

The background of the slide features a close-up photograph of a black Casio calculator with a silver display, a black pen, and several US dollar bills and coins scattered around. The calculator is the central focus, with its keypad and display clearly visible. The pen is positioned diagonally to the right of the calculator. The money, including a \$100 bill and several coins, is spread out in the background, creating a financial theme.

***Benefit-Cost Analyses***

***North Carolina Health and Wellness Trust Fund***

Prepared  
by  
***Chenoweth & Associates, Inc.***

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## Table of Contents

<i>Introduction</i>	3
<i>Scope of Services</i>	4
<i>Benefit-Cost Analysis of Selected Programs</i>	8
<b>A. <u>OBESITY</u></b>	
> In4Kids	9
> A+ Fit Schools	14
> Fit Community NC	20
> Breast-feeding	28
<b>B. <u>ORAL HEALTH INITIATIVE</u></b>	33
<b>C. <u>TOBACCO</u></b>	
> Teen Tobacco Use Prevention Initiative	35
> Tobacco-Free Colleges	42
> Smoke Free Bars/Restaurants (HB 2)	45
> Quitline NC	49
<b>D. <u>PRESCRIPTION ASSISTANCE</u></b>	
> CheckMeds	51
> NC Rx	54
> MAP	56
<b>E. COMPOSITE PROGRAMMATIC PROFILE</b>	58
<b>Appendix A</b>	
Benefit-Cost Analysis Framework	60
<b>Appendix B</b>	
Sample Present Value Adjustment	63

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## **Introduction**

Since the inception of the **North Carolina Health & Wellness Trust Fund** (NCHWTF) in 2001, the organization has developed and implemented various programs in several content areas:

1. Tobacco
2. Obesity
3. Health Disparities
4. Mental Health
5. Prescription drug assistance

Program interventions vary in length, ranging in length from 1 year to several years and generally include some level of “process” and/or “impact” evaluation. **Process** evaluation variables include participation, utilization, and client satisfaction measures – while **impact** evaluation variables include knowledge, awareness, attitude, behavior, and other performance indicators. Some of these evaluations are currently underway within several NCHWTF programs.

While process and impact evaluations can reveal how well a particular program may be received by a particular population and whether they have the intended impact, they do not generate the current or potential **financial value** of an intervention. Yet, in today’s economic climate, stakeholders and decision-makers alike, expect programs to be subjected to an objective, independent evaluation that answers the question: “*What [financial value] are we getting for our investment?*”

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*“All social institutions or subsystems, whether medical, education, religious economic, or political, are required to provide **proof of their legitimacy and effectiveness in order to justify society’s continued support**. Both the demand for and the type of acceptable proof will depend largely on the nature of the relationship between the social institution and the public. In general, a balance will be struck between faith and fact, reflecting the degree of man’s respect for authority and tradition within the particular system versus his skepticism and desire for tangible proof of work.”*

Edward Suchman

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Although most NCHWT-funded programs currently have some *process* and/or *impact* evaluation underway, **none of the interventions include a financial cost-to-benefit analysis** to answer the preceding question. Nonetheless, this void doesn't preclude the opportunity to incorporate a financial analysis in specific program settings. A well-planned and strategically implemented **benefit-cost analysis (BCA)** can fill some of this void. **The benefit-cost analysis described in this report does not take into account infrastructure costs as personnel into the calculation; it only assigns the dollars spent directly on a specific program in relation to the benefits generated by the respective program.** Appendix A provides a descriptive overview of BCA.

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## **Scope of Services**

In response to a request for individual financial benefit-cost analyses of NCHWTF programs, Chenoweth & Associates, Inc. (C&A) respectfully conducted the following services.

### **A. Program and Data Assessment**

The first phase of the financial analysis involved face-to-face meetings between C&A analysts and key NCHWTF personnel. These meetings were designed to provide analysts with an accurate assessment of current programs and representative data.

#### **Data Request, Acquisition, and Review**

Upon gathering feedback from each program officer, the evaluation officer, and the executive director, C&A analysts collaborated with and received approval from the executive director to work with the evaluation officer to request specific data needed for the evaluation. Requested data and their respective origination (program) must meet **all** of the following criteria:

- (1) measurable,
- (2) quantifiable,
- (3) of high value to stakeholders, and
- (4) pertinent to an intervention that has been in operation long enough to potentially produce a tangible impact.



In making the preceding data request, analysts were particularly interested in seeking information pertinent to:

- Confirming the legitimacy of the data source(s)
- Data format
- Timeframe of data
- Ready-availability of data
- Confidentiality of individuals' identities (e.g., comply with HIPAA)

Once evaluation data are obtained from their respective sources, the data are reviewed to determine which are appropriate for BCA and other analyses.

## B. Programmatic Selection

Based on an initial review of various NCHWTF programs over the past several years, C&A and the evaluation officer jointly agreed that the following interventions were suitable for independent financial analyses:

**Table 1**

<u>Major Area</u>	<u>Program Evaluated</u>
<b>Obesity</b>	In4 Kids
	A+ Fit Schools
	Fit Community NC
	Breastfeeding Social Marketing Campaign
<b>Tobacco</b>	Teen Smoking Prevention and Cessation Initiative
	Tobacco Free Colleges
	Quitline NC
	Smoke Free Bars/Restaurants (HB 2)*
<b>Prescription Assistance</b>	MAP
	NC Rx
	CheckMeds NC
<b>Oral Health</b>	Oral Health Initiative
	* Since HWTF cannot take primary credit for the passage of this bill, the analysis results are provided solely in this report in the event that HWTF staff may wish to share them with HWTF partners.

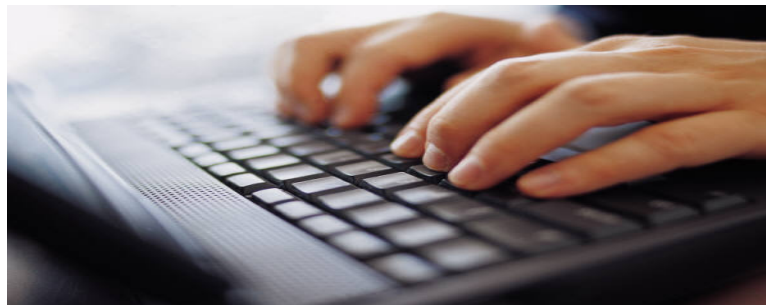


## Evaluation Methodology

Many program evaluations are subjected only to a “basic analysis” in which process and impact variables are confined to a limited timeframe and/or the condensed population. In contrast, C&A strives to supplement the basic analysis with a “**problem-focused analysis**” (PFA) in which a target population’s performance indicators are (1) tracked over a longer period of time [when available data allow] and (2) compared against other groups with a similar socio-demographic make-up (e.g., other Southeastern states). Essentially, a PFA-approach illustrates trends and head-to-head comparisons for decision-makers and stakeholders to determine the current status of a particular program or campaign – as well as identify potential progress [or stagnation] in the foreseeable future.

## Prepare and Format Data for Analysis

Once evaluation methodology and design are established, C&A analysts prepare and format data for analysis. It is assumed that the various data sources manage their respective data in different types of data files (e.g., Excel, Access, etc.). Thus, it is necessary to identify each file format and, where necessary, prepare each of the respective data file formats into a readily-accessible template for data analysis.



## Conduct Data Analysis

Each of the selected programs was subjected to the aforementioned BCA methodology within the specified timeframe. A **benefit-to-cost ratio value** (in dollars) was generated for each of the targets. Subsequently, individual benefit-cost values were summed and converted into a single, average benefit-cost ratio.

In addition to the preceding BCA ratio values, some of the targeted program evaluations were subjected to a **present value adjustment** (PVA). PVA is often used in econometric analyses to determine the approximate financial value of today's benefits and costs in the future. Essentially, PVA provides stakeholders and decision-makers with information to gauge how today's market forces (e.g., general inflation, medical care inflation, employment cost indices, etc.) affect benefit-cost ratio values over a designated period of time. For example, programmatic **cost** items (e.g., personnel, equipment, etc.) tied to a smoking cessation intervention are discounted at a lower rate than programmatic-induced **benefits** (e.g., health care cost savings) since the former can be used *immediately* in an alternative strategy (e.g., deposited in an interest-bearing account) while the latter may not accrue *until* the intervention makes a definitive impact – which may take months or years. PVA is particularly valuable for gauging how long a program that is successfully operational for only a designated timeframe (e.g., 1 year) can sustain a positive benefit-to-cost ratio before benefits depreciate at or below the cost value. A sample PVA framework is illustrated in **Appendix B**.





***Benefit Cost Analysis***  
***of***  
***Selected HWTF Programs\****

***Obesity***  
***Oral Health***  
***Tobacco***  
***Prescription Assistance***

***Please note that the program evaluations included in this report did not factor standard HWTF operational expenses that are naturally incurred (e.g., HWTF staff salaries, facility maintenance, communications, utilities, etc.)***

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***\* Programs regarding **health disparities** and **mental health** were not selected for an initial financial benefit-cost analysis due to having insufficient impact data from which to use. The mental health project was only 6 months old and the Health Disparities Initiative phase 2 had only collected baseline data at the time of this report.***



## ***Focus: OBESITY***

### ***In4 Kids***

#### **The Problem**

In North Carolina, the percent of children who are overweight or obese has significantly increased for all age groups over the past decade as evidenced from recent surveys showing:<sup>1-2</sup>

more than one in three (33.5%) youth aged 10 to 18 years of age with excess weight  
more than one in five (23.8% children aged 5 to 11 years of age with excess weight, and  
one in eight (14.9%) preschool children

Although there is evidence that interventions can prevent or reverse childhood overweight, there has been insufficient research on models that can reach children on a large scale. Further, there has been little work on the feasibility and financial sustainability of practices integrating nutritional counseling into pediatric primary care, an approach warranting attention.

#### **HWTF Solution (program description)**

IN4Kids was a pilot project designed to assess and evaluate the financial efficacy of incorporating a part-time registered dietitian (RD) into primary care pediatric practices. This is carried out by pilot-integrating RDs who provide nutrition counseling in 6-8 primary care practices. The program is implemented through a partnership with the 4 major medical schools in the state - Duke University, ECU's Brody School of Medicine, UNC Medical School, and Wake Forest University Medical Center - and managed by Duke Community and Family Medicine

#### **Outcomes**

Variables measured in the IN4KIDS pilot program sites included how effectively primary care practices incorporate an RD into the practice, changes in practice behavior, health status changes in the children referred to the nutritionist, and the potential financial feasibility of incorporating RDs into primary care practices. Since the scope of this econometric benefit-cost analysis is focused primarily on health status changes in children, with a particular emphasis on

**overweight and obese children**, *body mass index* (BMI) and *waist circumference* served as the primary metrics for the IN4KIDS program evaluation.

Although the prevalence of childhood obesity, as assessed by body mass index (BMI), has tripled over the last three decades, this index is a measure of excess weight rather than excess body fatness.<sup>3</sup> The accuracy of BMI varies according to the degree of body fatness. Among relatively fat children, BMI is a good indicator of excess adiposity, but differences in the BMIs of relatively thin children can be largely due to fat-free mass. Although the accuracy of BMI in identifying children with excess body fatness depends on the chosen cut points, researchers have found that a high BMI-for-age has a moderately high (70%–80%) sensitivity and positive predictive value, along with a high specificity (95%). Children with a high BMI are much more likely to have adverse risk factor levels and to become obese adults than are thinner children. Yet, it should be noted that **skin fold thicknesses** and **waist circumference** are also useful in identifying children with moderately elevated levels of BMI (85th to 94th percentiles) who truly have excess body fatness or adverse risk factor levels.<sup>3</sup> For example, research shows that the 80th percentile for waist circumference correctly identified 89% of girls and 87% of boys with high trunk fat mass (sensitivity) and 94% of girls and 92% of boys with low trunk fat mass (specificity).<sup>4</sup> Moreover, waist circumference performed significantly better as an index of trunk fat mass than did waist-to-hip ratio – thus, demonstrating that waist circumference provides a simple yet effective measure of trunk (abdominal) adiposity in children and adolescents.<sup>4</sup> Although BMI and waist circumference measurements initially served as the primary measurement indicators of excess weight in this project, a review of actual measurement data shows that youngsters completing the 12-month program were far more likely to have designated BMI measurements (98.4%) than waist circumference measurements (85.3%). Thus, *only BMI data* were deemed acceptable for this analysis.

As part of the IN4Kids study, from February 2009 through October 2010, registered dietitians (RD) located at eight primary care practices throughout North Carolina provided medical nutrition therapy (MNT) services to 1,568 overweight or obese pediatric patients aged 2 to 18 years. Of these 1,568 patients, 863 completed more than one visit with the IN4Kids RD with the average number of visits in this group equal to 3 MNT sessions with the RD. To assess the impact of RD services on pediatric overweight and obesity, we selected the patients from the 1,568 who had a follow-up height and weight measurement within the time range of at least 3 months (76 days) to at most 12 months (405 days) from their initial visit with the RD; there were 452 patients who met this criteria. For each patient, we used the latest measurement available from the baseline RD visit (within the above time range) to assess their change in BMI Z-Score during the course of the study. Then, we assessed change in BMI Z-Score among patients by sex at four time periods from baseline: 3 months (76-135 days), 6 months (136-225 days), 9 months (226-315 days), and 12 months (316-405 days). For example, if a patient had height and weight measurements at approximately 3 months and 9 months, we used the measurement at 9 months to assess change and the individual was included in the group of patients assessed at 9 months but not included in the 3 month group.

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Once the mean change in BMI-Z Score by sex for each time period was determined, we identified the change in weight that would result in the mean decrease in BMI Z-Score by sex for an individual of the average age, height and weight observed at baseline in each of the four cohorts.<sup>1</sup> The table below summarizes the mean change in BMI Z-Score by sex that was observed for each of the four time periods and the corresponding change in weight by sex. The findings are described in table 1.

**TABLE 1**

	N	Average Number of RD Visits	Mean Change in BMI Z-Score by Sex		Average Change in Weight Based on Reduction in BMI Z-Score	
			Boys	Girls	Boys	Girls
Patients who received MNT with furthest height and weight measurement at <b>3 months from baseline visit with RD (76-135 days)</b>	161	3.4	-0.098 (p<0.001)	-0.053 (p<0.001)	8.4 pounds	4.1 pounds
Patients who received MNT with furthest height and weight measurement at <b>6 months from baseline visit with RD (136-225 days)</b>	118	4.3	-0.104 (p<0.001)	-0.103 (p<0.001)	8 pounds	7.2 pounds
Patients who received MNT with furthest height and weight measurement at <b>9 months from baseline visit with RD (226-315 days)</b>	70	4.7	-0.102 (p=0.060)	-0.072 (p=0.013)	9.3 pounds	5.5 pounds
Patients who received MNT with furthest height and weight measurement at <b>12 months from baseline visit with RD (316-405 days)</b>	103	5.7	-0.092 (p=0.006)	-0.105 (p=0.003)	10.3 pounds	7.5 pounds
<b>Total</b>	<b>452</b>					

Once average weight-based Z scores were calculated, the following formula was used to compute the difference in each group's baseline weight vs. their final weight, as a percentage of each cohort's desired weight loss:

$$[\text{Baseline weight} - \text{minus} - \text{final weight}] - \text{divided by} - [\text{ideal weight}]$$

<sup>1</sup> The Children's Hospital of Philadelphia online body mass index and Z-Score calculator was used to determine the change in weight; available at: <http://stokes.chop.edu/web/zscore/>

Baseline vs. final weight differences for each of the four cohorts showed the following:

<b>Cohort</b>	<b># Patients</b>	<b>Gross % Difference</b>	<b>Adjusted % Difference</b>
@ 3 months	161	.092	.356
@ 6 months	118	.092	.261
@ 9 months	70	.105	.154
@ 1 year	<u>103</u>	<u>.137</u>	<u>.227</u>
Total	452		.103

Overall, the four cohorts of patients collectively reduced their *excess body weight* values by approximately 10.3%. Since a reduction of excess body weight lowers a person’s overall health risks, it is likely that this group of 452 individuals will reduce their need for health care services to treat obesity-related conditions. For example, obese youngsters in North Carolina presently incur about \$83 more medical care costs per year than non-obese youngsters.<sup>1</sup> Therefore, it is estimated that a 10.3% drop in excess body weight among IN4Kids participants is likely to generate an immediate medical care cost avoidance value, as follows:

$$\begin{array}{r}
 \text{\% drop in excess weight} \qquad \qquad \qquad .103 \text{ (10.3\%)} \\
 \text{\# of participants} \qquad \qquad \qquad \qquad \qquad \times 452 \\
 \text{Per capita annual medical cost of excess weight} \quad \times \underline{\$ 83.00} \\
 \text{Approximate cost-avoidance value} \qquad \qquad \qquad \$ 3,864 \text{ (per year)}
 \end{array}$$

Moreover, if these youngsters are able to maintain their current level of “reduced obesity” status into **adulthood**, they would presumably incur fewer **health care –and- lost productivity** costs (e.g., absenteeism, presenteeism, and short-term disability) at the following estimated value:

$$\begin{array}{r}
 \text{\% drop in excess weight} \qquad \qquad \qquad .103 \text{ (10.3\%)} \\
 \text{\# of participants} \qquad \qquad \qquad \qquad \qquad \times 452 \\
 \text{Per capita annual medical \& lost productivity cost} \quad \times \underline{\$ 3,070^2} \\
 \text{Approximate cost-avoidance value} \qquad \qquad \qquad \$ 142,926 \text{ (per year)}
 \end{array}$$

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<sup>1</sup> Estimated 2010 average annual medical care cost attributed to overweight/obese North Carolina youngsters, based on 2006 cost; derived from *Be Active North Carolina, Inc. Tipping the Scales*, June 2008.

<sup>2</sup> Attributable cost for excess weight among North Carolina adults; derived from *Be Active North Carolina, Inc. Tipping the Scales*, June 2008

## Benefit-Cost Comparison

The total cost of IN4KIDS grants provided by HWTF from July 2008 to December 2010 was \$1,772,436. Based on the preceding benefit and cost values, IN4Kids grants have generated the following benefit-to-cost ratio:

<b>Benefit*</b>	<b>\$ 357,315</b>		<b>\$ .20</b>	
-----	-----	=	-----	= <b>[-80% NET ROI]</b>
<b>Cost*</b>	<b>\$ 1,772,436</b>		<b>\$ 1.00</b>	

\* Values are for a timeframe of 2.5 years.

Overall, IN4Kids programs are expected to generate about **20 cents** in medical care and lost productivity cost avoidance benefits [in the future] for **every \$1** invested in these interventions. This translates into a **negative ROI value of 80 percent**.

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## References

<sup>1</sup> *The 2009 North Carolina Youth Risk Behavior Survey*, U.S. Dept. of Health and Human Services.

<sup>2</sup> The Kaiser Family Foundation, State Health Facts, *North Carolina: Percent of Children (10-17) who are Overweight or Obese, 2007*.

<sup>3</sup> Freedman, D. and Sherry, B. (2009) The Validity of BMI as an Indicator of Body Fatness and Risk Among Children. *Pediatrics* (supplement) 124, 1, S23-S34.

<sup>4</sup> Taylor, R. et al (2000) Evaluation of Waist Circumference, Waist-to-Hip Ratio, and the Conicity Index as Screening Tools for High Trunk Fat Measured by Dual-Energy X-Ray Absorptiometry, in Children Aged 3-19 Years. *American Journal of Clinical Nutrition*, 72, 2, 490—495.

# *A+ Fit Schools*

## **The Problem**

North Carolina has the 11<sup>th</sup> highest rate of childhood obesity in the nation, according to *Trust for America's Health*.<sup>1</sup> Children and many adults spend a large part of their day in schools across North Carolina. Although many schools are trying to provide a healthy environment for their students and staff, many students do not get enough physical activity during the day or enough healthy food to fuel their growing minds and bodies.

The NC Health and Wellness Trust Fund recognizes that schools offer an environment that can enhance the physical activity levels and healthy eating of students across the state. The Trust Fund has offered \$7,500 in grant funding to 10 different schools who are successfully providing a healthy environment for their students and staff. Additionally, these A+ Fit School projects can benefit the surrounding community who can take pride in the fact that their school is going above and beyond to address health, as well as to utilize the resources and amenities that will be funded through these grants.

## **HWTF Solution (program description)**

*A+ Fit Schools* is based on HWTF's *Fit Community* model. School grants and designation programs recognize and reward schools for their dedication to providing healthy environments for all students and staff. Two components of program:

*Designation for individual schools:* this designation was indicative of recognizing a school's achievement in providing a healthy environment for students and staff. Fourteen (14) schools are selected based on how they meet the Self-Assessment Criteria . In addition, an awards package includes a \$1,000 discretionary stipend to an individual school which includes a press/media kit; banner for school building, and plaque for principal's office. Fourteen (14) schools in the state have received the designation of an *A+ Fit School* as of this year.

*Grants to individual schools:* Each grant of \$7,500 is for one year. A partnership with ECU is established to provide technical assistance to enhance the application process. Funding can be used for equipment for nutrition services, staff wellness programs, physical education/physical activity equipment, and a certified physical education teacher to lead after-school activities

## **Participation and Impact**

In the 2009/2010 academic year, nine (9) schools received the A+ Fit School grants. Eight (8) schools monitored physical activity behavior in students participating in the program. The number of school-age children participating in the program with some reportable level of physical activity/exercise data ranged from **20** students engaged in an after-school physical activity program at Jackson Alternative School in Sylva to **775** students at Pinehurst Elementary School in Pinehurst.

The Centers for Disease Control and Prevention (CDC) recommends that school-age youngster engage in at least 60 minutes of physical activity per day.<sup>2</sup> Physical activity is essential for a child’s growth and development, as well as to prevent overweight, diabetes, and other physical inactivity-related disorders and diseases.<sup>2</sup>

A recent statewide report indicates that physical inactivity, excess weight, and pre-diabetic syndrome-related medical costs among North Carolina school age children is more than \$105 million per year in direct medical care costs.<sup>3</sup> This cost profile is illustrated in greater detail in Table 1.

**Table 1**

	<u>Physical Inactivity</u>	<u>Excess Weight</u>	<u>Pre/Diabetic Syndrome</u>
Prevalence rate	54.1%	34%	1%
# of at-risk children	872,909	548,594	15,397
Medical costs	\$41,380,000	\$33,330,000	\$30,430,000
Per capita cost*	\$47.40	\$60.75	\$1,976
Proportionate weight**	.607	.381	.012
Weighted cost*	\$28.77	\$23.14	\$ 23.71
Weighted cost@	\$34.97	\$28.12	\$28.81

\* In 2006 dollars

\*\* Risk factor prevalence rate divided by prevalence sum of all risk factors combined.

@ 2010 dollars (\$91.90)

Based on the weighted risk factor costs listed in table 1, the combined annual medical cost for physical inactivity-related risk factors is \$91.90 (in 2010 dollars). Considering the recommended physical activity level for school-age children is 60 minutes per day, this would equate to 300 minutes in a standard five-day school week. Since the scope of the A+ Fit Schools funding is limited to the time in which youngsters are at school, a standard of 300 minutes is used to compute a *medical cost value per minute of physical activity*. In order to convert all values to a standard nine-month academic term, the following equation is used:

$$[\$91.90] - \text{divided by} - [300 \text{ minutes} \times 36 \text{ weeks}] = .0085 \text{ cents per minute}$$

Table 2 illustrates the number of physically active participants in the A+ Fit Schools program, the increased number of physical activity minutes per week, and the total and average medical cost avoidance value per school.

**Table 2**

School	# of Participants	Increased # Minutes of Physical Activity/Week*
Arapahoe Charter	333	59,940
CT Overton Elem.	434	26,040
East Wilkes H.S.	40	3,600
Forest View Elementary	602	3,010
Graham Barden Elementary	180	2,700
Griffith Elementary	350	38,500
Jackson Alternative	44	4,800
Pinehurst Elementary	<u>775</u>	<u>11,290</u>
Sub-total	2,758	149,880
# of weeks		x 36
Cost Avoidance \$ per minute		<u>x .0085</u>
<b>Total Cost-Avoidance Value</b>		<b>\$45,913</b>
<b>Average per School</b>		<b>\$5,739</b>

\* Estimated: as reported by the Department of Health Education & Promotion at East Carolina University.

Overall, the A+ Fit Schools program generated approximately \$45,913 in medical cost avoidance benefits –or- an average of \$5,739 per school. However, these values do not factor in the likelihood that some A+ Fit School grants provide collateral benefits to the local community. For example, at least four schools listed in table 2 – Forest View, Graham Barden, Griffith Elementary, and Pinehurst Elementary – have established HWTF grant-funded resources that can be used by residents living within close proximity of these institutions. In particular, these resources are:

<u>School</u>	<u>Resource/Facility</u>
Forest View Elementary	Fitness trails with drainage and mile markers
Graham Barden Elementary	Asphalt-paved walking track
Griffith Elementary	New asphalt-covered outside basketball courts
Pinehurst Elementary	Walking trail enhancements around school

In most communities throughout North Carolina, it is common to see people of all ages utilize school-based fitness trails, walking tracks, and basketball courts. Many people use these no-cost resources for exercise and recreational pursuits, instead of financially paying for these opportunities in the marketplace (i.e., fitness club memberships, nature tours, etc.). Although it is difficult to calculate the cost-savings that users incur by using school-based fitness trails, walking tracks, and basketball courts, land-use economists have developed a technique to estimate such benefits.

While physical activity and recreational venues provide much indirect value, they also provide more tangible value through such activities as bicycling, walking, picnicking, bench-sitting, bird watching, and other nature-oriented experiences. Economists call these activities “*direct uses.*” Most direct uses in recreational and physical activity venues are free of charge, but economists can still calculate value by determining the consumer’s “willingness to pay” for the experience in the private marketplace. In other words, if such venues were not available in North Carolina, how much would the resident (or “consumer”) pay for similar experiences in commercial facilities or venues? Thus, rather than income, the direct use value represents the ***amount of money residents save by not having to pay market rates*** to engage in the many physical and recreational activities they enjoy.

The model used to quantify the benefits received by direct users is based on the “Unit Day Value” method as documented in Water Resources Council recreation valuation procedures by the U.S. Army Corps of Engineers.<sup>4</sup> The Unit Day Value model counts venue visits by specific activity, with each activity assigned a dollar value. For example, playing in a playground is worth \$3.50 each time to each user. Running, walking or rollerblading on a park trail is worth \$4.00, as is playing a game of tennis on a city court. Under the theory that the second and third repetitions of a venue encounter in a given period are slightly less valuable than the first use (i.e., the value to a person visiting a recreational value the fifth time in a week is somewhat lower than the first), this model is modified further by building in an estimated sliding scale of diminishing returns for heavy venue users. Thus, for example, recreational value is diminished from \$3.50 for the first time to \$1.93 for the seventh time in a week.

Using population density and physical activity prevalence norms for each of the four targeted elementary schools, a direct use value of A+ Fit School grant-inclusive trails, walking paths, and basketball courts shows an annual cost-savings to participants of nearly \$200,000 (see table 3).

---

**Table 3**

**Estimated Community Participation and Cost-Savings at Selected A+ Fit Schools**

School	# of Residents in Close Proximity	Estimated Annual Encounters	Median Per Encounter Value <sup>^</sup>	Cost-Savings Per Group
Forest View Elem.	1,171	30,406*	\$2.48	\$ 75,408
Graham Barden Elem.	795	22,327**	\$2.48	\$ 22,327
Griffith Elementary	1,101	28,056***	\$2.48	\$ 69,580
Pinehurst Elem.	401	11,237****	\$2.48	\$ 27,867
			Group Total	\$195,182

\* Based on an estimated 1,171 people living within 955 meters<sup>5</sup> of the HWTF-sponsored venue, multiplied by .429 (local physical activity rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to the designated venue.<sup>5-13</sup>)

\*\* Based on an estimated 795 people living within 955 meters<sup>5</sup> of the HWTF-sponsored venue, multiplied by .464 (local physical activity prevalence rate), multiplied by 388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to the designated venue.<sup>5-13</sup>)

\*\*\* Based on an estimated 1,101 people living within 955 meters<sup>5</sup> of the HWTF-sponsored venue, multiplied by .421 (local physical activity rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to the designated venue.<sup>5-13</sup>)

\*\*\*\* Based on an estimated 401 people living within 955 meters<sup>5</sup> of the HWTF-sponsored venue, multiplied by .463 (local physical activity rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to the designated venue.<sup>5-13</sup>)

<sup>^</sup> Median per visit value based on the U.S. Corp of Engineers, Direct Use Value Calculator.<sup>4</sup>

<sup>5</sup> Some research suggests this may be the distance threshold that distinguishes persons who use neighborhood facilities vs. those that do not.

**Benefit vs. Cost**

In the 2009-2010 academic year, the **HWTF** invested \$67,716 for nine A+ Fit School programs highlighted in table 2. In addition, HWTF spent an additional \$90,117 for technical assistance from the Department of Health Education & Promotion at East Carolina University. At least four of the nine schools used their one-year grants to construct new or enhance existing physical activity facilities (i.e., trails, paths, etc.) that can be considered small-scale “capital projects” because of their *sustained presence and usability*. Thus, it is important to keep this “one year cost –to- multiyear usage” perspective when reviewing the following benefit-cost comparison.

The following benefit and cost figures represent *cumulative* values, to date.

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Benefit	\$ 241,095		\$1.52	
-----	-----	=	-----	= <b>+52% ROI</b>
Cost	\$ 157,833		\$1.00	

Overall, it appears that A+ Fit Schools generates a positive ROI value.

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# *Fit Community NC*

## The Problem

In North Carolina, alarmingly high rates of obesity are resulting in an increasing prevalence of chronic diseases such as heart disease, diabetes and several types of cancer. The Centers for Disease Control & Prevention (CDC) estimates that obesity-related expenses add up to more than \$2.1 billion in North Carolina alone, with just over half of that coming at the expense of taxpayers, via Medicare and Medicaid.<sup>1-2</sup> The community in which one lives, works and plays can help or hinder one's own personal health by providing opportunities to make healthy lifestyle choices. The community can offer safe places for people of all abilities to walk, bike, and play safely, as well as include stores that sell fresh fruits and vegetables. Communities across North Carolina can take a leading role to help positively affect the health of its residents.

## HWTF Solution (program description)

*Fit Community NC* is a program that rewards municipal and county efforts to promote physical activity, healthy eating, and tobacco-free programs, policies, environments and lifestyles. Fit Community designations and grants reward NC communities for creating and implementing a sustainable action plan to avoid or remedy preventable chronic health problems in their areas of North Carolina. Fit Community grantees tailor their activities to best fit the needs of their communities. Projects target children, work sites, neighborhoods, schools, minority populations and seniors. Collectively, Fit Community grants have been awarded to 38 communities since 2005.

*Fit Community NC* programs and facilities provide many North Carolinians with enhanced pride, quality of life, and health-related benefits. Although Fit Community NC initiatives were not designed specifically as an economic development tool, there is a growing realization that they provide numerous towns and communities with substantial economic and non-economic value. This value, for the first time ever, has now been defined. Not every aspect of a Fit Community NC can be quantified – for instance, the mental health value of a walk along a nature path has not yet been documented and is not counted here; and there is no agreed-upon methodology for valuing the carbon sequestration value of a wooded habitat – but three major factors are enumerated – *direct use, health benefits, and community cohesion*.

It is important to note that the following benefit value computations pertain only to eighteen (18) communities in which participation and outcome data were readily available at the time of this analysis. Furthermore, no attempt was made to assign a financial value to ***Fit Community NC designations*** due to a lack of any quantification metric. Also, ***tobacco-free components*** were not financially quantified due to a lack of any baseline vs. outline data specific to tobacco-reduction efforts.

## **Human Value**

By far the largest factor is via the human value of directly using Fit Community NC's physical activity and recreational venues instead of having to purchase these items in the marketplace. While physical activity and recreational venues provide much indirect value, they also provide more tangible value through such activities as team sports, bicycling, skateboarding, walking, picnicking, bench-sitting, bird watching, and other nature-oriented experiences. Economists call these activities "*direct uses.*"

Most direct uses in recreational and physical activity venues are free of charge, but economists can still calculate value by determining the consumer's "willingness to pay" for the experience in the private marketplace. In other words, if such venues were not available in North Carolina, how much would the resident (or "consumer") pay for similar experiences in commercial facilities or venues? Thus, rather than income, the direct use value represents the *amount of money residents save by not having to pay market rates to indulge in the many park activities they enjoy.*

The model used to quantify the benefits received by direct users is based on the "Unit Day Value" method as documented in Water Resources Council recreation valuation procedures by the U.S. Army Corps of Engineers.<sup>3</sup> The Unit Day Value model counts venue visits by specific activity, with each activity assigned a dollar value. For example, playing in a playground is worth \$3.50 each time to each user. Running, walking or rollerblading on a park trail is worth \$4.00, as is playing a game of tennis on a city court. For activities for which a fee is charged, like golf or ice skating, only the "extra value" (if any) is assigned; i.e., if a round of golf costs \$20 on a public course and \$80 on a private course, the direct use value of the public course would be \$60. Under the theory that the second and third repetitions of a venue encounter in a given period are slightly less valuable than the first use (i.e., the value to a person visiting a recreational value the fifth time in a week is somewhat lower than the first), this model is modified further by building in an estimated sliding scale of diminishing returns for heavy venue users. Thus, for example, recreational value diminished from \$3.50 for the first time to \$1.93 for the seventh time in a week.

Using reported physical activity participation rates tied to Fit Community NC venues from 2006-2010, a direct use calculation of HWTF-granted projects shows an annual direct use value to participants of \$516,274.

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**Table 1**

**Estimated Weekly Participation in Fit Community NC Sites  
with Operational Physical Activity and Recreational Venues**

<u>Location</u>	<u># Weekly Participants</u>	<u>Est. Weekly Encounters@</u>	<u>Est. Annual Encounters</u>
Ashe County	16	1.91	1,589
City of Graham	70	1.91	6,952
City of Lumberton	50	1.91	4,966
Duplin County	48	1.91	4,767
Town of Faison	130	1.91	12,912
Haywood Co. Health Dept. Heartworks-Children's Medical Home (Pamlico County)	64	1.91	6,356
Sampson County	70	1.91	6,952
Graham Children's Health Services of Toe River	60	1.91	5,959
Healthy Carolinians of Stokes	120	1.91	11,918
Northampton County	15	1.91	1,490
City of Shelby	60	1.91	5,959
Town of Spring Lake	563	1.91	55,917
City of Burlington*	32	1.91	3,178
Town of Edenton	237	1.91	23,539
First Health of Carolinas	45	1.91	4,469
Pitt County**	100	1.91	9,932
Central Park, NC***	340	1.91	33,769
	<u>76</u>		<u>7,548</u>
<b>Total</b>	2,096		208,175

@ Based on the median number of reported physical activity session per week (4 days) – multiplied by – the median percentage of exercisers reporting at least 30 minutes of moderate activity per session (47.8%). Source: North Carolina Behavioral Risk Factor Surveillance Survey, 2009.

[<http://www.epi.state.nc.us/SCHS/brfss/2009/nc/all/modpatim.html>].

\* Based on 1,251 people living within 955 meters of the HWTF-sponsored venue, multiplied by .489 (local physical activity rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to park, trail, etc.<sup>5-13</sup>)

\*\* Based on 2,072 people living within 955 meters of the HWTF-sponsored venue, multiplied by .423 (local physical activity prevalence rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to park, trail, etc.<sup>5-13</sup>)

\*\*\* Based on 400 people living within 955 meters of the HWTF-sponsored venue, multiplied by .497 (local physical activity rate), multiplied by .388 (approximate percentage of people likely to engage in physical activity – recreational encounters due to residing in close proximity to park, trail, etc.<sup>5-13</sup>)

**NOTE:** Some research suggests that the geographic threshold for persons using neighborhood recreational facilities is approximately 955 meters from their residence.<sup>5)</sup>

The result of the Direct Use Calculator for participating North Carolina communities in 2010 is as follows:

<i>Number of total encounters per year</i>	<b>208,175</b>
<i>Average value per encounter</i>	<b><u>\$ 2.48*</u></b>
<i>Total direct use value per year</i>	<b>\$516,274</b>

\* Median per visit value based on the U.S. Corp of Engineers, Direct Use Value Calculator.<sup>3</sup>

Certainly, not all Fit Community NC-based activities might take place if they had to be purchased. On the other hand, North Carolinians truly are getting pleasure and satisfaction from their use of these physical activity and recreational venues. If they had to pay and if they consequently reduced some of this use, they would be materially “poorer” from not doing some of the things they enjoy.

### **Health Benefits**

The second factor is classified as a **health benefit** – savings in medical costs – due to the beneficial aspects of **exercise** in the Fit Community NC venues. Several studies have documented the large economic burden related to physical inactivity.<sup>14-18</sup> Lack of exercise is shown to contribute to obesity and its many effects, and experts call for a more active lifestyle. Research suggests that access to parks, walking trails, and other recreational venues can help people increase their level of physical activity.<sup>5-13</sup> The **physical activity cost calculator** measures the collective economic savings achieved by individuals who engage in a minimum acceptable level of exercise while using such venues.

The calculator was created by identifying the common types of medical problems that are inversely related to physical activity, such as heart disease and diabetes. Using data from a large economic analysis study conducted on North Carolinians, it is estimated that individuals who engage, at a minimum, in *moderate-intensity* physical activity (e.g., brisk walking, jogging, etc.) three or more days per week incur approximately \$770 fewer health care expenses per year than those who don’t.<sup>19</sup>

Realizing that some venue users do not use Fit Community NC facilities for the purposed of engaging in moderate or vigorous levels of exercise, it is important to account for this distinction within the physical activity cost calculation. Thus, using the estimated number of venue users and published physical activity rates, it is estimated that **approximately 1,157 persons** are engaging at or above the minimum level of physical activity, due to the provision of Fit Community NC venues.

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Venue users	2,096
% of users increasing physical activity*	<u>x .552</u> (55.2%) <sup>6</sup>
# of venue users with increased activity	1,157

\* The approximate percentage of venue users likely to increase physical activity since they began using the venue.<sup>6</sup>

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Thus, based on the per capita medical cost savings attributed to physical activity in North Carolina, it is reasonable to assume that Fit Community NC users engaging in higher levels of physical activity generate :

# of venue users with increased activity	1,157
Per capita medical cost difference*	<u>x \$770</u>
Total medical cost-avoidance	\$ 890,890

\* Annual medical cost difference between physically active vs. physically inactive persons.<sup>19</sup>

### **Stimulating Community Cohesion**

The third factor is the *community cohesion benefit* of people banding together to improve and preserve their neighborhood recreational and physical activity venues. This “know-your-neighbor” social capital, while hard to tabulate, helps ward off all kinds of anti-social problems that would otherwise cost towns and cities more in police, fire, prison, counseling and rehabilitation costs.

Numerous studies have shown that the more webs of human relationships a neighborhood has, the stronger, safer and more successful it is. Any institution that promotes relationship-building – whether a religious institution, a club, a political campaign, a co-op, or a school – adds value to a neighborhood and, by extension, to the larger community.

This human web, for which the term “social capital” was coined by Jane Jacobs, is strengthened in some communities by physical activity and recreational venues. From playgrounds to sports fields to park benches to chessboards to swimming pools to ice skating rinks to flower gardens -- these types of venues offer opportunities for people of all ages to communicate, compete, interact, learn and grow. Perhaps more significantly, the acts of improving, renewing or even saving a venue can build extraordinary levels of social capital in a neighborhood that may well be suffering from fear and alienation partially due to the lack of safe public spaces.

While the economic value of social capital cannot be measured directly, it is possible to tally up a crude proxy – the amount of time and money that volunteers donate to their local physical activity and recreational venues. Such as proxy is applicable to Fit Community NC.

For example, *in addition to their contractual technical assistance services* to Fit Community NC, the staff of *Active Living By Design* (ALBD) provided the following services on a pro-bono basis:

- of in-kind contributions of personnel (staff and students), space, local and long distance telephone, and I.T. support
- field-building (presentations, strategic advice/input, white papers, business development)
- advisory/consulting (task forces, committees, etc.)

During the time frame of April 1, 2005 to June 30, 2010, ALBD staff and associates provided **\$130,354 worth of pro-bono services**, as described above. Please note that this figure does not include community cohesion-driven cost-savings generated by other individuals who may have volunteered in other ways (i.e., picking up trash, pulling weeds, raising playgrounds, teaching about the environment, educating public officials, etc).

**Opportunity Grants**

As a result of the Fit Community NC grants, recipients were able to leverage an additional **\$780,715 in health promotion grants** for their respective communities.

Collectively, it is estimated that the financial value generated by Fit Community NC venues for the citizens of North Carolina is more than \$2.3 million, as shown below:

<b>The Value of <i>Fit Community NC</i> Venues</b>	
<b>1 Direct Use Value (cost-savings)</b>	<b>\$ 516,274</b>
<b>2 Medical care cost-savings</b>	<b>\$ 890,890</b>
<b>3 Community Cohesion Value</b>	<b>\$ 130,354</b>
<b>4 Additional grants leveraged</b>	<b><u>\$ 780,715</u></b>
<b>Total</b>	<b>\$2,318,233</b>

### Benefit-Cost Comparison

Since 2005, the HWTF has paid nearly \$1 million in *Fit Community NC* grants to 18 organizations and groups. In addition, HWTF paid ALBD \$440,420 over the **past four years** to provide technical assistance to grant recipients. A breakdown of total payments is as follows:

<u>Time Frame</u>	<u>\$ Grant Paid</u>
2006-2007	\$ 286,116
2007-2008	\$ 321,551
2009-2010	<u>\$ 334,411</u>
sub-total	\$ 942,078
Payments to ALBD	<u>\$ 440,420</u>
<b>Total</b>	<b>\$ 1,382,498</b>

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Based on the preceding benefit and cost values, *Fit Community NC* grants have generated the following benefit-to-cost ratio:

<b>Benefit</b>	<b>\$ 2,318,233</b>		<b>\$ 1.67</b>
-----	-----	=	----- = + <b>67% Net ROI</b>
<b>Cost</b>	<b>\$ 1,382,498</b>		<b>\$ 1.00</b>

Overall, *Fit Community NC* grant-related initiatives were responsible for nearly \$1 million in net financial benefits to participating communities. Thus, *Fit Community NC* generates a *favorable benefit-to-cost* ratio.

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## *Breastfeeding*

In 2009, the **North Carolina Health and Wellness Trust Fund** awarded a two-year grant to the **North Carolina Healthy Start Foundation** to develop a social marketing and media campaign to promote breastfeeding in North Carolina. The long-term goal is to increase the initiation of breastfeeding in eastern North Carolina among women ages 20 to 34. The campaign strives to increase knowledge of the benefits of breastfeeding, promote positive attitudes about breastfeeding, and link people with resources for more information. Much of the impetus of this campaign stems from the overwhelming evidence showing the health-related benefits from breast-feeding to both mother and baby.<sup>1-2</sup> For example, breastfeeding improves the short- and long-term health of women and their infants; and breastfed infants have lower total healthcare costs than infants who are not breastfed. Moreover, breastfeeding decreases the incidence or severity of diarrhea, lower respiratory infections, otitis media, bacterial meningitis, botulism, UTIs, and necrotizing enterocolitis. And, breastfeeding protects against sudden infant death syndrome (SIDS), insulin-dependent diabetes, and allergic diseases. Finally, benefits of breastfeeding for mothers include reductions of hip fractures during menopause, less postpartum bleeding, and reduced risk of ovarian and pre-menopausal breast cancers.<sup>1</sup>

Compared to breastfed infants, formula-fed infants cost the healthcare system more money in their first-year of life due to their increased rate of illness and hospitalization.<sup>3</sup> For example, in the first year of life, never-breastfed infants (compared to breastfed infants) experience 2,033 *excess* office visits, 212 *excess* days of hospitalization, and 609 *excess* prescriptions per 1,000 infants. This additional health care cost the managed care system studied between \$331 and \$475 per never breastfed infant (in 1999 dollars). In addition, hospital, doctor, or clinic visits for upper respiratory tract infections are significantly greater if predominant breastfeeding was stopped before 2 months or partial breastfeeding was stopped before 6 months.<sup>4</sup> Predominant breastfeeding for less than six months is associated with an increased risk for two or more hospital, doctor, or clinic visits and hospital admission for wheezing lower respiratory illness. Breastfeeding for less than 8 months is associated with a significantly increased risk for two or more hospital, doctor, or clinic visits or hospital admissions because of wheezing and lower respiratory illnesses. Another study found infants who were exclusively breastfed for six months experienced less illness from gastrointestinal infection than those who were mixed breastfed for three or four months, and no deficits were demonstrated in growth among infants from either developing or developed countries who were exclusively breastfed for six months or longer.<sup>5</sup>

In support of the breastfeeding awareness campaign, the NC Healthy Start Foundation developed two television commercials based on recommendations from women and men in eastern NC. The commercials feature moms and their significant others from eastern North Carolina who share the reasons why they breastfeed or support breastfeeding. After a total of 3,020 spots were aired in May (Phase I), a second phase of the breastfeeding awareness campaign ran in September in the same Greenville/New Bern television market.

The two spots ran in 50/50 rotation on the following channels. (The number of spots follows in bold):

- WNCT (CBS)—**155**
- WNCT (CW)—**195**
- WITN (NBC)—**133**
- WITN (MyWx)—**63**
- WCTI (ABC)—**87**
- WFXI (Fox)—**116**
- Suddenlink (Cable)—**777**

A total of **1,526** spots aired in the Greenville market beginning September 1, 2010 and ending on October 3, 2010. This concluded the second and final phase of the media buy for the campaign. Documentation sent from WITN showed 74 “click-throughs” in September from this web banner to the Foundation’s website: [www.nchealthystart.org](http://www.nchealthystart.org). Based on the 74 click-throughs reported from WITN, it is estimated that each spot generated .55 click-throughs among all of the media outlets –or- 55 click-throughs per 100 spots. At this presumed rate, the 1,526 spots would generate approximately 839 click-throughs. However, it is unknown how many individuals are responsible for this number of presumed click-throughs, as it is possible that one person may have been responsible for two or more click-throughs. Nonetheless, the Foundation’s breastfeeding awareness and promotion campaign has generated good interest among women throughout eastern North Carolina. For example, in a survey of 300 women who were asked if they had seen or heard any media messages promoting breastfeeding in the past 30 days, 114 (38%) indicated they did so. Yet, 6-month and 1-year breastfeeding behaviors have not been conducted on this cohort of women. Thus, it is unknown what percentage, if any, of this group have increased [or will increase] their breastfeeding tendencies due to seeing such media messages.

In order to gauge a realistic level of increased breastfeeding practices among women who have been exposed to a social marketing campaign like the Foundation’s initiative, it is necessary to identify a comparable cohort of women. Arguably, the closest match to the Foundation’s social marketing campaign directed to women with similar baseline breastfeeding practices would be the *National WIC Breastfeeding Promotion Project* in the State of Iowa.<sup>6</sup> It showed that a media marketing campaign similar to the N.C. Healthy Start Foundation campaign generated increased breastfeeding rates:

- in Iowa hospitals from 57.8% to 64.4% within 6 months and up to 65.1% at one year.
- from 20.4% to 29.3% at 6 months and up to 32.2% at one year among mothers who were still breastfeeding

Given the fact that the percentage of women who *have ever breastfed* in Iowa (74.4%) and North Carolina (73.5%) is virtually identical, it is reasonable to assume that eastern North Carolina women exposed to social messaging about the benefits of breastfeeding would be similarly inclined to increase their level of breastfeeding practices to that of Iowa women.

The preceding timeframes of 6 and 12 months are important thresholds to establish in any type of benefit-cost analysis study since research shows that, in order to confer substantial health-related benefits, it is necessary for a mother to breast-feed her baby for at least the first six (6) months after the baby's birth.<sup>3,4,8</sup>

Applying the results from the Iowa social marketing campaign, it is reasonable to expect that the Foundation's breastfeeding promotional campaign will influence more than 500 women in eastern North Carolina to breastfeed (see table 1).

**Table 1**  
**Calculation of Cost-Avoidance Benefits**  
**Among Eastern North Carolina Women**  
**Attributed to Social Marketing Media Breastfeeding Messaging**

Total # of eastern NC women who are presumably pregnant between May-September 2010	14,166 <sup>a</sup>
% of eastern NC women who are presumably pregnant between May-September 2010 and reportedly saw or heard a campaign message on breastfeeding	x .38 <sup>b</sup>
Total # of eastern NC women who are presumably pregnant between May-September 2010 and reportedly saw or heard a campaign message on breastfeeding	5,383
% of NC women reportedly breastfeeding at 6 months	x 35.9% <sup>c</sup>
# of eastern NC women reportedly saw/heard a campaign message that are likely to breastfeed at 6 months	1,932
% increase in breastfeeding among Iowa women in WIC program	x .275 <sup>d</sup>
# of additional eastern NC women who are presumably breastfeeding due to social marketing messaging	531
Annual excess medical care cost per non-breastfed baby	\$656 <sup>e</sup>
Total excess <i>medical care cost-avoidance</i> among eastern NC women who breastfeed due to social marketing messaging	<b>\$ 348,336</b>

<sup>a</sup> 2010 pregnancy data are unavailable. Thus, 2009 pregnancy data were obtained from the North Carolina State Center for Health Statistics. The cumulative number is comprised of pregnancies for the following counties: Beaufort, Bertie, Carteret, Craven, Duplin, Greene, Hyde, Jones, Lenoir, Martin, Onslow, Pamlico, Pitt, Tyrell, and Washington. Adjusted for neonatal and postnatal infant mortality rates.

<sup>b</sup> Post-program survey of 300 women.

<sup>c</sup> Centers of Disease Control and Prevention (CDC) *Provisional geographic-specific breastfeeding rates among children born in 2007*. State of North Carolina.

<sup>d</sup> Median percentage increase in breast-feeding among Iowa women at 6 months after the start of the WIC program.

<sup>e</sup> 2010 adjusted medical care costs based on (1) Ball TM, Wright AL. Health care costs of formula-feeding in the first year of life. *Pediatrics*. 1999;103(4):870-876 and (2) Oddy WH, Sly PD, Klerk NH, et al. Breastfeeding and respiratory morbidity in infancy: a birth cohort study. *Archives of Disease in Childhood*. 2003;88:224-228.

## **Benefit vs. Cost Comparison**

Since the inception of the breastfeeding awareness and promotion campaign, HWTF has invested \$ 200,000 in the social marketing endeavor. Considering the preceding cost-avoidance benefit of \$348,336 and HWTF's investment, the following benefit-cost ratio is representative of the breastfeeding campaign's overall cost and value:

$$\begin{array}{rcccl} \text{Benefit} & \$ 348,336 & & \$ 1.74 & \\ \text{-----} & \text{-----} & = & \text{-----} & = \quad +74\% \text{ Net ROI} \\ \text{Cost} & \$ 200,000 & & \$ 1.00 & \end{array}$$

The preceding benefit-cost ratio shows that for every \$1 invested by HWTF in the social marketing campaign, \$1.74 in medical care cost-avoidance benefits is presumably achieved.

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# ***FOCUS: HEALTH DISPARITIES***

## ***Oral Health Initiative***

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In 2009, the North Carolina Health and Wellness Trust Fund launched an *Oral Health Initiative*, awarding funding to seven grantees across the state to implement interventions addressing the oral health needs of underserved populations in North Carolina. The Oral Health Initiative (OHI) addresses four broad goals:

- 1) Increase the number of low income, high-need individuals who receive preventive and treatment services;
- 2) Increase the number of low income, high need special populations who receive oral health care;
- 3) Increase the number of medical providers who take on responsibility for certain aspects of dental care; and
- 4) Increase the number of dentists who treat low-income, high need special populations.

In response to these four goals, the grantees began implementing their three year projects in July 2009. As a group, they provide dental care to over 25,000 clients in FY 2009/2010. This represents a 37% (n=6,654) increase over their reported baseline numbers, comprising an additional 7,888 dental procedures than in year 1. A total of 124,401 dental procedures were performed by the grantees in Year 1 (Table 1). Diagnostic and preventive procedures were the most common procedures, representing 38% and 35% of the total procedures, respectively.

Grantees were also able to recruit a broad network of dental providers. At the end of year 1, there were 26 full-time equivalent dentists (FTEs) working in the grantee dental clinics (Table 1). This is an increase of 13 dentists compared to the year prior to the start of this initiative. In addition, NFDH recruited 274 dentists to provide dental care for patients who have disabling conditions. Across the sites, there were 10 FTE dental hygienists, which was the same number as reported at baseline. Other dental staff, including dental assistants, increased in year 1 to 57 FTEs compared to 33 FTEs at baseline.

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**Table 1****Dental Procedures Performed by HWTF Oral Health Initiative Grantees in Year 1  
(FY 2009/2010)**

	Blue Ridge	Carolinas Mobile Dentistry	Carolinas Family Health Center	First Health Dental	Madison Co. Health Dept.	New Hanover Community Health Center	NFHD	Totals	Percent of total
Diagnostic	12788	2940	7592	19850	2889	697	274	47030	37.8%
Endodontic	69	5	29	272	57	0	9	441	0.4%
Periodontal	106	257	1019	19	180	0	32	1613	1.3%
Preventive	6786	1166	2990	30609	1417	0	30	42998	34.6%
Prosthodontic	36	1188	186	0	17	0	109	1536	1.2%
Restorative	3751	919	1586	10367	1847	0	120	18590	14.9%
Surgical	3109	246	2168	722	1208	302	279	8034	6.5%
Other	52	334	3637	102	0	0	34	4159	3.3%
Totals	26697	7055	19207	61941	7615	999	887	124401	100.0%

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**OHI Cost vs. Benefit**

The annual monetary cost to fund the OHI in fiscal year 2009/2010 was \$607,121 though the project has a total commitment of \$1.8 million over the course of the 3-year grant period. Overall, this allocation generated an annual *estimated dollar value* (“benefit”) of \$5,108,351 in the provision of dental services to many poor, high-need, and underserved North Carolinians. Simply put, without the OHI funding to the seven grantees, it is very likely that a substantial portion of this unique population would not have received dental services in a timely manner. Consequently, those with existing oral and dental health conditions may eventually incur potentially serious and costly conditions. Yet, since diagnostic (37.8%) and preventive (34.6%) services comprised nearly 3/4<sup>ths</sup> of all dental procedures provided to the target populations, many minor and acute oral health conditions (e.g., cavities, gingivitis, gum disease, etc.) were promptly diagnosed and treated at the time of delivery.

Given the brief timeframe (1 year) of the OHI and the lack of a control or comparison group, it is **difficult to calculate the long-term financial value of the initial diagnostic and preventive services**. It is also necessary to note that a substantial network of providers has been built during year 1 of the project, directly as a result of the funding provided by HWTF. It can only be assumed that the **volume of services will increase tremendously in the remaining two years of the project** which cannot be quantified at this time. Thus, the “benefit” value assigned to the OHI services is limited to a single year in this particular cost-benefit analysis:

EDV [“Benefit”]	\$ 532,604	\$ .87		
OHI Funding [“Cost”]	\$ 607,121	\$ 1.00	=	=
			=	=

**[-13% Net ROI]**

Based on the reported cost and benefit values associated with the OHI, it appears that the initiative did not generate a positive ROI in year 1 of its three-year grant.

# **TOBACCO**

## **Teen Tobacco Use Prevention and Cessation Initiative**

The teen smoking rate has dropped dramatically in recent years, from 27.3% in 2003 to an historic low of 16.7% in 2009, according to the Youth Tobacco Survey.<sup>1</sup>

Evidence shows that comprehensive school-based programs, combined with community and mass-marketing efforts, can effectively prevent or postpone the onset of youth smoking. HWTF has funded a comprehensive statewide program to address youth tobacco prevention and cessation since 2003, including a grassroots and mass media campaign known as *Tobacco-Reality-Unfiltered* (TRU). □ □

Since 2003, HWTF has provided grant funding to over 60 community and school-based organizations across the state reaching all 100 North Carolina counties. All grantees use a comprehensive approach to address four key tobacco control goals as recommended by the CDC: preventing youth initiation, eliminating exposure to secondhand smoke, promoting cessation and eliminating disparities. HWTF also funds grants that work exclusively with priority population youth:

- > DHHS / Alcohol Law Enforcement (ALE) of state law prohibiting the sale of tobacco to minors. HWTF provides a grant to DHHS and the Division of Alcohol Law Enforcement (ALE) to provide education and enforcement of the State's Youth Access to Tobacco Products Law, with emphasis on areas where there is high noncompliance among retailers.

### **Measuring Impact**

Nationwide, teen smoking rates have been dropping significantly over the past decade. The Centers for Disease Control & Prevention (CDC) believes three factors contribute to this nationwide trend:<sup>1</sup>

- School outreach efforts
- Increased tobacco prices
- Mass media anti-smoking campaigns with edgy, hard-hitting messages

The state of North Carolina has also seen dramatic decreases in youth tobacco use rates, a trend that began in 2003 and has continued through 2010. Since HWTF began funding prevention efforts in 2003, middle school smoking has dropped by 51.6% and high school smoking has dropped by 38.8%.<sup>2</sup>

Certainly, teen smoking rates are influenced by various factors including certain economic forces – tobacco price increases, in particular. For example health economists estimate that for every 10% increase in the point-of-sale (retail) price of cigarettes, consumption drops by nearly 4%.<sup>3</sup> In fact, the 2000 report of the U.S. Surgeon General – *Reducing Tobacco Use* – concluded that raising tobacco excise taxes is one of most effective tobacco prevention and control strategies.<sup>4</sup> Specifically, it found that increasing the price of tobacco products would decrease the prevalence of tobacco use, particularly among youth and young adults, and that tobacco excise tax increases would lead to substantial long-term improvements in health.

In order to measure the relative influence of cigarette price increases on teen smoking rates since 2003, it is necessary to explore any possible relationship between these variables (see Table 1).

**Table 1**  
**North Carolina Middle School & High School Smoking Indicators**

<b>Indicator</b>	<b>2003*</b>	<b>2004</b>	<b>2005*</b>	<b>2006</b>	<b>2007*</b>	<b>2008</b>	<b>2009*</b>	<b>2003 - 2009</b>
High School Smoking Rate	27.3%	23.8%	20.3%	19.65%	19%	17.85%	16.7%	-38.83%
High School Population	381,034	394,258	407,940	421,863	430,733	433,609	425,234	+4.28%
# of Smokers @ 2003 rate	104,103	107,562	111,367	114,933	117,590	118,375	116,088	
Actual # of smokers	104,103	93,833	82,811	82,896	81,839	77,399	71,014	
# of smokers averted	N/A	13,729	28,556	32,037	35,751	40,976	45,074	
<b>Ave. \$ per pack</b>	<b>\$3.11</b>	<b>\$3.04</b>	<b>\$3.29</b>	<b>\$3.29</b>	<b>\$3.45</b>	<b>\$3.47</b>	<b>\$4.51</b>	<b>+31.05%</b>
Middle School Smoking Rate	9.3%	7.55%	5.8%	5.15%	4.5%	4.4%	4.3%	-53.77%
Middle School Population	322,832	334,036	332,927	334,981	333,658	331,294	321,371	-0.05%
# of Smokers @ 2003 rate	30,023	31,065	30,962	31,153	31,030	30,810	29,887	
Actual # of mid-school smokers	30,023	25,219	19,309	17,251	15,014	14,577	13,819	
# of smokers averted	N/A	5,846	11,653	13,902	16,016	16,233	16,068	
<b>TOTAL Middle &amp; High School</b>							<b>58,360**</b>	<b>-45.25%</b>

\* Years of actual survey; percentages listed for other years are estimated median values based on prior and succeeding years

\*\*Total number of tobacco-free youngsters based on a population-weighted composite mean using actual high school and middle-school smoking rates and UNC Tobacco Prevention and Evaluation Program calculations.

A 31% increase in the unit cost of tobacco occurred in North Carolina from 2003 - 2009. Based on this increase, the decline in youth smoking seen cannot be attributed only to price escalation, particularly because *little of the increased costs occurred from 2003-2007*, when the *rates of tobacco use declined more than they did from 2007-2009*. In contrast, there was a 45.37% drop in North Carolina middle school and high school-aged smokers from 2003 to 2009, which translates into 58,360 fewer young smokers.

Considering the impact of retail price escalation on a pack of cigarettes during this time, we estimated a decline of 16,018 young smokers according to the following equation:

Cumulative price increase:	31.05% / 10%	=	3.105 cost units
			<u>x 4%</u> drop per unit <sup>2</sup>
% drop in smoking due to price hike			12.42%
% of price hike drop -to- % of total drop			27.44% (12.42%/45.25%)
Average # of young quitters			<u>x 58,360</u>
# young smokers quitting due to price hike			16,018
# remaining young quitters			42,342

The preceding calculation shows that an average of 16,018 North Carolina middle school and high school-aged youngsters quit smoking each year due to ***cigarette price inflation***. Thus, a logical question to ask is: “*What factors are responsible for the remaining number of North Carolina teens who quit smoking?*”

Since 2003, HWTF-sponsored *Teen Smoking Prevention and Cessation Initiative* programs, policies, and media campaigns have comprised the bulk of all statewide smoking prevention interventions targeted to North Carolina teens. For example, the Initiative includes the *Not-On-Tobacco* (NOT) smoking cessation program for North Carolina teens. Published research shows that NOT programming in another state actually generated a significant drop in teen smoking and has the potential to do so in other venues.<sup>5</sup> Considering that *school outreach efforts* and *mass media anti-smoking campaigns* are also part of the *HWTF-sponsored Initiative*, it is reasonable to assume that the *Initiative* has contributed to the steady drop in teen smoking throughout North Carolina. Yet, to what extent?

Attempting to understand the relative weight of HWTF’s Initiative as well as other factors that may be responsible for the decline in teen smoking is difficult. For example, the *expansion of smoke-free policies to 100% of all North Carolina school districts* is also credited for some of the teen smoking decline over the past few years.

The HWTF has played a significant role in the growth of tobacco-free school policies from 2003 until 2008; in fact, during this timeframe, the number of North Carolina school districts that **adopted such policies increased from 38 in 2003 to at least 87 by June 2007**.<sup>6</sup> All 115 North Carolina school districts were mandated to adopt a tobacco-free school policy by August 2008. Thus, the growth in tobacco-free school policies **prior to the mandatory policy** was approximately 63.63% [(87-38) / (115-38)].

Large-scale studies of tobacco-free school policies show they compress teen smoking rates between 8% - 28%.<sup>7-8</sup> Considering the percentage volume increase (63.63%) in tobacco smoke-free policies in North Carolina and published impact prevalence rates (median of 18%) published by external school districts, it is estimated that the attributable smoke-free policy impact on North Carolina middle school and high school age-related smoking rates is approximately 11.45%:

% increase in tobacco-free policies	63.63%
Median % in smoking compression	<u>x .18</u> (18%)
<b>% drop in smoking attributable to policies</b>	<b>11.45%</b>
# of young quitters/abstainers	x <u>42,342</u>
# of quitters/abstainers due to policies	4,848 (2003-2009)
% impact pre- vs. post state policy	x .9426*
Adjusted # of quitters/abstainers	<u>4,570</u> (2003-2008; Initiative-driven)
# of quitters/abstainers remaining	278 (Non-Initiative)

*\* 2003-2008 percentage drop in smoking rate – divided by – 2003 -2009 percentage drop in smoking rate; adjusted by group size and smoking rates (e.g., 91.7% for high schoolers; 97.7% for middle-schoolers)*

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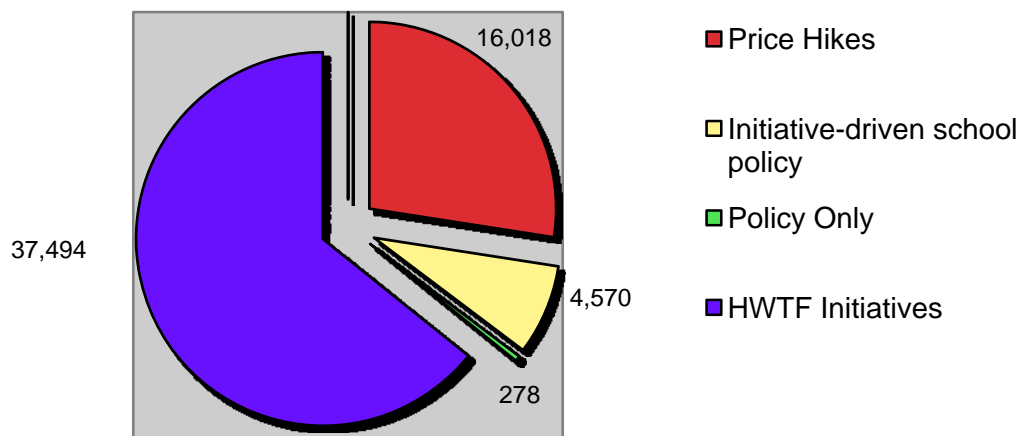
Since HWTF’s Initiative is largely credited for the significant growth of tobacco-free school policies from 2003 to mid-2008, it is likely that 4,570 youngsters quit or avoided smoking due to the Initiative’s impact on such policies.

Overall, the primary factors responsible for the reported smoking rate reductions from 2003 – 2009 are as follows:

- Tobacco price hikes: 16,018 students
- Initiative-driven smoke-free school policies: 4,570 students
- Policy only (independent of Initiative influence): 278 students

Thus, the remaining number of young tobacco quitters/abstainers (37,494) could be attributed to the ***HWTF Teen Smoking Prevention Initiative*** (see Figure 1).

Figure 1. Estimated Number of N.C. Middle School –and- High School-aged Youngsters Quitting or Abstaining from Tobacco by Primary Source of Motivation.



### Calculating Benefits vs. Costs

The per capita excess medical cost of smoking in North Carolina is \$1,805.<sup>9</sup> [Baseline cost of \$1,400 adjusted to year 2010 value]. Based on the previous computations, it is estimated that 42,064 middle school and high school aged youngsters have reportedly abstained or quit tobacco due to the Initiative’s collective impact (e.g., 42,064 = 37,494 + 4,570). Thus, the medical care cost-avoidance “benefit” that would likely among this group, per year, during their adulthood would be as follows:

Per capita medical costs of smoking	\$ 1,805
# of teen tobacco quitters/abstainers tied to the HWTF Initiative	x 42,064
<b>Estimated cost-avoidance “benefit” per adult year</b>	<b>\$ 75,925,520</b>

Since 2003, the HWTF has *spent* \$72,740,033 on the **Initiative** –or- approximately \$9,092,504 per year.

Approximately one-third of the cumulative expenditure in the Initiative was devoted to **media** (\$26,575,750).

Thus, comparing the preceding cost-avoidance benefit vs. the cost of the Initiative – on an annualized basis - reveals the following:

$$\begin{array}{rcl}
 \text{Benefit} & \$ 75,925,520 & \\
 \text{-----} & \text{-----} & \\
 \text{Cost} & \$ 9,092,504 & \\
 \end{array}
 =
 \begin{array}{rcl}
 & \$8.35 & \\
 \text{-----} & & \\
 & \$1.00 & \\
 \end{array}
 =
 \textbf{+735\% Net ROI}$$

Overall, the **Initiative** is likely to generate more than eight times as many financial benefits as its overall cost.

### **Present Value Adjustment**

In addition to the preceding BCA ratio value, *HWTF Initiative* outcome data were subjected to a **present value adjustment** (PVA). Essentially, PVA provides stakeholders and decision-makers with information to gauge how today’s market forces (e.g., general inflation, medical care inflation, employment cost indices, etc.) affect benefit-cost ratio values over a designated period of time. For example, programmatic **cost** items (e.g., personnel, equipment, etc.) tied to a particular program intervention are discounted at a lower rate than programmatic-induced **benefits** (e.g., health care cost savings) since the former can be used *immediately* in an alternative strategy (e.g., deposited in an interest-bearing account) while the latter may not accrue *until* the intervention makes a definitive impact – which may take months or years. PVA is particularly valuable for gauging how long a program that is successfully operational for only a designated timeframe (e.g., 1 year) can **sustain a positive benefit-to-cost ratio** before benefits depreciate at or below the cost value.

Table 2 illustrates PVA values over a 5-year period of time, starting in 2010-2011. Overall, in the event that the *HWTF Initiative* is discontinued, the benefit-cost ratio is projected to drop from 8.35:1 to 6.11:1 over the next five years. This slight decline suggests that past and present benefits generated by the Initiative carry long-term value. In essence, the Initiative demonstrates a **very good benefit-cost** impact.

**Table 2**

	<i>Baseline</i>	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>	<i>Year 5</i>
	<b>2009-2010</b>	<b>2010-2011</b>	<b>2011-2012</b>	<b>2012-2013</b>	<b>2013-2014</b>	<b>2014-2015</b>
<i>Benefit*</i>	\$75,925,520	\$69,900,129	\$64,398,236	\$59,316,813	\$54,583,408	\$50,248,524
<i>Cost**</i>	\$ 9,092,504	\$ 8,911,599	\$ 8,734,394	\$ 8,561,680	\$ 8,395,664	\$ 8,228,510
<i>BC ratio</i>	8.35:1	7.84:1	7.37:1	6.93:1	6.50:1	6.11:1

\* *Benefit dollars are discounted 8.62% per year (Source: Families USA based on Medical Expenditure Panel Survey (MEPS) data from 2000-2009 on North Carolina job-based health insurance premiums).*

\*\* *Cost dollars are discounted 2.03% per year (Source: Families USA based on U.S. Census Bureau’s American Community Survey (ACS) data for North Carolina median workers’ earnings.)*

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# *Tobacco-Free Colleges (TFC)*

## The Issue

Young adults (ages 18-24) comprise the age group with the highest smoking prevalence in North Carolina. While the current smoking rate for all North Carolina adults is 20.3%, the young adult smoking rate is approximately 26%.<sup>1</sup>

In December 2005, NCHWTF awarded more than \$1.6 million in Tobacco-Free Colleges (TFC) grant funding for 20 college-based tobacco use prevention and cessation projects. In January 2008, NCHWTF expanded its college initiative further by awarding \$1.4 million in Phase II grant funding for 48 campuses across the state. Recently, the TFC Initiative has been expanded in this third phase to provide assistance to all NC campuses in adopting and implementing comprehensive, campus-wide tobacco use policies. All grantees work to:

- Prevent initiation of tobacco use among young adults of 18-24 years of age.
- Eliminate exposure to second-hand smoke on college campuses
- Promote tobacco cessation among young adults
- Eliminate tobacco-related health disparities in this age group

Prior to the TFC Initiative, only one small, private college in North Carolina was tobacco-free. By 4 years into the initiative, 40 universities and community colleges, representing **more than 175,700 students annually**, have adopted comprehensive smoke-free or tobacco-free policies to protect students, faculty, staff, and visitors from tobacco exposure.<sup>2</sup>

To date, the level of impact that TFC Initiative-driven policies may have on student smoking rates has not been established. However, published research suggests that such policies in a workplace setting [universities and colleges are relatively large worksites] result in a 3.8% decline in smoking rates.<sup>3</sup> Given the *ongoing* [4 years] and *expanding* nature of the TFC Initiative, it is logical to assume that the preceding rate of decline would be achieved among North Carolina's college-age population.

Therefore, the presumed impact of the TFC initiated policies would be reflected as follows:

Approximate # of college students at TFC sites	175,700 <sup>4</sup>
Approximate percentage of smokers	<u>26.0%</u> <sup>1</sup>
Approximate number of smokers	45,682
Estimated percentage decline in smoking	<u>3.8%</u> <sup>3</sup>
<b>Number of ex-smokers due to TFC Initiatives</b>	<b>1,736</b>

Considering that the smoking rate among young adults in North Carolina is 26% and the smoking rate in adults is 20.3%,<sup>5</sup> it is conceivable that approximately 28 percent  $[(26\% - 20.3\%) / 20.3\%]$  of today's young adult smokers will quit smoking as they enter adulthood. Since it is difficult to determine what, if any, effect that this potential [future] decrease could be attributed to TFC Initiatives, it is appropriate to credit any presumed drop in smoking solely within the scope of published research (e.g., 3.8% decline).

### **Calculating Cost vs. Benefit**

Many cost-benefit analyses conducted on smoking cessation and smoking control policies and programs include outcome metrics such as medical care and lost productivity costs. Yet, these costs are generally tied to working adults, not young adults enrolled in universities and colleges. Thus, it is important to note that any smoking cessation impact from TFC initiatives actually reflects costs that will be *avoided in the future*, when the young adult ex-smoker enters full-time working status. Since "cost avoidance" implies that potential future costs could be averted, it is essential to quantify what those costs would be for a person who *continues* to smoke as they migrate from young adulthood into adulthood. Thus, a smoking-attributable medical care cost value must first be established for a North Carolina adult who smokes.

The per capita excess medical cost of smoking in North Carolina is approximately \$1,805.<sup>6</sup> Applying this cost in the analysis shows the following potential cost-avoidance ("benefit") that would likely accrue from a group of 1,736 young adult ex-smokers:

Annual per capita excess medical costs of smoking	\$ 1,805
Expected # of ex-smoking young adults tied to TFC	x <u>1,736</u>
<b>Estimated cost-avoidance "benefit"</b>	<b>\$3,133,480</b>

Since the inception of TFC grant distribution to North Carolina colleges and universities in December 2005, HWTF has expended more than \$3 million in *Tobacco Free College* interventions –or- about \$666,666 per year over its 4.5 year timeframe. Thus, a comparison of cost-avoidance benefits to TFC cost shows:

Benefit	\$ 3,133,480		\$ 4.70	
-----	-----	=	-----	= <b>370% Net ROI</b>
Cost*	\$ 666,666		\$ 1.00	

Overall, the cumulative [2006-2010] impact from the TFC initiative is projected to generate an annual cost-savings of nearly \$2.5 million. Overall, it appears the TFC intervention has generated a strong return on its investment.

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**NOTE: Results associated with the following intervention/policy are included solely for INFORMATIONAL PURPOSES and should not be attributed to HWTF's tobacco cessation efforts.**

## ***Smoke-Free Bars and Restaurants*** **[House Bill 2]**

House Bill 2, North Carolina's smoke-free bars and restaurants law passed by the General Assembly was signed into law by Governor Bev Perdue in May, 2009. In December 2009, HWTF launched a media campaign to raise public awareness prior to the historic legislation which took effect January 2, 2010.

HWTF funding was also provided to supply local health departments with coasters for local distribution to bars and restaurants to help these businesses remind customers of the date the law took effect as well as to promote the use of *QuitlineNC* to patrons who may be interested in quitting tobacco use.

North Carolina is one of many states that have enacted new or expanded laws for smoke-free bars and restaurants in the past decade.<sup>1</sup> Much of the driving force behind these policies evolves from:

- the Surgeon General's conclusion that no risk-free level of secondhand tobacco smoke (SHS) exists<sup>2</sup> and
- a growing body of evidence showing that SHS exposure directly affects both smokers and non-smokers and increases the risk of illness, premature disease, and death<sup>2-9</sup>

One of the most reliable indicators of a person's exposure to STS is the presence of cotinine. **Cotinine**, which can be measured in serum, urine, or saliva, is a metabolic by-product of nicotine and a biomarker for both active smoking and SHS exposure.<sup>4-9</sup> Thus, a non-smoker exposed to SHS can show a measurable level of cotinine.

Moreover, studies show that levels of airborne particulate matter in restaurants, bars, and other hospitality venues as well as levels of SHS exposure among non-smoking hospitality employees drop significantly and rapidly after implementation of laws that prohibit smoking in indoor workplaces and public places. For example, one year after New York's statewide smoke-free law took effect in workplaces, saliva cotinine levels among nonsmoking workers dropped by 78% as well as 47% for nonsmoking patrons.<sup>4</sup> Other studies conducted primarily in the hospitality industry – bars and restaurants – also show statistically significant reductions of cotinine in workers, respiratory tract symptoms, sensory symptoms, and improvements in respiratory function resulting from such smoke-free policies.<sup>5-7</sup>

## Calculating Smoke-Free Policy Benefits

Various studies indicate economic benefits of clean indoor air laws as measured in medical care cost-savings and, to a lesser extent, lost productivity cost-avoidance.<sup>11-12</sup> Much of the medical care cost savings have focused on major illness/disease categories such as:<sup>8, 11-12</sup>

- Cancer (lung and cervical)
- Respiratory (asthma, colds, chronic obstructive pulmonary disease, etc.)
- Cardiovascular (coronary heart disease)
- Perinatal (low birth weight)
- Postnatal (sudden infant death syndrome)

Among the preceding categories, research shows the *most immediate* health-related impacts from indoor STS exposure among working adults is **respiratory** in nature.<sup>2-7</sup> Two of the nation's more populated states – California and New York – established indoor smoke-free laws in 1998 and 2003, respectively. The laws include smoke-free bars and restaurants and have been evaluated by independent researchers on various cost and benefit variables over the past decade. Thus, they serve as appropriate cohorts upon which to conduct a cost-benefit analysis of North Carolina's smoke-free bar and restaurant law. Table 1 lists comparative smoking rates between the three states and other variables used to calculate the medical cost of STS exposure among hospitality workers in North Carolina.

**Table 1**

<u>Variable</u>	<u>Measurement Period</u>	<u>Value</u>
A.1. Smoking rate (North Carolina vs. New York)	2002 (last year prior to New York state's indoor clean air law)	New York – 22.3% North Carolina – 26.3 %
A.2. Smoking rate (North Carolina vs. California)	1997 (last year prior to California's indoor clean air law)	California – 18.4% North Carolina – 25.8%
B. Urine cotinine level and STS exposure	Within 1 year of Intervention	88% decrease <sup>a</sup>
C. Respiratory symptoms	Within 2 months of Intervention	56.5% decrease <sup>b</sup>
D. Respiratory claims rate	Annually	.047 (4.7%) <sup>c</sup>
E. # of hospitality workers in N.C.	May 2009	346,620 <sup>d</sup>
F. # of hospitality workers in N.C. likely to file a respiratory claim	Annually	16,291 (d x e)
G. Per capita respiratory claim cost	Annually	\$554 <sup>e</sup>
H. Respiratory claim medical cost	Annually	\$9,025,214

<sup>a</sup> Based on New York's 77.8% reduction in average cotinine level and 98.3% reduction in number of work time hours exposed to second hand smoke [Farrelly MC et al. *Tobacco Control*, 2005: 14, 236-241]

<sup>b</sup> Based on a sampling of California's hospitality workers. [Eisner MD et al. *Journal of the American Medical Association*, 1998: 280, 22, 1909-1915.]

<sup>c</sup> Percentage of adults filing a respiratory claim derived from the nationwide *Medical Expenditure Panel Survey*. [Yelin E. et al The national study of medical care expenditures for respiratory conditions. *European Respiratory Journal*, 2002, 19, 3, 414-421.]

<sup>d</sup> *Occupational Employment Statistics, May 2009 State Occupational Employment and Wage Estimates, North Carolina*. Bureau of Labor Statistics.

<sup>e</sup> Based on outpatient medical expenses for three acute ETS exposure-related respiratory conditions (acute bronchitis, asthma, and impaired lung function). Source: Blue Cross Blue Shield of North Carolina.

When the preceding variables are subjected to a benefit-cost computation, it is estimated that eliminating smoking in North Carolina’s restaurants and bars will generate nearly **\$4.7 million** per year in averted **medical care** costs (see table 2).

**Table 2**  
**Estimated Cost vs. Benefit**  
**2010 Dollars**  
**North Carolina Smoke-Free Bars & Restaurants**

<u>Costs</u>	<u>Value</u>
# of North Carolina hospitality workers likely to incur a medical claim tied to SHS in the workplace	16,291
Annual per capita respiratory claim cost	x \$554
Unadjusted annual cost of SHS-based respiratory claims	\$9,025,214
<u>Benefits</u>	
% drop in urine cotinine levels and respiratory symptoms after smoke-free laws enacted	x .7225 <sup>a</sup> (72.25%)
Projected impact on North Carolina smoking rates (pre vs. post)	x 1.009 [9/10ths of 1% drop] <sup>b</sup>
Unadjusted annual cost-savings	\$6,579,403
<u>Discount</u>	
Smoking excess rate among North Carolina workers (17.9% higher than New York –and 40.21% higher than California)	x .71 <sup>c</sup> (+29% excess)
<b>Cost-avoidance</b>	<b>\$4,671,376</b>

<sup>a</sup> Two state (California & New York) composite average.

<sup>b</sup> Two state (California & New York) composite average of 1 year pre vs. 1 year smoking rates after smoke-free laws were enacted; based on an increase of .8% in California and a 1.7% decrease in New York.

<sup>c</sup> Unadjusted annual cost-savings are discounted (devalued) 29% since the smoking rate among North Carolina workers was approximately 29% higher than New York and California workers; thus, expected reductions in urine cotinine levels and respiratory symptoms in North Carolina hospitality workers will presumably be 29% less than actual impacts reported in California and New York.

In closing, HWTF *cannot lobby* the North Carolina Legislature or take primary credit for the passage of House Bill 2. However, it should be mentioned that, numerous HWTF grantees worked to generate local, regional, and statewide support for the passage of this bill. Moreover, upon passage of the Bill, HWTF did contribute \$2,000 for each public health department throughout the state for (1) promotion, (2) distribution of coasters to bars and restaurants, and (3) an awareness campaign. Despite its past and present contribution to the passing and implementation of the Bill, **HWTF is not claiming any financial credit** associated with the purported benefits of HB 2.

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## References

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- <sup>2</sup> U.S. Department of Health and Human Services. *The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General*. Atlanta, GA; Centers for Disease Control and Prevention, 2006.
- <sup>3</sup> Centers for Disease Control and Prevention. *Morbidity and Mortality Weekly (MMWR)*, Indoor air quality in hospitality venues before and after implementation of a clean indoor air law – western New York. 2004:53, 1038-1041.
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- <sup>5</sup> Farrelly MC, Nonnemaker, JM et al. Changes in hospitality workers' exposure to secondhand smoke following the implementation of New York's smoke-free law. *Tobacco Control*, 2005:14, 236-241.
- <sup>6</sup> Eisner MD, Smith AK, and Blanc PD. Bartenders' respiratory health after establishment of smoke-free bars and taverns. *J American Medical Association*, 1998:280, 1909-1914.
- <sup>7</sup> Menzies D, Nair A, et al. Respiratory symptoms, pulmonary function, and markers of inflammation among bar workers before and after a legislative ban on smoking in public places. *J American Medical Association*, 2006:296, 1742-1748.
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- <sup>9</sup> Jensen JA et al. Tobacco smoke exposure in nonsmoking hospitality workers before and after a state smoking ban. *Cancer Epidemiology, Biomarkers & Prevention*, 2010, 19, 4, 1016-1021.
- <sup>10</sup> Siegel M et al. The impact of tobacco use and secondhand smoke on hospitality workers. *Clinics in Occupational and Environmental Medicine*, 2006:5, 1, 31-42.
- <sup>11</sup> Eriksen M and Chaloupka F. The economic impact of clean indoor air laws. *CA: A cancer journal for clinicians*. 2007:57, 6, 367-378.
- <sup>12</sup> New York State Department of Health. *The health and economic impact of New York's clean indoor air act*. Albany, NY: July 2006.

## *QuitlineNC*

Since February 2005, HWTF has funded QuitlineNC services to help individuals quit tobacco use. Telephone quit lines help tobacco users quit their addiction by offering advice, support and referrals to local cessation resources. QuitlineNC services are provided by trained “quit coaches” who provide up to four callbacks to check on progress and provide additional guidance. HWTF funding supports the following:

- > Callers aged 24 years or younger
- > Callers who are identified as school or childcare employees
- > Callers who live with and/or are the primary caregivers of children under the age of 18 and, thus, are role models for children/youth

QuitlineNC is available from 8 a.m. to midnight, seven days a week. In September 2007, HWTF launched the “Call It Quits” campaign, the first multimedia ad campaign to promote QuitlineNC services to young adults (ages 18 to 24). The ads simulate a phone call between a caller and a Quit Coach to help the audience get a “peek behind the curtain” of what it might be like to call QuitlineNC.

### Quit Rates and Satisfaction

A recent analysis by QuitlineNC vendor *Free & Clear, Inc.* showed Quitline NC users had a median age of 44 while those who reportedly **quit tobacco** had a median age of 41.<sup>1</sup> Additional analyses showed an 8.7% intent-to-treat, 30-day quit rate in year 5 among 7-month follow-up survey respondents (including both One-Call and Multi-Call Program participants). The respondent quit rate was 27.2%, comparable to the 25.9% rate observed in year 4. (The respondent rate does not account for the smoking status of survey non-respondents and, thus, overestimates the true quit rate among all QuitlineNC callers). Therefore, the true quit rate for QuitlineNC callers lies between the intent-to-quit estimate and the respondent estimate. Table 1 shows both estimates per year since the inception of QuitlineNC.

**Table 1**

**QuitlineNC Intent-to-Quit and Respondent Quit Rates by Year  
(Number of Individuals)**

<u>Year</u>	<u>HWTF Allocation</u>	<u>Intent-to-Quit Rate</u>	<u>Respondent Quit Rate</u>	<u>Median # Quitters</u>
1 & 2	\$2.03 million	10.8% (708)	23.6% (1,546)	1,127
3	\$3.02 million	11.2% (712)	28.6% (1,819)	1,265
4	\$3.02 million	8.6% (603)	25.9% (1,817)	1,210
5	<u>\$1.2 million</u>	8.7% (724)	27.2% (2,322)	<u>1,523</u>
Total	\$9.27 million			5,125

Table 1 shows that approximately 5,125 individuals presumably quit smoking due to Quitline NC over the past five years -- an average of 1,025 per year.

## Calculating Cost vs. Benefit

Many cost-benefit analyses conducted on smoking cessation and smoking control policies and programs include outcome metrics such as medical care and lost productivity costs. Since these costs are generally tied to working adults and not children or young adults, it is important to note that any smoking cessation impact from QuitlineNC should reflect costs that will be *avoided* in the future. The concept of **cost avoidance** implies that costs tied to the presence of a specific risk factor (i.e., smoking) could be averted if that risk factor is eliminated. Therefore, it is essential to quantify what level of cost difference exists between a person who continues to exhibit the risk factor (smoking) vs. a person who eliminates the risk factor (stops smoking). In order to calculate such a difference, a representative *smoking-attributable cost* value must first be established. Published research shows that the per capita excess medical care and lost productivity cost per smoking adult in North Carolina is \$4,469.<sup>2-3</sup> Applying this cost into the analysis shows the following potential cost-avoidance (“benefit”) that is likely to accrue from a group of 1,025 ex-smokers per year:

Annual per capita medical cost of smoking	\$ 4,469
# of individuals presumably quitting due to Quitline NC	<u>x 1,025</u>
<b>Estimated cost-avoidance “benefit”</b>	<b>\$ 4,580,725</b>

Since the inception of QuitlineNC in 2005, over \$15 million has been invested in the program. HWTF has contributed \$9.27 million of this tab in addition to \$4.65 million for media, with the remainder coming from the CDC, the State Health Plan (SHP), and Blue Cross Blue Shield of North Carolina (BCBSNC). Thus, comparing the preceding annual cost-avoidance benefit to the overall cost of implementing QuitlineNC, the following benefit-to-cost ratio shows:

Benefit	\$ 4,580,725	=	\$ 1.15	=	<b>15% Net ROI</b>
-----	-----		-----		
Cost	\$ 3,959,723		\$ 1.00		

Overall, it appears that QuitlineNC has generated a positive return on investment.

## References

<sup>1</sup> *Free & Clear*. Age data on Quitline NC callers between 6/1/10 and 1/31/11.

<sup>2</sup> Centers for Disease Control and Prevention, *Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC)*, accessed at: <http://apps.nccd.cdc.gov/sammec/>

<sup>3</sup> Fellows, J., Troscclair, A. and Rivera, C. (2002). National Center for Chronic Disease and Prevention and Health Promotion. Annual Smoking Attributable Years of Potential Life Lost, and Economic Costs – United States, 1995-1999. *Morbidity and Mortality Weekly Report, Journal of the American Medical Association*, 287:2335-2356.

# **Focus: PRESCRIPTION ASSISTANCE**

## *Checkmeds NC*

### **The Problem**

Medication Therapy Management (MTM) is a proven method of saving lives and reducing overall health care costs by insuring that medications are appropriately prescribed and used according to accepted standards of care. Nationally, as many as 200,000 deaths and an estimated 16% of all hospital admissions are linked to medication-related problems. The national Medicare Modernization Act included an MTM services requirement of participating Medicare Part D Prescription Drug Plans (PDP). PDP efforts around MTM have been primarily limited to telephone based screening systems for enrollees identified as high risk.

Use of face-to-face, community-based pharmacist encounters has thus far been very limited. As a result, HWTF created and funded a MTM program for North Carolina seniors that is more effective and accessible than the services that were previously available. HWTF has invested \$4 million over three years to place retail and community pharmacists under contract to counsel Medicare enrollees on the most appropriate and cost-effective use of their federal drug benefit. By expanding the availability of counseling services through retail pharmacists, North Carolina has become the first state in the nation to utilize this type of proven, free service for all North Carolina residents age 65 or older who take part in a Medicare Prescription Drug Program.

### **HWTF Solution (program description)**

Launched by HWTF in October 2007, *Checkmeds NC* reimburses retail and community pharmacists for counseling eligible seniors on the most appropriate and cost-effective use of their federal drug benefit. Services include a comprehensive “brown bag review” session between the senior and the specially trained *Checkmeds NC* pharmacist. The medication review may result in advice, patient education, and/or follow-up with the prescribing physician to discuss medication changes that may be helpful to the senior.

### **Impact**

Over 15,000 seniors took advantage of the *Checkmeds NC* program during its first year (2008) with nearly 12,000 seniors participating in 2009. Currently, in its third year (2010) of operation, year-to-date participation is exceeding levels reported in each of the first two years. Estimated cost avoidance (ECA) values reflect savings in health care services that have been avoided as a result of providing prescription assistance; the ECA algorithm measures such variables as drug product savings, reduced emergency room visits, and hospitalizations.

The ECA model used here was developed by **Outcomes Pharmaceutical Health Care™ (OPHC)**, based on an initial cost-of-illness model related to drug-related morbidity and mortality.<sup>2</sup> A recent study of a multi-state MTM program for seniors over seven years showed statistically significant improvements in 6 of 8 *estimated cost avoidance* (ECA) levels and per capita cost-avoidance values that were approximately 18 times higher in year 7 vs. year 1.<sup>1</sup>

In order to determine the financial impact of CheckMeds NC, OPHC integrated program data into the ECA model and calculated values over the past 2.5 years (see table 1).

**Table 1**

***CheckMeds NC Claim Quality Report***

<u>Date Interval</u>	<u># Patients</u>	<u># Claims</u>	<u># Pharmacies</u>	<u>MTM Fee</u>	<u>ECA Total</u>
2008	15,705	28,858	283	\$932,140	\$ 8,672,950
2009	11,968	23,956	248	\$700,880	\$11,531,606
2010 January –July	11,671	23,826	320	\$575,420	\$15,456,066

To date, a cumulative ECA of approximately \$35,660,622 has been generated from the CheckMeds program.

**Benefit-Cost Comparison**

HWTF has invested \$4 million through June 2011 in the CheckMeds NC program. Since the year-to-date results in table 1 reflect participation and ECA values through **July 2010**, participation levels and any attributable ECA values that may accrue from August 2010 through June 2011 are not included in this particular BCA. Therefore, the following benefit-cost analysis is based on existing (conservative) cost-avoidance benefits and does not include probable benefits likely to occur in 2011. Based on the preceding benefit and cost values, the CheckMeds program has generated the following benefit-to-cost ratio:

Benefit	\$35,660,622		\$ 13.55
-----	-----	=	----- = <b>+1,255% Net ROI</b>
Cost	\$ 2,631,945		\$ 1.00

Overall, for every \$1 that HWTF invests in ChecKmeds NC, North Carolina seniors receive more than \$13 worth of prescription advice, counseling, and medication management services from licensed pharmacists.

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### References

<sup>1</sup> Barnett, M. et al (2009). Analysis of Pharmacist-Provided Medication Therapy Management (MTM) Services in Community Pharmacies Over 7 Years. *Journal of Managed Care Pharmacy*, 15, 1, 18-31.

<sup>2</sup> Johnson, J. and Bootman, L. (1995) Drug-Related Morbidity and Mortality: A Cost-of-Illness Model. *Archives of Internal Medicine*, 135, 1949-1956.

# NC Rx

## The Problem

The average senior citizen spends more than \$1,700 per year on prescription drugs. And despite this group's typical reliance on limited and/or fixed incomes, a great deal of that medication is paid out of pocket. Adding to this burden, the number of prescriptions and cost per prescription have increased dramatically in recent years, forcing many seniors to choose between their basic necessities such as food and housing or taking the medications they truly need.

In light of the federal government's failure to provide seniors with prescription drug coverage under the Medicare Program during the 1990's, more than half of the states developed their own programs to respond to this critical issue. Recognizing the acute need for prescription assistance by North Carolina senior citizens, HWTF created *Senior Care* as a bridge to help the state's vulnerable seniors who lacked prescription drug coverage until the day when the Medicare Part D drug benefit would be implemented. Funded over three years, *Senior Care* started providing benefits to NC seniors on November 1, 2002 and ended services on December 31, 2005. HWTF continued its commitment to our seniors even after the launch of the Medicare Part D benefit by creating **NCRx**, a new premium assistance plan to help low-income seniors participate in the Medicare prescription drug program, on January 1, 2007.

## HWTF Solution (program description)

NCRx is the state's prescription drug assistance plan to help low-income seniors participate in the federal Medicare Part D prescription drug program. NCRx is available to low-income seniors who meet the eligibility requirements. The program pays up to \$29 toward monthly premiums for Medicare Prescription Drug Plans that work with NCRx. NCRx enrollees can select a particular prescription drug plan in order to receive the monthly premium assistance. Table 1 lists various drug plans, their respective costs provided with vs. without premium assistance, and total premiums paid in 2009-2010 by HWTF. The median cost values listed in table 1 represent a sample drug formulary that is typically used by NCRx enrollees. Data on three (3) health plans (Aetna, Today's Option, and Torchmark) were not available. HWTF invested \$830,598 in NCRx premiums over the past year that generated annual cost-savings of \$16,081,298 and yielded the following ratio:

Benefit	\$ 16,081,298		\$ 19.36
-----	-----	=	----- = <b>+1,836% Net ROI</b>
Cost	\$ 830,598		\$ 1.00

Overall, for every \$1 that HWTF invests in NCRx, North Carolina seniors save more than \$19 in prescription drugs. Thus, NCRx generates a **positive benefit-to-cost** value.

**Table 1**

<u>Health Plan</u>	<u># of Members</u>	<u>Median Cost with NCRx</u>	<u>Median Cost without NCRx*</u>	<u>Gross Cost Difference</u>	<u>Rx Drug Use** Adjust.</u>	<u>Net Cost Difference</u>	<u>HWTF Premium Paid</u>	<u>Benefit- Cost Ratio</u>
Advantra	295	\$2,133	\$5,818	\$1,087,075	.7	\$760,952	\$49,357	15.41:1
Aetna	102	NA	NA	NA	NA	NA	NA	NA
BC MAPD	139	\$1,764	\$5,818	\$563,506	.7	\$394,484	\$15,729	25.07:1
Blue Medicare	252	\$1,938	\$5,818	\$977,760	.7	\$684,432	\$40,975	16.70:1
Cigna	144	\$1,964	\$5,818	\$554,976	.7	\$388,483	\$15,472	25.10:1
Envision	6	\$2,641	\$5,818	\$19,062	.7	\$ 13,343	\$ 348	38.34:1
First Health	304	\$1,882	\$5,818	\$1,196,544	.7	\$837,580	\$18,932	44.24:1
Humana	1,584	\$2,100	\$5,818	\$5,889,312	.7	\$4,122,518	\$227,406	18.12:1
Penn Life	628	\$2,259	\$5,818	\$3,843,126	.7	\$2,690,188	\$ 86,430	31.12:1
Rx America	46	\$2,108	\$5,818	\$ 170,760	.7	\$ 119,462	\$ 8,655	13.18:1
Secure Horizon	20	\$1,488	\$5,818	\$ 86,600	.7	\$ 60,620	\$ 498	121.72:1
Silver-Script	66	\$2,005	\$5,818	\$251,658	.7	\$176,160	\$ 9,222	19.10:1
Today's Option	72	NA	NA	NA	NA	NA	NA	NA
Torchmark	65	NA	NA	NA	NA	NA	NA	NA
United Healthcare	1,746	\$1,961	\$5,818	\$6,734,322	.7	\$4,714,025	\$268,301	17.56:1
Wellcare	427	\$2,074	\$5,818	\$1,598,688	.7	\$1,119,081	\$60,369	18.53:1
					<b>Total</b>	<b>\$16,081,298</b>	<b>\$830,598</b>	<b>19:36:1</b>

\* Office of Rural Health and Community Care. Drug prices were obtained from Drugstore.com, a nationally recognized pharmacy certified by the National Association of Boards of Pharmacy as a *Verified Internet Pharmacy Practice Site* and reflect mail order pricing for prescription drugs. Retail pricing would be about 10% higher. \*\* N.C. Medicare enrollees over age 65 average 2.8\*\*\* prescriptions per month which is 70% of the sample Rx drug formulary consisting of four (4) prescription medications provided by the Office of Rural Health.

\*\*\* Source: *State Health Facts, 2009, North Carolina*, The Henry J. Kaiser Family Foundation.

# **Medication Assistance Program** **(MAP)**

## **The Problem**

Uninsured North Carolinians, or even those who qualify for Part D Medicare coverage, often find that they cannot afford the medications required to treat their chronic health problems. .

## **HWTF Solution (program description)**

Recognizing that access to prescription drugs was a critical need for all low-income North Carolinians, HWTF added value to *Senior Care* in 2002 by funding community-based organizations to use customized software *Medication Access Review Program* (MARP) to access free drug programs offered by pharmaceutical manufacturing companies. This effort, the ***Medication Assistance Program*** (MAP), has reached large numbers of underserved and uninsured North Carolinians through community and faith-based efforts. The NC Institute of Medicine's 2005 *Healthcare Safety Net Report* called MAP a "significant safety net for the uninsured in North Carolina." MAP has become a critical part of the safety net for the uninsured, especially in recent economic times as the rate of unemployment and the number of uninsured have increased. HWTF has continued to fund the MAP program since 2002 and is currently in its sixth phase of funding that began in December 2009. MAP grants focus on helping those under the age of 65, as well as those Medicare Part D eligibles in the "donut" hole who cannot afford their medications.

## **Benefit-Cost Comparison**

From January 2003 to June 2010, MAP grantee sites have provided \$333,673,523 in free and low-cost medications to uninsured and underserved patients, which has resulted in a **\$15 to \$1** rate of return. Medication dollar amounts are estimated through the financial value of the medications received through the MARP software and reflect the "average wholesale price" (AWP) of the medication as provided by First DataBank. First DataBank is a national vendor that provides a drug database within the MARP operating system. This drug database provides educational information about the drug, the average wholesale price at which wholesalers sell drugs to physicians and pharmacies and other customers. The pricing information is based on information obtained from manufacturers, distributors, and other suppliers of prescription drugs. AWP has become sort of a prescription drug "benchmark" for payers in the health care industry.

During this timeframe, HWTF has invested \$22,017,720 in the MAP program. Thus, a comparison of benefits to costs shows:

Benefit	\$333,673,523		\$15.15	
-----	-----	=	-----	= <b>+1,415% Net ROI</b>
Cost	\$ 22,017,720		\$ 1.00	

Overall, for every \$1 that HWTF invests in MAP, North Carolina seniors receive more than \$15 worth of free/low cost medication. Please note that this analysis has taken into account only the retail cost of the medications cost that were provided free of cost to citizens through this program.

## COMPOSITE PROGRAMMATIC PROFILE

### Benefit-Cost Ratios

Benefit-cost ratios for each of the selected programs evaluated are listed below. Ratios range from a low of **.20 to 1.00** (*IN4 Kids*) to a high of **19.36 to 1.00** (*NC Rx*). A distribution of the respective ratios is highlighted in table 1.

**Table 1**

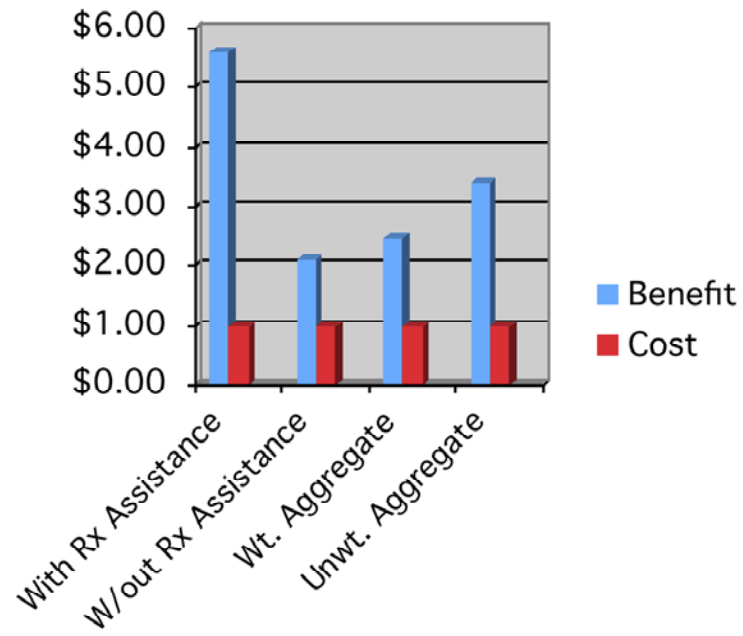
<u>Program</u>	<u>Annual Net Cost-Savings</u>	<u>% of Total</u>	<u>Benefit-Cost Ratio</u>
<b>Obesity</b>			
<b>In4 Kids</b>	[-\$1,415,121]		[.20 to 1.00]
<b>A+ Fit Schools</b>	\$ 83,262		1.52 to 1.00]
<b>Fit Community NC</b>	\$ 935,735		1.67 to 1.00
<b>Breastfeeding</b>	\$ 148,335		1.74 to 1.00
<b>Total and Average ROI</b>	[-247,789]	.007%	<b>1.28 to 1.00</b>
<b>Oral Health Initiative</b>	[- \$74,517]	.0005%	[.87 to 1.00]
<b>Tobacco</b>			
<b>Teen Initiative</b>	\$ 66,833,016		8.35 to 1.00
<b>Tobacco Free Colleges</b>	\$ 2,466,814		4.70 to 1.00
<b>QuitlineNC</b>	\$ 621,002		1.15 to 1.00
<b>Total and Average ROI</b>	<b>\$ 69,920,832</b>	50.51%	<b>4.73 to 1.00</b>
<b>Prescription Assistance</b>			
<b>Checkmeds</b>	\$13,211,470		13.55 to 1.00
<b>NC Rx</b>	\$15,250,700		19.36 to 1.00
<b>MAP</b>	<u>\$38,956,975</u>		<u>15.15 to 1.00</u>
<b>Total and Average ROI</b>	<b>\$67,419,145</b>	48.70%	<b>16.02 to 1.00</b>
<b>All Program Total</b>	<b>\$ 137,017,671</b>		
		<b>Average</b>	
	With Prescription Assistance	5.50 to 1	
	Without Prescript. Assistance	1.71 to 1	
	Aggregate weighted ratio	2.54 to 1	
	Aggregate unweighted ratio	5.29 to 1	

Collectively, when all of the respective ratios are proportionately weighted, the aggregate average benefit-to-cost ratio is 2.54 to 1. Simply put, for **every \$1 that HWTF spent on these programs, approximately \$2.54 was [or will be] generated in financial benefits (see figure 1).**

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**Figure 1**

**Approximate Ratio of Benefit to Cost**



## APPENDIX A

### BCA Framework

The primary purpose of benefit-cost analysis (BCA) is to determine whether a program is worth its cost. In reality, BCA is an econometric tool that factors in the monetary value of everything that can be tangibly measured and quantified. By and large, the monetary value of a project rests on two fundamental postulates:

Postulate 1: The social value of an intervention is the sum of the value of the project [e.g., NCHWTF] to the individual members of society (e.g., North Carolina citizens)

Postulate 2: The value of an intervention to an individual is equal to his (fully informed) willingness to pay for the intervention.

Making value judgments about the desirability of economic states is the thrust of welfare economics and the choice of a decision criterion is critical. A guiding rule in formulating criteria, at least in Western society, is that each individual's preferences must (somehow) count in the evaluation of alternative economic states. While there are four popular decision criteria (Unanimity, Pareto Superiority, Majority Rule, Potential Pareto Superiority), the criterion used in benefit-cost analysis is the *Potential Pareto Superiority* criterion. It states that an increase in general welfare occurs if those that are made better off and still from some change could, in principle, fully compensate those that are made worse off and still achieve in welfare improvement. While this criterion provides the basis for the quantitative part of BCA, it poses problems in that *potential* compensation may not be *actual* compensation.

Operationally, BCA compares intervention costs and any benefits as a ratio:

$$\text{B/C Ratio} = \frac{\text{Benefit}}{\text{Cost}}$$

Obviously, BCA is most appropriate when both benefits and costs can be **tangibly measured in monetary terms**. Nevertheless, some researchers keenly warn that quantification shouldn't be the sole basis for performing a benefit-cost analysis. They contend that just because some important factors are not easily measured, they should not be ignored or given a lesser value than factors that can be measured. For example, how can the human pain and suffering by people with severe back pain or chronic depression be accurately quantified? In essence, BCA doesn't portend to introduce rigor and quantification when data originate on subjectivity, imprecision, or where quantification is not feasible. However, when costs and benefits *can* be quantified, a BCA can be used to judge the worth of a single intervention or provide comparisons on two or more interventions.

Overall, benefit-cost analysis provides meaningful data to the extent that any benefits can be accurately measured. Yet such noble benefits as human lives saved, preventing heart attacks, or easing chronic back pain are not easily translated into precise numbers. Interestingly, a human life was valued to be worth a mere \$5,000 nearly a Century ago. Moreover, should a monetary value even be placed on a human life? Although it is possible to calculate the direct costs of treating a heart attack victim or to discount a person’s future job earnings lost from a disability, try to imagine the technical and ethical implications of using a benefit-cost analysis beyond its intended scope.



The **cost side** of a benefit-cost analysis involves calculating the costs of all resources used in planning and implementing an intervention. In contrast, the **benefit side** of the equation involves calculating the monetary value of any *positive outcomes* [e.g., smoking rates dropping after NCHWT-funded programs become operational] that can be quantified. Measuring benefits requires a number of different techniques. The effects of direct benefits are usually measurable using standard accounting reports and conventional financial analysis. However, the effects of indirect benefits can be very large, though difficult to prove using conventional cost-accounting.

Obviously, in order to prepare a workable BCA framework, it is essential to **identify** and **measure** benefits and costs. A sample listing of typical benefits and costs is as follows:

<p><u>Typical Benefit Outcomes</u>          Fewer injuries/accidents          Lower health care cost          Fewer sick leave absences          Greater productivity          Higher quality of life</p>	vs.	<p><u>Typical Cost Units</u>          Facilities/equipment          Personnel          Health screenings          Health care delivery          Prescription drugs</p>
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Presumably, calculating “direct” benefits associated with an intervention should be relatively simple. However, before any benefit can be calculated, evaluators must select benefit variables that are accessible and measurable, and feel confident that any **benefit outcome** is *due, to some defensible extent, to the intervention*. After all costs and benefits have been identified and measured, the two categories are compared monetarily. In most cases, the goal is to determine the “net benefit” of a particular intervention. In essence, if the value of the *benefits minus the value of the costs is*

*positive*, then the analysis would indicate that the intervention is financially "worth the effort." The net benefit of any intervention can be calculated as follows:

Net Benefit =  $[\sum L\$ + \sum GP + \sum PI] - C$  where:

$\sum L\$$  (sometimes called the *direct benefit*) stands for the reduction in medical care expenses due to reducing the factors (e.g., tobacco use) that drive such expenses. For example, if a traditionally high rate of health care encounters can be reduced, then some portion of overall spending [by all payers] on outside medical care services will be avoided.

$\sum GP$  stands for the increase in general productivity, leading to greater output and income. For example, by reducing the incidence of smoking, an employee's performance capabilities can be increased and, thereby, enable him/her to **actually earn** a larger portion of their paycheck.

$\sum PI$  stands for the gain in working income due to reduced illness and injury and their effects on absenteeism (lost income). For example, managing a chronic condition such as hypertension or diabetes via medication and healthy lifestyle actions directly benefits the affected employee by (1) avoiding time away from work (e.g., potential lost income) to seek health care, (2) reducing the prospects that such a condition will lead to subsequent absences and (3) enhancing the odds that, even in the event that an absence does ensue, the affected employee will have a shorter recovery time and return to functional work in a timely manner.

$C$  stands for the cost of the intervention [e.g., a smoking cessation campaign].

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## **Appendix B      Sample Present Value Adjustment (PVA) Framework.**

### **1. Benefits**

$$PV_b = \sum \frac{B_y}{(1+r)^y} = \frac{B_1}{(1+r)^1} = \frac{B_2}{(1+r)^2} = \frac{B_3}{(1+r)^3}$$

$$\frac{B_1}{(1+r)^1} = \frac{\$9,760,000}{(1+1.10)^1} = \frac{\$9,760,000}{1.10^1} = \frac{\$9,760,000}{1.10} = \$8,872,727 \text{ (year 1)}$$

$$\frac{B_2}{(1+r)^2} = \frac{\$9,760,000}{(1+1.10)^2} = \frac{\$9,760,000}{1.10^2} = \frac{\$9,760,000}{1.21} = \$8,066,115 \text{ (year 2)}$$

$$\frac{B_3}{(1+r)^3} = \frac{\$9,760,000}{(1+1.10)^3} = \frac{\$9,760,000}{1.10^3} = \frac{\$9,760,000}{1.33} = \$7,338,345 \text{ (year 3)}$$

$$\sum \frac{B_y}{(1+r)^y} = \$8,872,727 + \$8,066,115 + \$7,338,345 = \$24,277,187$$

$$PV_b = \$24,277,187$$

### **2. Costs**

Determine the approximate amount of personnel time and materials devoted exclusively to screen, educate, and monitor (SEM) smokers. The calculation for the cost of SEM time is the amount of the annual budget (\$168,875,000) multiplied by the SEM time (4.5% of total workload).

Annual budget	\$168,875,000
x SEM time	.045
<b>SEM cost to employer</b>	<b>\$7,599,375</b>

$$PV_c = \sum \frac{C_y}{(1+r)^y} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3}$$

$$\frac{C_1}{(1+r)^1} = \frac{\$7,599,375}{(1+1.075)^1} = \frac{\$7,599,375}{1.075^1} = \frac{\$7,599,375}{1.075} = \$7,069,186 \text{ (year 1)}$$

$$\frac{C_2}{(1+r)^2} = \frac{\$7,599,375}{(1+1.075)^2} = \frac{\$7,599,375}{1.075^2} = \frac{\$7,599,375}{1.15} = \$6,608,152 \text{ (year 2)}$$

$$\frac{C_3}{(1+r)^3} = \frac{\$7,599,375}{(1+1.075)^3} = \frac{\$7,599,375}{1.075^3} = \frac{\$7,599,375}{1.24} = \$6,128,528 \text{ (year 3)}$$

$$\sum \frac{C_y}{(1+r)^y} = \$7,069,186 + \$6,608,152 + \$6,128,528 = \$19,805,866$$

$$PV_c = \$19,805,866$$

### 3. Calculate net benefit-cost ratios

	Year 1	Year 2	Year 3
<b>Benefit</b>	\$8,872,727	\$8,066,115	\$7,338,345
<b>Cost</b>	\$7,069,186	\$6,608,152	\$6,128,528
<b>Return on Investment (ROI ratio)</b>	<u>\$1.25</u> <b>\$1.00</b>	<u>\$1.22</u> <b>\$1.00</b>	<u>\$1.19</u> <b>\$1.00</b>

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