

What is it Worth?

An Economic Evaluation of the MFH Tobacco Initiative



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Missouri Foundation for Health
Tobacco Prevention and Cessation Initiative

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Executive Summary

In 2004, the Missouri Foundation for Health (MFH) announced the nine-year Tobacco Prevention and Cessation Initiative (TPCI) focused on reducing the health effects and economic toll of tobacco use on Missouri residents.

The first phase of TPCI (2005-2008) comprised three strategies:

- **Strategy 1: Increase the Tax on Tobacco Products**
- **Strategy 2: Implement Smokefree Workplace Programs**
- **Strategy 3: Promote School-Based Prevention Programs**

Due to the significant investment MFH has made in TPCI, there was a need for an economic evaluation to assess the Foundation's return on investment. This report presents the results from the economic evaluation conducted by the Center for Tobacco Policy Research (CTPR) at Washington University in St. Louis. Although there have been several economic evaluations of individual tobacco cessation and prevention programs, there have been few, if any, to date that have examined a tobacco control initiative with multiple strategies. For this analysis, CTPR focused on the first three strategies of TPCI.

Methods

Both cost-effectiveness and cost-benefit analysis approaches were used. The costs, benefits, and cost-to-benefit ratios for all three strategies were calculated individually and then combined. Due to the tobacco tax increase not passing, two different scenarios were assessed: 1) the actual election outcome of the tax not passing; and 2) the benefits that would have been gained if the tax had passed. In any economic evaluation a number of assumptions are made; this evaluation took the most conservative approach in its assumptions. See the full report for a detailed description of the methods used, including the calculations of the costs and benefits, and all assumptions made.

Evaluation Highlights

The Initiative resulted in savings, despite the failure of the tobacco tax increase.

The total combined benefits for the three TPCI strategies during the time period resulted in real savings: 5,228 quality adjusted life years (QALYs) gained and long-term medical care savings of \$30.5 million. Therefore, a positive return on investment was seen in the "reality" scenario, despite the tobacco tax not passing.

TPCI costs and benefits for the two tax scenarios

	Tax Failed (Reality)	If Tax Passed
Costs	\$7,066,434	\$7,066,434
QALYs Gained*	5,228	105,526
Long-term Medical Care Savings	\$30,510,165	\$616,497,054
Cost/QALY Gained	\$1,352	\$67
Medical Care Savings/ Dollar Spent	\$4	\$87

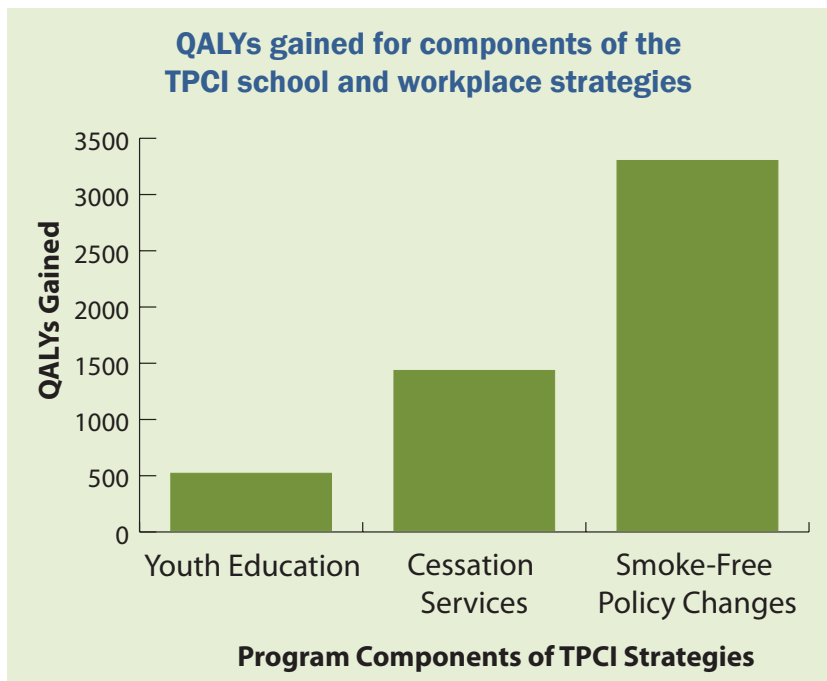
* Quality Adjusted Life Years

The success of the tobacco tax strategy would have increased the positive net benefit of TPCI twenty-fold.

Had the tobacco tax ballot initiative passed, the strategy would have resulted in large benefits both in regard to QALYs and long-term medical savings for the people of Missouri. For every \$1 spent on TPCI, there would have been medical care savings of \$87.24 vs. \$4.32.

Policy changes result in the largest benefit.

Grantees from both the school and workplace strategies were involved in advocating for policy changes, in addition to providing cessation services and educational programs in the schools. Within the school and workplace-based strategies, smoke-free policy changes, particularly on the community level, showed two to six times higher cost-benefit/cost-effectiveness ratios in comparison to cessation services and youth education programs.



Conclusions

The results of our economic evaluation for TPCI during the specified time period show a net positive benefit across the entire initiative, as well as for the workplace and youth prevention strategies individually. These results provide valuable lessons learned and important information for future TPCI efforts, other tobacco prevention efforts, and decisions regarding MFH's future efforts to improve the health of Missourians in its service area. Due to current plans for the initiative to continue an additional four years, the information presented in this report should inform future decisions on interventions to support within TPCI as well as the level of resources to dedicate to TPCI efforts. Based on the evaluation findings, the following recommendations were identified:

Recommendations

- Advocate for an increase in the tobacco tax.
- Emphasize policy interventions as a main component of a comprehensive effort to reduce tobacco use.
- Continue to conduct cost analyses for the Tobacco Prevention and Cessation Initiative and expand the practice to all Missouri Foundation for Health initiatives.

Introduction

Due to the burden of tobacco use in Missouri and limited funding for tobacco prevention and cessation programs, the Missouri Foundation for Health (MFH) identified tobacco use as a major health issue in its service area of 84 counties and the City of St. Louis. In 2004, MFH announced the nine-year Tobacco Prevention and Cessation Initiative (TPCI) focused on reducing the health effects and economic toll of tobacco use on Missouri residents.

The first phase of TPCI (2005-2008) comprised three strategies:

- **Strategy 1: Increase the Tax on Tobacco Products** An education campaign to increase awareness about the effectiveness of increasing the price of tobacco products on preventing youth from smoking and increasing the number of adults who quit.
- **Strategy 2: Implement Smokefree Workplace Programs** A workplace and community strategy for which grantees increase access to cessation resources (e.g., classes) and advocate for smokefree workplaces.
- **Strategy 3: Promote School-Based Prevention Programs** A youth-focused strategy that included three different programs carried out in Missouri schools that educated students on the burden of tobacco use and promoted youth advocating for policy change.

In subsequent years, TPCI has added two other strategies: eliminating tobacco-related disparities and supporting local tobacco control policy change. In total, MFH has supported more than 70 organizations, contractors, and partners' efforts to implement tobacco prevention and cessation programming, with more than \$22 million in grants since the beginning of the initiative.

In any public health initiative, stakeholders often question whether the investment can be justified by the outcomes. Due to the significant investment MFH has made in TPCI, there was a need for an economic evaluation to assess the Foundation's return on investment. This report presents the results from the economic evaluation conducted by the Center for Tobacco Policy Research at Washington University in St. Louis. Although there have been several economic evaluations of individual tobacco cessation and prevention programs, there have been few, if any, to date that have examined a tobacco control initiative with multiple strategies. For this analysis, CTPR focused on the first three strategies of TPCI. This will serve as the first of additional economic analyses that will be conducted during the remainder of TPCI.

Methods

Standard methods for economic evaluations were used.¹ The costs, benefits, and cost-to-benefit ratios for all three strategies were calculated individually and then combined. In any economic evaluation a number of assumptions are made; this evaluation took the most conservative approach in its assumptions. A detailed description of the assumptions on costs, benefits, and their valuation in monetary terms is included in the Appendix.

For this evaluation, both cost-effectiveness and cost-benefit analysis approaches were used. A cost-effectiveness analysis allows different interventions to be assessed based on what it costs to achieve a particular outcome (*e.g.*, smoking cessation). A strength of cost-effectiveness analysis is that it allows combining cost data with outcome or effectiveness data (*i.e.*, few adjustments have to be made).¹ If a program has a strong and comprehensive evaluation, those data are often available. A challenge with cost-effectiveness analysis is that you can only make comparisons with programs that have the same outcome.

For cost-benefit analysis, costs and benefits are assessed in monetary terms. Thus, each intervention can be examined on its own and compared to interventions with different objectives. The difficulty of assigning a value to particular outcomes can make cost-benefit analysis a challenge. We applied both approaches for economic evaluations to allow for examining the costs of a particular outcome, as well as comparisons in monetary terms across and within the TPCI strategies.

Benefits were measured in quality-adjusted life years (QALYs) gained and life-time medical care savings per smoker who quit or youth prevented from smoking. A discount rate of 3% was used. This is not to be confused with adjusting for inflation. Discount rates are used to adjust for costs, benefits, etc. distributed across time.¹ Money that is received today is usually considered more valuable than the same amount received in the future, thus future costs or benefits are discounted.

Cost-Effectiveness vs. Cost-Benefit Analysis

Cost-Effectiveness Analysis

- Benefits are assessed in terms of outcomes (*e.g.*, youth prevented from smoking)
- Analysis identifies the cost of achieving a specific outcome
- *E.g.*, The program costs \$350 per smoker who stays quit

Cost-Benefit Analysis

- All benefits and costs are described in monetary terms
- Analysis determines if the cost is less than the value of the benefit
- *E.g.*, For every dollar spent, \$5,000 is saved in medical care costs

Calculation of Costs

The time periods for the three TPCI strategies assessed were:

- **Strategy 1 – Campaign to Increase Tobacco Tax:** 2005-2006
- **Strategies 2 & 3 – School and Workplace Programs:** 2007-2008

The efforts to increase the tobacco tax took place during the two-year period of 2005 & 2006 only. For the school and workplace strategies, the time period selected was based on the availability of comprehensive data. In January 2007, grantees began reporting data on their efforts via an online data collection system.

Only direct program costs were included in the analyses. Costs not included for any of the strategies were MFH staff salaries, costs associated with the initiative evaluation, trainings for grantees, and other capacity building activities not directly related to grantees' programs. For the tobacco tax strategy, the total funding provided by MFH for the education portion of the tobacco tax initiative was determined. The funding contributed by other organizations for both the education portion as well as the political campaign was also calculated. These costs did not include volunteer hours as those data were not available. The program was heavily dependent on volunteers; unfortunately, records only show the number of volunteers involved and not the amount of time they contributed.

For the workplace and school strategies, we combined the amount of funding distributed by MFH to all grantees implementing programs specifically for these two strategies. For each grantee, we divided its funding by the number of months in its grant award. This allowed us to come up with an estimate of funding for grantees with grants that preceded or continued after the time period we were evaluating (*i.e.*, 2007-2008).

For grantees that were funded to implement both strategies, it was unclear how much was allocated to each strategy. Therefore, after calculating the amount of funding for the time period, the amount was divided in half for each strategy. Funding amounts for grantees for which there were no records of their activities for the specified time period, 8 out of 44, were not included in the analyses. Additional funding grantees received to implement their programs were also added to the total costs along with the value of volunteer hours.

Calculation of Benefits

Data used in the calculation of benefits were provided by grantees and in most cases were estimates. There are other benefits not accounted for that may have resulted from these programs, including capacity-building within the grantee communities. Therefore, in many ways we took the most conservative approach in calculating the benefits of TPCI's programs.

To keep the analyses standard across all three strategies, two primary benefits that could be calculated were chosen: quality-adjusted life years gained (QALYs) and lifetime medical care savings. These benefits are common in cost-benefit analyses and can be calculated whether you are examining adults who quit or youth prevented from smoking.

Effectiveness of a Tobacco Tax

In assessing the tobacco tax strategy, two different scenarios were examined. The first scenario was the actual election outcome, the failure to pass the tobacco tax increase. In November 2006, Missouri voters rejected the proposed tax increase; 51.4% against, 48.6% in support. The number of adults influenced to quit or youth influenced to not start because of the educational campaign were assumed to be minimal and not included in the analysis of benefits. The second scenario was hypothetical scenario based on the benefits that would have been gained if the tobacco tax increase had passed. Increasing the price of tobacco products is one of the best ways to reduce tobacco use initiation and increase cessation.⁴ The strategy of increasing Missouri's tobacco tax will continue to be a recommended practice for the state and thus warranted further examination of the benefits that would have been gained if the tax increase had passed.

To calculate the anticipated benefits if the tax had passed, established price elasticity measures from the literature on tobacco taxes were used.^{2,3} Price elasticity measures the responsiveness of a variable (*e.g.*, cigarette sales) to a change in price. For example, for every 10% increase in the price of cigarettes, it is estimated that cigarette consumption is reduced by 3-5%. Since youth and young adults are more responsive to price increases, price elasticities by age group were used, starting with 15-17 year olds.³ The estimated decrease in smoking prevalence was calculated for each age group. Then, the number of smokers anticipated to quit based on the decrease in prevalence was determined. Data from the Behavioral Risk Factor Surveillance System (BRFSS)⁵ conducted during the time period when the tobacco tax increase would have gone into effect were used to calculate the number of smokers who would quit.

Effectiveness of Smokefree Policy Change

The same procedure described in Ong and Glantz's 2005 paper to determine the number of smokers who would quit as a result of the passage of a smokefree policy was followed for this evaluation.⁶ The procedure accounts for smokers who would quit anyway, a 90% compliance rate for community-wide policy changes, and a 35% relapse rate. Data provided by grantees on policy changes they were involved in during the time period were used in the calculation. This included grantees who were involved in workplace and school-based strategies. Community-wide policy changes were separated from individual worksite policy changes, though the numbers used in the calculations were the same, except for the compliance rate, which was only used with community policies. One hundred percent compliance with smokefree policies was assumed for workplaces. The number of smokers within a community or a worksite was estimated based on a 23.2% prevalence rate for the state of Missouri from the 2006 BRFSS⁵, the year prior to policy changes taking place. Benefits from decreasing or eliminating exposure to secondhand smoke were not included in our calculations and would be considered to provide additional benefits.

Effectiveness of Cessation Programs

The number of smokers who quit due to their involvement in TPCI-funded cessation classes was calculated using 12-month quit rate data collected via the TPCI online data collection system. All grantees were provided a protocol by CTPR to follow when conducting follow-up calls to assess whether program participants had stopped smoking at three, six, and twelve months after completing the cessation program. Based on previous research, we assumed a 35% relapse rate for those who quit.^{6,7}

Effectiveness of Youth Prevention Programs

For the school-based strategy, the most conservative approach for estimating the number of youth affected by the programs was used. For two of the three programs, only the students reported to be trained by the grantees were counted. This is because these two programs were primarily focused on training middle and high school youth to educate their peers and conduct advocacy-related activities. For the third program, the number of students reported to be involved in classroom activities was also counted, because a large portion of this program involved lessons and activities conducted in the classroom. Based on a rate of smoking initiation for youth estimated at 10.2% in previous research, the number of youth involved in the programs who would likely become established smokers was calculated.⁸ Then based on figures reported in the Institute of Medicine's *Ending the Tobacco Problem: A Blueprint for a Nation*, it was estimated that youth programs would decrease the initiation rate by 10%.⁸ From there, the number of youth who would be less likely to initiate smoking due to their involvement in the programs was calculated.

Quality-Adjusted Life Years

Based on the number of adults who quit and the number of youth prevented from smoking, quality-adjusted life years (QALYs) gained were calculated. Quality-adjusted life years take into account both the quantity and quality of life gained by an intervention. Two different numbers for calculating QALYs gained were used; one for adults and one for youth. For adults quitting smoking, we used 1.58 QALYs gained per each sustained quitter based on several past studies.^{6,7} This estimate assumes the average quitter is 45 years of age and benefits of quitting cease after the age of 65. For youth, a previously reported estimate of 3.4 QALYs gained per youth who do not smoke was used.^{9,10}

What are QALYs?

- Quality-adjusted life years take into account both the quantity and quality of life gained by a health intervention.
- A year of perfect health is worth 1; a year of less than perfect health is worth less than 1.

Table 1. Values used to calculate benefits of TPCI components

Benefit	
QALYs generated per quitter*	1.58
QALYs generated per youth not initiating**	3.4
Excess lifetime medical expenditures for smokers***	\$9,231
Lifetime medical savings for youth who never start smoking***	\$19,640

*Keeler et al, 2002 and Ong & Glantz, 2005.

**Kaplan et al, 2007 and Holtgrave et al, 2009

***Hodgson, 1992 (adjusted for inflation to 2007 dollars)

Results

The costs and benefits for each of the strategies are displayed in Table 2. The table shows the individual and total costs of the TPCI initiative. The total combined cost for the three TPCI strategies during the time period we assessed was \$7,066,434. The totals for the actual election outcome (tax amendment failing) and the scenario of the tax passing are presented in two tables.

Table 2 shows the total costs and benefits of all three strategies, with the tobacco tax increase not passing. The cost-to-benefit is expressed in two ways: cost of each QALY gained and the amount of long-term medical care savings per dollar spent. The table provides these measures for each individual strategy and the initiative as a whole. The tobacco tax strategy shows that there were no benefits gained from the educational campaign. The total combined benefits for the three TPCI strategies during the time period resulted in real savings: 5,228 QALYs gained and long-term medical care savings of \$30.5 million. Therefore, a positive return on investment was seen in the “reality” scenario, despite the tobacco tax not passing.

Table 2. Total costs and benefits for TPCI strategies

Strategy	Costs	Total QALYs Gained	Total Long-term Medical Care Savings	Cost/QALY Gained	Medical Care Savings/Dollars Spent
Tobacco Tax	\$654,000	0	\$0	\$0	\$0
Workplace	\$3,476,210	4,464	\$26,078,955	\$778.72	\$7.50
Schools	\$2,936,224	764	\$4,431,210	\$3,843.23	\$1.51
All Strategies Combined	\$7,066,434	5,228	\$30,510,165	\$1,351.65	\$4.32

In Table 3, the benefits for both the school and workplace strategies remain the same as in Table 2; however, benefits gained from the tobacco tax strategy are distinctly different. A tobacco tax increase would have resulted in very large benefits for the people of Missouri: 100,298 QALYs and more than \$585 million in long-term medical care savings. Had the tobacco tax ballot measure passed, the positive benefits-to-cost results would have been magnified twenty-fold; for every \$1 spent on TPCI, there would have been medical care savings of \$87.24 vs. \$4.32, given the reality of the tax ballot measure failing. When all of the costs for the tobacco tax campaign are included (*i.e.*, costs of education and political campaigns), the benefit-to-cost ratio is still large, \$44.07, despite more than \$7 million having been spent.

Table 3. Costs and benefits if tobacco tax increase had passed

Strategy	Costs	Total QALYs Gained	Total Long-term Medical Care Savings	Cost/QALY Gained	Medical Care Savings/Dollars Spent
Tobacco Tax	\$654,000	100,298	\$585,986,889	\$6.52	\$896
Workplace	\$3,476,210	4,464	\$26,078,955	\$778.72	\$7.50
Schools	\$2,936,224	764	\$4,431,210	\$3,843.23	\$1.51
All Strategies Combined	\$7,066,434	105,523	\$616,497,054	\$66.96	\$87.24

A Closer Look at Benefits Associated with the School and Workplace Strategies

The activities and potential outcomes for the workplace and school strategies are more complicated than they might first appear. Thus, they warrant closer examination and additional interpretation of the results. For example, for workplaces, it is not simply adults quitting due to smoking cessation classes that accounts for the positive outcomes, but also the smokefree policy changes that have occurred in businesses and communities. Likewise, for the school initiative, it is not only the number of youth who will not initiate smoking, but also the policies youth have advocated for and helped to pass in their schools, individual businesses, and communities.

Therefore, in Table 4, additional detail has been provided regarding the benefits of TPCI for the two strategies. Smokefree policy changes show the greatest amount of benefit, particularly for community-wide policies. Grantees from both the school and workplace strategies were involved in advocating for policy changes. We estimate that 1,973 adults in Missouri quit smoking due to community-wide policy changes and an additional 111 adults quit smoking due to worksite policy changes. As a result of TPCI supported cessation programs, an estimated 902 adults quit smoking, and stayed quit. For the school programs, we estimate that 150 school-aged children who would have initiated smoking were prevented from doing so.

Table 4. Benefits from Each Component of the School and Workplace Strategies

Smokefree Policy Changes	
<i>Number of Adults Who Would Quit</i>	
Community-wide policy changes	1,973
Worksite policy changes	111
<i>QALYs Gained</i>	
Community-wide policy changes	3,117
Worksite policy changes	175
<i>Long-Term Medical Care Savings to Society</i>	
Community-wide policy changes	\$18,208,270
Worksite policy changes	\$1,020,768
Cessation Services	
<i>Number of Adults Who Quit</i>	902
<i>QALYs Gained</i>	1,425
<i>Long-Term Medical Care Savings to Society</i>	\$8,326,362
Youth Education	
<i>Youth Who Will Not Start Smoking Due to Education Programs</i>	150
<i>QALYs Gained</i>	510
<i>Long-Term Medical Care Savings to Society</i>	\$2,953,736

Conclusions

The results of our economic evaluation for TPCI during the specified time period show a net positive benefit across the entire initiative, as well as for the workplace and youth prevention strategies individually. Given the failure to increase the Missouri tobacco tax in 2006, the separate economic evaluation for the strategy to raise support for the tax increase resulted in a net loss of the entire amount of MFH's investment in the educational campaign, as well a total loss of investment by others who funded the political campaign. Had the tobacco tax ballot initiative passed, the strategy would have resulted in large benefits both in regard to QALYs and long-term medical savings for the people of Missouri. The additional benefits from the success of the tobacco tax strategy would have increased the positive net benefit of TPCI twenty-fold.

These results provide valuable lessons learned and important information for future TPCI efforts, other tobacco prevention efforts, and decisions regarding MFH's future efforts to improve the health of Missourians in its service area. Due to current plans for the initiative to continue an additional four years, the information presented in this report should inform future decisions on interventions to support within TPCI as well as the level of resources to dedicate to TPCI efforts.

Recommendations

Prioritize increasing the tax on tobacco products to yield significant long-term savings

The lost opportunity represented by the failure of the tobacco tax shows the value of increasing the tax in Missouri. This poses the question of how much should be invested in a future effort to increase the tobacco tax given the large benefits that would be seen. Based on the findings of this report and evidence-based guidelines for tobacco control (*e.g.*, The Community Guide), it is recommended that MFH support efforts to increase Missouri's tobacco tax.

Incorporate policy interventions at each level of programming to realize savings

The results demonstrate the potential power of both a statewide initiative and individual strategies that incorporate different levels of intervention to reduce tobacco use (community vs. workplaces/schools vs. individual youth prevention and adult cessation efforts). Many of the grantees that focused on adult smoking cessation or youth prevention incorporated policy interventions. Were it not for these incorporated policy interventions, the overall findings for cost-benefit and cost-effectiveness would have resulted in a net loss for MFH.

Recommendations

- Advocate for an increase in the tobacco tax.
- Emphasize policy interventions as a main component of a comprehensive effort to reduce tobacco use.
- Continue to conduct cost analyses for the Tobacco Prevention and Cessation Initiative and expand the practice to all Missouri Foundation for Health initiatives.

These findings strengthen the idea, both in theory and common sense, that policies prohibiting smoking promote quitting and adults who want to quit benefit from readily available and accessible smoking cessation services. Likewise, youth who never initiate and adults who quit are much more likely to advocate for policies to prohibit tobacco use in public places and are more likely to support future efforts to raise the state tobacco tax.^{14,15}

Plan and conduct similar analyses across MFH programs to allow for program comparisons

Even with the failure of the tax initiative, our results demonstrate a net-positive benefit for TPCI overall. Similar efforts to collect cost and benefits for current and future funding programs would allow comparisons of the relative cost-benefit and cost-effectiveness of MFH's funded projects across the main causes of morbidity and mortality and across the strategies adopted by MFH and its grantees. There is one caveat with this recommendation. Programs focused on other areas of chronic disease, such as physical activity, nutrition and chronic disease management, do not have as extensive of a science base as tobacco control. This influences the availability of data to adequately assess the outcomes for a specific strategy.

Limitations

As with all evaluations generally, and economic evaluations specifically, this work has limitations. The limitations include design issues, data concerns and the many assumptions made in conducting any cost-benefit and cost-effectiveness analysis. The design issues primarily relate to our decisions to use two standard measures to calculate benefits, QALYs and long-term medical savings. Establishing standard, common measures applicable across the three strategies was necessary to make comparisons among the three and to combine them to measure a total benefit for TPCI. This is the accepted practice for cost-benefit and cost-effectiveness analyses. This approach likely underestimated the value of the benefit for TPCI since the value of practices such as capacity-building and recruiting tobacco prevention advocates for life was not included. Additionally, outcomes other than smokers who quit and youth who will not start smoking, such as reduced exposure to secondhand smoke, were not included.

The data concerns primarily relate to the total absence of some important data (*e.g.*, volunteer hours) and the absence of periods of data. These problems result in a less than ideal database when forced to restrict the analyses to several years' worth of TPCI and eliminate a small number of grantees from the analysis. Although we would have preferred to have full data, we do not believe that these data problems skew the findings in either direction since neither the cost nor benefits associated with either the excluded years or grantees was included in the analyses.

The final set of limitations concerns the many assumptions that must be made when conducting economic evaluations. These assumptions are comprehensively and clearly described in an appendix to this report. All of our assumptions are based on the best information available from published, peer-reviewed literature and recognized, reputable organizations. In all cases, we have made the most conservative assumptions. Given this approach, if our assumptions have produced biased results, they are much more likely to have underestimated, not overestimated, the benefits of the three strategies and the overall initiative.

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Appendix- Assumptions

Strategy 1 (Increase Tobacco Tax)

Costs

1. Cost of MFH staff salaries, benefits, etc. not included.
2. Cost of evaluation and training contracts not included.
3. Number of volunteer hours not included. Data are not available.

Benefits

1. For the actual outcome of tax initiative analysis (“Factual”):
 - a. Assumed no benefits given that the tobacco tax initiative failed; adults influenced to quit or kids influenced not to start because of the educational campaign (Show Me Health) are assumed to be minimal.
2. For the “Scenario” analyses:
 - a. The age categories for price elasticity (*i.e.*, price effects on smoking) from the literature (Chaloupka, 1999 and Ahmad & Franz, 2008) and the BRFSS Smoking Prevalence Rates for Missouri were not a perfect match; the categories were matched as closely as possible.
 - b. Weighted the decrease in prevalence for smoking among the Missouri population age categories by the percentage in those categories; that weighted average was 4.41%.
 - c. Divided the price elasticity (*i.e.*, price effects on smoking) for each age group in half because the reported price elasticity is for a decrease in the number of cigarettes consumed; half of the elasticity is the actual reduction in prevalence. For every 10% increase in the tobacco tax, the following percentages were used to calculate the anticipated reduction in prevalence for each age group:

Age	15-17	18-23	24-29	30-39	40-65	65+
Anticipated % decrease in prevalence	4.2%	1.8%	1.5%	1.0%	1.0%	1.6%

Source: Chaloupka, 1999 and Ahmad & Franz, 2008

- d. Used the reported 1.58 increase in quality-adjusted life years (QALYs) for each sustained quitter (Keeler et al, 2002 and Ong & Glantz, 2005). This estimate assumes:
 - i. The average quitter is 45 years of age.
 - ii. The benefits of quitting cease after age 65.
 - iii. A discount rate of 3%.
 - iv. A 35% probability of relapse.
 - v. A compensation for background quits which would have occurred in the future can be achieved by multiplying the QALYs by a factor of 0.79.
- e. Lifetime expenditure savings from quitting (Hodgson, 1992) were updated for inflation between 1992 and 2007 and were gender-adjusted based on the percent population of males and females in Missouri in 2007.

Strategy 2 (Workplace/Community Programs)

Costs

1. Cost of MFH staff salaries, benefits, trainings for grantees, evaluation contracts, etc. was not included.
2. Cost of expansion of Quitline services was not included.
3. Mean hourly wage for all occupations in Missouri in 2007 (\$17.90) was used to calculate value of volunteer time (Sources: TIES for number of volunteer hours; Bureau of Labor Statistics for mean hourly wage).
4. Removed funding for grantees for whom we do not have programmatic data.

Benefits

1. Followed procedure in the Ong & Glantz 2005 paper to determine number of smokers who would quit if a smoke-free worksite policy passed. The procedure accounts for:
 - a. Smokers who would quit anyway, without a policy.
 - b. A 90% compliance with the policy change (only for community-wide policies, not individual worksite policies).
 - c. A 35% relapse rate for quitters.
2. Calculated number of smokers who quit because of cessation classes using TIES quit rate data; assumes 35% probability of relapse and is discounted at 3%.
3. Used the reported 1.58 increase in quality-adjusted life years (QALYs) for each sustained quitter (Keeler, et al, 2002 and Ong & Glantz, 2005). This estimate assumes:
 - a. Average quitter is 45 years of age.
 - b. Benefits of quitting cease after age 65.
 - c. Discount rate of 3%.
 - d. 35% probability of relapse.
 - e. Compensation for background quits that would have occurred in the future can be achieved by multiplying the QALYs by a factor of 0.79.
4. Lifetime medical expenditure savings from quitting (Hodgson, 1992) were updated for inflation between 1992 and 2007 and were gender-adjusted based on the percent population of males and females in Missouri in 2007.
5. Benefits from the Kirksville community-wide smoke-free policy were equally divided among the workplace and school strategies because both were involved in its passage.
6. Did not include benefits from removal of exposure to second-hand smoke (e.g., health benefits).

Strategy 3 (School Programs)

Costs

1. Cost of MFH staff salaries, benefits, trainings for grantees, evaluation contracts, etc. was not included.
2. Median hourly wage for Missouri high school teachers in 2007 (\$21) was used to calculate value of volunteer time since most volunteers were teachers for the school programs (Sources: TIES for number of volunteer hours; Bureau of Labor Statistics for teacher median hourly wage).
3. Removed funding for grantees for whom we do not have programmatic data.

Benefits

1. For school-based interventions:
 - a. Took the most conservative approach to estimating the number of youth affected by the intervention; we counted only the students trained to be active participants, not all youth exposed. The exception was one program involving lessons and activities conducted in the classroom. For this program, we also counted students in the classroom.
 - b. Used the rate of youth initiation (0.1021) for the entire U.S. in 2003.
 - c. Used the reported 10% decrease in initiation rate reported in the IOM report , *Ending the Tobacco Problem: A Blueprint for a Nation*, to determine how many youth would not initiate smoking due to programs.
 - d. Used the reported 3.4 increase in QALYs for each youth who doesn't start smoking (Kaplan et al. and Holtgrave et al.), discounted at 3%
 - e. Lifetime medical expenditure savings for youth who never start smoking (Hodgson, 1992) were updated for inflation between 1992 and 2007 and were gender-adjusted based on the percent population of males and females in Missouri in 2007.
2. For worksite smoke-free policies involving students:
 - a. Same assumptions as described in worksite section above.
3. Benefits from the Kirksville community-wide smoke-free policy were equally divided among the workplace and school strategies because both indicated involvement in its passage.

