2 or more kinds of fruit every day? (This includes fresh, frozen, canned, and 100% juice).

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

16. How often do you eat low-fat foods instead of high-fat foods?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

FN5132 17. In the past 12 months, how often did you ever eat less than you felt you should because there was not enough money to buy food?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

UT100 18. How often do you walk, take the stairs, run with your kids, and take other opportunities to be physically active?

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

MH003 19. How often do you currently eat 3 or more kinds of vegetables every day? (This includes fresh, frozen, canned, and 100% vegetable juice).

	Before Class	Now
NEVER	☐	☐
SELDOM	☐	☐
SOMETIMES	☐	☐
MOST OF THE TIME	☐	☐
ALMOST ALWAYS	☐	☐

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Appendix B –Supplemental Tables from Sensitivity Analysis

TABLE B-1 LABOR SENSITIVITY ANALYSIS DISTRICT ONE

DCP #	Program Reached		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10404	$510	$510	$521	$561	$641	$1,725
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10808	$290	$537	$537	$597	$1,155	$2,415
10909	$300	$824	$837	$959	$1,953	$3,766
11111	$295	$427	$445	$515	$812	$1,320
11112	$242	$384	$395	$425	$589	$1,053
Total	**$323**	**$569**	**$584**	**$648**	**$1,014**	**$1,862**
Average	**$358**	**$708**	**$721**	**$848**	**$1,863**	**$1,879**
SD	$107	$558	$552	$761	$2,772	$938
Range	$274	$1,669	$1,651	$2,236	$8,162	$2,607

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-1 shows the new total CER and average CER of PAs in District One with the removal of labor cost outliers.

TABLE B-2 LABOR SENSITIVITY ANALYSIS DISTRICT TWO

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20101	$696	$1,267	$1,267	$1,400	$3,883	$7,523
20202	$210	$748	$748	$903	$1,689	$1,870
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20507	$500	$903	$903	$940	$2,135	$4,698
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
20810	$374	$827	$827	$1,048	$1,814	$2,358
20911	$915	$1,567	$1,567	$1,567	$1,567	$1,842
20912	$714	$757	$757	$766	$913	$1,713
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
Total	**$415**	**$830**	**$833**	**$904**	**$1,487**	**$2,582**
Average	**$433**	**$857**	**$859**	**$950**	**$1,952**	**$4,643**
SD	$229	$342	$340	$339	$996	$5,260
Range	$705	$1,154	$1,154	$1,145	$3,099	$17,183

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-2 shows the new total CER and average CER of PAs in District Two with the removal of labor cost outliers.

TABLE B-3 LABOR SENSITIVITY ANALYSIS DISTRICT THREE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
30101	$335	$797	$797	$835	$956	$1,031
30202	$337	$881	$954	$1,091	$1,762	$3,817
30505	$626	$1,327	$1,369	$1,684	$3,457	$8,759
30506	$667	$1,327	$1,354	$1,543	$2,073	$3,085
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
Total	**$496**	**$1,014**	**$1,052**	**$1,190**	**$1,794**	**$3,041**
Average	**$468**	**$1,149**	**$1,228**	**$1,446**	**$2,641**	**$5,146**
SD	$134	$565	$628	$823	$2,374	$5,018
Range	$343	$1,693	$1,781	$2,524	$7,471	$15,197

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-3 shows the new total CER and average CER of PAs in District Three with the removal of labor cost outliers.

TABLE B-4 LABOR SENSITIVITY ANALYSIS DISTRICT FOUR

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
40302	$249	$977	$977	$1,059	$1,694	$4,234
40504	$1,078	$1,459	$1,459	$1,459	$2,480	$12,399
40605	$412	$1,509	$1,547	$1,933	$2,475	$4,759
40806	$240	$327	$334	$351	$517	$874
40807	$344	$477	$482	$482	$737	$1,983
Total	**$339**	**$624**	**$634**	**$668**	**$994**	**$2,075**
Average	**$465**	**$950**	**$960**	**$1,057**	**$1,580**	**$4,850**
SD	$350	$544	$551	$663	$931	$4,511
Range	$838	$1,182	$1,213	$1,582	$1,963	$11,525

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-4 shows the new total CER and average CER of PAs in District Four with the

removal of labor cost outliers.

TABLE B-5 LABOR SENSITIVITY ANALYSIS DISTRICT FIVE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
50202	$156	$197	$203	$203	$276	$442
50303	$311	$415	$415	$415	$415	$2,189
50404	$206	$232	$260	$260	$285	$462
50505	$284	$522	$556	$556	$622	$1,458
Total	**$220**	**$288**	**$305**	**$305**	**$355**	**$711**
Average	**$239**	**$342**	**$359**	**$359**	**$400**	**$1,138**
SD	$71	$154	$159	$159	$161	$846
Range	$155	$325	$353	$353	$346	$1,747
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	0	N/A	N/A	N/A	N/A	N/A
Total	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Average	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Range	**$547**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

Table B-5 shows the new total CER and average CER of PAs in District Five and no district PAs with the removal of labor cost outliers.

TABLE B-6 CAPITAL SENSITIVITY ANALYSIS DISTRICT ONE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
10101	$438	$1,018	$1,018	$1,952	$11,710	$15,614
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10707	$341	$376	$389	$396	$792	$5,545
10808	$290	$537	$537	$597	$1,155	$2,415
11111	$295	$427	$445	$515	$812	$1,320
11112	$242	$384	$395	$425	$589	$1,053
Total	**$332**	**$562**	**$577**	**$655**	**$1,087**	**$2,039**
Average	**$354**	**$715**	**$727**	**$940**	**$2,964**	**$3,837**
SD	$97	$553	$548	$830	$4,203	$4,984
Range	$322	$1,720	$1,707	$2,355	$11,121	$14,561

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-6 shows the new total CER and average CER of PAs in District One with the removal of capital cost outliers.

TABLE B-7 CAPITAL SENSITIVITY ANALYSIS DISTRICT TWO

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20101	$696	$1,267	$1,267	$1,400	$3,883	$7,523
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20506	$337	$520	$520	$700	$1,819	$3,638
20507	$500	$903	$903	$940	$2,135	$4,698
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
21114	$388	$1,203	$1,279	$1,582	$2,313	$3,165
Total	**$354**	**$772**	**$779**	**$871**	**$1,820**	**$3,902**
Average	**$371**	**$810**	**$820**	**$940**	**$2,158**	**$5,474**
SD	$143	$292	$302	$368	$1,037	$5,004
Range	$467	$854	$866	$1,160	$3,099	$17,154

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-7 shows the new total CER and average CER of PAs in District Two with the removal of capital cost outliers.

TABLE B-8 CAPITAL SENSITIVITY ANALYSIS DISTRICT THREE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
30101	$335	$797	$797	$835	$956	$1,031
30303	$829	$1,722	$1,722	$1,722	$3,198	$7,461
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
31211	$203	$418	$435	$528	$986	$1,633
Total	**$352**	**$707**	**$736**	**$828**	**$1,285**	**$2,122**
Average	**$449**	**$1,114**	**$1,186**	**$1,357**	**$2,574**	**$4,943**
SD	$201	$702	$765	$950	$2,605	$5,394
Range	$626	$1,693	$1,781	$2,524	$7,471	$15,197

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-8 shows the new total CER and average CER of PAs in District Three with the removal of capital cost outliers.

TABLE B-9 CAPITAL SENSITIVITY ANALYSIS DISTRICT FOUR

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
40302	$249	$977	$977	$1,059	$1,694	$4,234
40403	$279	$436	$456	$546	$989	$1,899
40504	$1,078	$1,459	$1,459	$1,459	$2,480	$12,399
40605	$412	$1,509	$1,547	$1,933	$2,475	$4,759
40806	$240	$327	$334	$351	$517	$874
Total	**$322**	**$611**	**$627**	**$699**	**$1,087**	**$2,056**
Average	**$452**	**$941**	**$955**	**$1,069**	**$1,631**	**$4,833**
SD	**$357**	**$553**	**$557**	**$650**	**$879**	**$4,525**
Range	**$838**	**$1,182**	**$1,213**	**$1,582**	**$1,963**	**$11,525**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-9 shows the new total CER and average CER of PAs in District Four with the removal of capital cost outliers.

TABLE B-10 CAPITAL SENSITIVITY ANALYSIS DISTRICT FIVE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
50101	$331	$392	$403	$621	$2,128	$4,063
50303	$311	$415	$415	$415	$2,189	$24,083
50404	$206	$232	$260	$285	$462	$2,202
50505	$284	$522	$556	$622	$1,458	$5,286
Total	**$273**	**$356**	**$377**	**$434**	**$1,055**	**$4,319**
Average	**$283**	**$390**	**$409**	**$486**	**$1,560**	**$8,908**
SD	**$55**	**$120**	**$121**	**$165**	**$803**	**$10,195**
Range	**$125**	**$290**	**$296**	**$337**	**$1,727**	**$21,881**
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	$0	N/A	N/A	N/A	N/A	N/A
Total	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Average	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Range	**$547**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.
[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

Table B-10 shows the new total CER and average CER of PAs in District Five and no district PAs with the removal of capital cost outliers.

TABLE B-11 MATERIALS SENSITIVITY ANALYSIS DISTRICT ONE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
10101	$438	$1,018	$1,018	$1,952	$11,710	$15,614
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10707	$341	$376	$389	$396	$792	$5,545
10808	$290	$537	$537	$597	$1,155	$2,415
10909	$300	$824	$837	$959	$1,953	$3,766
11111	$295	$427	$445	$515	$812	$1,320
Total	**$342**	**$626**	**$641**	**$736**	**$1,303**	**$2,482**
Average	**$361**	**$764**	**$776**	**$999**	**$3,115**	**$4,176**
SD	**$90**	**$540**	**$534**	**$807**	**$4,130**	**$4,858**
Range	**$274**	**$1,720**	**$1,707**	**$2,355**	**$10,990**	**$14,455**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-11 shows the new total CER and average CER of PAs in District One with the removal of material cost outliers.

TABLE B-12 MATERIALS SENSITIVITY ANALYSIS DISTRICT TWO

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20101	$696	$1,267	$1,267	$1,400	$3,883	$7,523
20202	$210	$748	$748	$903	$1,689	$1,870
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20506	$337	$520	$520	$700	$1,819	$3,638
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
20810	$374	$827	$827	$1,048	$1,814	$2,358
20911	$915	$1,567	$1,567	$1,567	$1,567	$1,842
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
21114	$388	$1,203	$1,279	$1,582	$2,313	$3,165
Total	**$377**	**$854**	**$860**	**$966**	**$1,746**	**$2,893**
Average	**$393**	**$862**	**$870**	**$998**	**$2,043**	**$4,676**
SD	**$210**	**$344**	**$350**	**$379**	**$963**	**$4,796**
Range	**$705**	**$1,154**	**$1,154**	**$1,160**	**$3,099**	**$17,183**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-12 shows the new total CER and average CER of PAs in District Two with the removal of material cost outliers.

TABLE B-13 MATERIALS SENSITIVITY ANALYSIS DISTRICT THREE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
30101	$335	$797	$797	$835	$956	$1,031
30303	$829	$1,722	$1,722	$1,722	$3,198	$7,461
30505	$626	$1,327	$1,369	$1,684	$3,457	$8,759
30506	$667	$1,327	$1,354	$1,543	$2,073	$3,085
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
Total	**$517**	**$1,040**	**$1,076**	**$1,212**	**$1,832**	**$3,095**
Average	**$529**	**$1,254**	**$1,324**	**$1,525**	**$2,820**	**$5,601**
SD	**$186**	**$601**	**$618**	**$622**	**$1,057**	**$2,862**
Range	**$505**	**$1,693**	**$1,781**	**$1,750**	**$2,814**	**$7,728**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-13 shows the new total CER and average CER of PAs in District Three with the removal of material cost outliers.

TABLE B-14 MATERIALS SENSITIVITY ANALYSIS DISTRICT FOUR

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
40101	$147	N/A	N/A	N/A	N/A	N/A
40302	$249	$977	$977	$1,059	$1,694	$4,234
40403	$279	$436	$456	$546	$989	$1,899
40605	$412	$1,509	$1,547	$1,933	$2,475	$4,759
40807	$344	$477	$482	$482	$737	$1,983
Total	**$309**	**$686**	**$703**	**$779**	**$1,233**	**$2,783**
Average	**$286**	**$850**	**$866**	**$1,005**	**$1,473**	**$3,219**
SD	**$100**	**$504**	**$514**	**$670**	**$781**	**$1,491**
Range	**$265**	**$1,073**	**$1,091**	**$1,451**	**$1,738**	**$2,860**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-14 shows the new total CER and average CER of PAs in District Four with the removal of material cost outliers.

TABLE B-15 MATERIALS SENSITIVITY ANALYSIS DISTRICT FIVE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
50101	$331	$392	$403	$621	$2,128	$4,063
50303	$311	$415	$415	$415	$2,189	$24,083
50404	$206	$232	$260	$285	$462	$2,202
50606	$431	$682	$689	$751	$1,079	$1,238
Total	**$307**	**$391**	**$410**	**$469**	**$1,005**	**$2,341**
Average	**$320**	**$431**	**$442**	**$518**	**$1,465**	**$7,897**
SD	**$92**	**$187**	**$179**	**$208**	**$840**	**$10,855**
Range	**$225**	**$450**	**$429**	**$466**	**$1,727**	**$22,845**
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	0	N/A	N/A	N/A	N/A	N/A
Total	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Average	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	N/A	N/A	N/A	N/A	N/A
Range	**$547**	N/A	N/A	N/A	N/A	N/A

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

Table B-15 shows the new total CER and average CER of PAs in District Five and no district PAs with the removal of material cost outliers.

TABLE B-16 UTILITY SENSITIVITY ANALYSIS DISTRICT ONE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
10101	$438	$1,018	$1,018	$1,952	$11,710	$15,614
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10404	$510	$510	$521	$561	$641	$1,725
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10707	$341	$376	$389	$396	$792	$5,545
10909	$300	$824	$837	$959	$1,953	$3,766
11112	$242	$384	$395	$425	$589	$1,053
Total	**$347**	**$618**	**$634**	**$717**	**$1,152**	**$2,273**
Average	**$379**	**$756**	**$769**	**$985**	**$3,034**	**$4,057**
SD	**$106**	**$545**	**$539**	**$817**	**$4,180**	**$4,923**
Range	**$322**	**$1,720**	**$1,707**	**$2,355**	**$11,121**	**$14,561**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-16 shows the new total CER and average CER of PAs in District One with the removal of utility cost outliers.

TABLE B-17 UTILITY SENSITIVITY ANALYSIS DISTRICT TWO

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20506	$337	$520	$520	$700	$1,819	$3,638
20507	$500	$903	$903	$940	$2,135	$4,698
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
20911	$915	$1,567	$1,567	$1,567	$1,567	$1,842
20912	$714	$757	$757	$766	$913	$1,713
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
21114	$388	$1,203	$1,279	$1,582	$2,313	$3,165
Total	**$414**	**$796**	**$802**	**$866**	**$1,352**	**$2,436**
Average	**$422**	**$833**	**$842**	**$939**	**$1,834**	**$4,616**
SD	**$215**	**$336**	**$343**	**$378**	**$863**	**$4,903**
Range	**$686**	**$1,154**	**$1,154**	**$1,160**	**$2,675**	**$17,312**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-17 shows the new total CER and average CER of PAs in District Two with the removal of utility cost outliers.

TABLE B-18 UTILITY SENSITIVITY ANALYSIS DISTRICT THREE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
30101	$335	$797	$797	$835	$956	$1,031
30303	$829	$1,722	$1,722	$1,722	$3,198	$7,461
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
31211	$203	$418	$435	$528	$986	$1,633
Total	**$352**	**$707**	**$736**	**$828**	**$1,285**	**$2,122**
Average	**$449**	**$1,114**	**$1,186**	**$1,357**	**$2,574**	**$4,943**
SD	**$201**	**$702**	**$765**	**$950**	**$2,605**	**$5,394**
Range	**$626**	**$1,693**	**$1,781**	**$2,524**	**$7,471**	**$15,197**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-18 shows the new total CER and average CER of PAs in District Three with the removal of utility cost outliers. The utility and capital sensitivity analysis resulted in the removal of the same PAs leading to the exact same outcome.

TABLE B-19 UTILITY SENSITIVITY ANALYSIS DISTRICT FOUR

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
40101	$147	N/A	N/A	N/A	N/A	N/A
40302	$249	$977	$977	$1,059	$1,694	$4,234
40806	$240	$327	$334	$351	$517	$874
40807	$344	$477	$482	$482	$737	$1,983
Total	**$262**	**$475**	**$482**	**$498**	**$750**	**$1,535**
Average	**$245**	**$594**	**$598**	**$630**	**$982**	**$2,364**
SD	**$81**	**$340**	**$337**	**$377**	**$626**	**$1,712**
Range	**$197**	**$650**	**$643**	**$708**	**$1,177**	**$3,360**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-19 shows the new total CER and average CER of PAs in District Four with the removal of utility cost outliers.

TABLE B-20 UTILITY SENSITIVITY ANALYSIS DISTRICT FIVE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
50202	$156	$197	$203	$276	$442	$1,005
50303	$311	$415	$415	$415	$2,189	$24,083
50505	$284	$522	$556	$622	$1,458	$5,286
50606	$431	$682	$689	$751	$1,079	$1,238
Total	**$267**	**$381**	**$391**	**$459**	**$926**	**$1,835**
Average	**$295**	**$454**	**$373**	**$413**	**$1,034**	**$6,323**
SD	**$113**	**$203**	**$208**	**$212**	**$730**	**$10,964**
Range	**$275**	**$485**	**$486**	**$475**	**$1,747**	**$23,078**
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	0	N/A	N/A	N/A	N/A	N/A
Total	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Average	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Range	**$547**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.
[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

Table B-20 shows the new total CER and average CER of PAs in District Five and no district PAs with the removal of utility cost outliers.

TABLE B-21 TOTAL COST SENSITIVITY ANALYSIS DISTRICT ONE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
10101	$438	$1,018	$1,018	$1,952	$11,710	$15,614
10202	$564	$2,096	$2,096	$2,751	$8,803	N/A
10303	$293	$517	$523	$542	$720	$1,220
10404	$510	$510	$521	$561	$641	$1,725
10505	$369	$468	$497	$566	$869	$1,159
10606	$358	$612	$643	$716	$1,223	$2,370
10909	$300	$824	$837	$959	$1,953	$3,766
11111	$295	$427	$445	$515	$812	$1,320
11112	$242	$384	$395	$425	$589	$1,053
Total Effect	**$341**	**$610**	**$627**	**$720**	**$1,128**	**$2,026**
Average Effect	**$374**	**$762**	**$775**	**$999**	**$3,036**	**$3,529**
SD	**$109**	**$540**	**$534**	**$807**	**$4,179**	**$4,966**
Range	**$322**	**$1,712**	**$1,701**	**$2,326**	**$11,121**	**$14,561**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-21 shows the new total CER and average CER of PAs in District One with the removal of total cost outliers.

TABLE B-22 TOTAL SENSITIVITY ANALYSIS DISTRICT TWO

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
20101	$696	$1,267	$1,267	$1,400	$3,883	$7,523
20202	$210	$748	$748	$903	$1,689	$1,870
20303	$295	$856	$856	$885	$1,222	$3,667
20404	$235	$550	$564	$678	$1,088	$1,871
20505	$229	$413	$413	$422	$784	$2,387
20507	$500	$903	$903	$940	$2,135	$4,698
20608	$309	$795	$795	$832	$1,803	$4,161
20709	$437	$595	$604	$679	$3,459	$19,025
20810	$374	$827	$827	$1,048	$1,814	$2,358
20911	$915	$1,567	$1,567	$1,567	$1,567	$1,842
21013	$286	$1,001	$1,001	$1,279	$3,070	$4,605
21114	$388	$1,203	$1,279	$1,582	$2,313	$3,165
Total	**$382**	**$870**	**$876**	**$974**	**$1,755**	**$2,915**
Average	**$406**	**$894**	**$902**	**$1,018**	**$2,069**	**$4,764**
SD	**$211**	**$327**	**$332**	**$368**	**$961**	**$4,785**
Range	**$705**	**$1,154**	**$1,154**	**$1,160**	**$3,099**	**$17,183**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-22 shows the new total CER and average CER of PAs in District Two with the removal of total cost outliers.

TABLE B-23 TOTAL SENSITIVITY ANALYSIS DISTRICT THREE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
30101	$335	$797	$797	$835	$956	$1,031
30202	$337	$881	$954	$1,091	$1,762	$3,817
30505	$626	$1,327	$1,369	$1,684	$3,457	$8,759
30607	$431	$684	$748	$862	$1,725	$2,833
30808	$499	$2,082	$2,177	$2,177	$2,394	$2,394
30909	$324	$389	$396	$427	$643	$3,019
31010	$523	$1,708	$2,029	$2,951	$8,114	$16,228
31211	$203	$418	$435	$528	$986	$1,633
Total	**$393**	**$809**	**$843**	**$968**	**$1,567**	**$2,734**
Average	**$410**	**$1,036**	**$1,113**	**$1,319**	**$2,505**	**$4,964**
SD	**$136**	**$614**	**$683**	**$882**	**$2,441**	**$5,128**
Range	**$423**	**$1,693**	**$1,781**	**$2,524**	**$7,471**	**$15,197**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-23 shows the new total CER and average CER of PAs in District Three with the removal of total cost outliers.

TABLE B-24 TOTAL SENSITIVITY ANALYSIS DISTRICT FOUR

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	Graduated	1	2	3	4
40302	$249	$977	$977	$1,059	$1,694	$4,234
40403	$279	$436	$456	$546	$989	$1,899
40504	$1,078	$1,459	$1,459	$1,459	$2,480	$12,399
40806	$240	$327	$334	$351	$517	$874
40807	$344	$477	$482	$482	$737	$1,983
Total	**$306**	**$485**	**$496**	**$530**	**$836**	**$1,731**
Average	**$438**	**$735**	**$742**	**$779**	**$1,283**	**$4,278**
SD	**$360**	**$476**	**$470**	**$465**	**$802**	**$4,703**
Range	**$838**	**$1,132**	**$1,125**	**$1,108**	**$1,963**	**$11,525**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

Table B-24 shows the new total CER and average CER of PAs in District Four with the removal of total cost outliers.

TABLE B-25 TOTAL SENSITIVITY ANALYSIS DISTRICT FIVE

DCP #	Number of Participants Reached CER		Change in Knowledge CER[1]			
	Starting	**Graduated**	**1**	**2**	**3**	**4**
50101	$331	$392	$403	$621	$2,128	$4,063
50202	$156	$197	$203	$276	$442	$1,005
50303	$311	$415	$415	$415	$2,189	$24,083
50404	$206	$232	$260	$285	$462	$2,202
Total	**$227**	**$278**	**$292**	**$357**	**$743**	**$2,284**
Average	**$251**	**$309**	**$320**	**$399**	**$1,306**	**$7,838**
SD	**$84**	**$110**	**$105**	**$161**	**$986**	**$10,903**
Range	**$175**	**$218**	**$212**	**$345**	**$1,747**	**$23,078**
No District[2]						
No1	$547	N/A	N/A	N/A	N/A	N/A
No2	0	N/A	N/A	N/A	N/A	N/A
Total	**$609**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Average	**$273**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
SD	**$387**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**
Range	**$547**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

[1] The change in knowledge represents the positive change in pre- and post-test responses. For further description see Chapter 3 Section 4.

[2] PAs listed as No1 and No2 were PAs who were not assigned a district and county, and therefore were not assigned a DCP number. PA No1 was not assigned a DCP due to not completing training and No2 had no graduating participants for SNAP-Ed prior to program completion for fiscal year 2013 before resigning.

Table B-25 shows the new total CER and average CER of PAs in District Five and no district PAs with the removal of total cost outliers.