Center for Health Research

Estimating the Return on Investment from Reducing Tobacco Use in Texas

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Executive Summary

This report quantifies the substantial health care and productivity cost savings in Texas that have been achieved from efforts to reduce adult smoking. Adult smoking prevalence has declined from 19.4% in 2007 to 14.5% in 2014. However, tobacco control program efforts in two coalition populations have led to an additional 3.9% cumulative decline in adult smoking.

Evaluation of the Tobacco Prevention and Control Coalition (TPCC) programs from 2008 to 2014. In the 2008-12 TPCC program area, smoking prevalence fell from 19.2% to 13.7% in 2014. Without the TPCC program, we estimated that 14.2% of adults would be smoking in 2015, which would have increased healthcare expenditures and productivity costs by $154 million from 2015 to 2019. We found that program spending of $19.8 million ($1.18 per capita annually) generated a net return on investment over five years of nearly $28 per capita (discounted 2015 dollars). As of 2014, similar effects have been achieved by the TPCC program implemented in a new area.

Statewide expansion of the TPCC program. A 3.9% smoking rate reduction would have reduced 2015 smoking prevalence from 14.5% to 13.9%, at a total cost of approximately $111 million. We estimated this program would save the state $991 million dollars over five years (2015-2019), including $664 million in reduced healthcare expenditures and $327 million in smoking-attributable lost work time. The net financial savings over five years would total about $29 per capita.

TPCC program effects for Medicaid eligible adults. Nearly 16% of Texas adults are covered by Medicaid. The TPCC program has reduced smoking among Medicaid recipients from about 28% to about 27% since 2008, generating an estimated cost savings of $48 million over five years. Statewide expansion of the 2008-12 TPCC program would have saved $176 million compared to no program.

Peers Against Tobacco program. There are nearly 1.5 million college students in Texas. If the program reduces smoking prevalence by 3.9% over two years, the program could save $19

million over the next five years from reduced healthcare expenditures and productivity losses, with a positive net ROI of about $11 per capita.

Increasing the smoking age to 21. Increasing the smoking age to 21 would result in 30,500 fewer smokers after three years, and lead to $185 million in reduced healthcare expenditures and productivity costs over five years. Lower cigarette excise tax revenue of $3.4 million would reduce the 5-year net savings, however the state would still generate a net financial savings of just under $182 million.

Effectiveness of the Texas state quitline. We estimated that there are more than 10,000 fewer smokers in Texas because of the quitline and associated media campaign spending. Increasing media campaign spending to $1.84 per capita would lead to 23,400 fewer smokers each year, and nearly 12,000 fewer smokers with mental health or substance abuse conditions.

Reducing maternal smoking prevalence. During 2010-2014, there were 98,535 live births to women who smoked, which accounted for an estimated cost of $34.6 million in additional neonatal hospitalization costs and 207 preventable infant deaths.

Electronic Nicotine Delivery Systems (ENDS). The evidence base is sparse for the impact on ENDS on smoking initiation, cigarette smoking prevalence, and health outcomes. It appears that most ENDS users are also smokers. So far, the concerns that electronic cigarettes are a gateway to regular smoking may be overstated, however e-cigarettes do not appear to be an effective method for quitting smoking. ENDS may be a safer alternative than cigarette smoking, but they do appear to carry health risks for users. Efforts to reduce ENDS use through tax policy are emerging. ENDS users may be 2-3 times more sensitive to increasing prices than regular cigarette users. A recent study showed that a 10% increase in price led to a 12% decline in consumption of disposable e-cigarettes and a 19% decline for reusable e-cigarettes.

Conclusion. Overall, this report demonstrates that resources allocated to reducing smoking in Texas has led to substantial health and economic benefits. The data suggests that expanding the TPCC program to cover all Texas counties would dramatically reduce smoking and save Texas nearly $1 billion in preventable healthcare expenditures and productivity losses over five years.

Overview and Specific Aims

Cigarette smoking is the number one cause of preventable deaths in the United States. Each year, smoking accounts for over 440,000 deaths and about 5.1 million years of potential life lost.[1] The economic costs of smoking are substantial and account for over $75.5 billion in annual healthcare costs and $96.8 billion in death-related productivity losses.[2] In Texas each year, cigarette smoking is responsible for an estimated 28,030 premature deaths and $8.9 billion in excess healthcare expenditures and $8.9 billion in death-related lost productivity.[3]

Smoking prevalence in Texas has declined considerably, from 23.5% in 1999 to 19.4% in 2007, and to 14.5% in 2014.[4] During this period, the Texas Department of State Health Services (DSHS) funded comprehensive tobacco control programs in select areas of the state. There were also substantial increases in cigarette excise prior to 2007. The state excise tax increased from $0.41 to $1.41 in 2006, while the federal excise tax increased from $0.39 to $1.01 in 2009.[5] Texas and federal excise tax rates remain at these levels.

This study estimates the impact of the TPCC program during 2008-2014 on smoking prevalence, health care expenditures, and productivity, overall and for selected population groups. We achieve this goal by addressing the following specific aims using a model developed by researchers at the Kaiser Permanente's Center for Health Research (CHR). The model was developed to estimate the net financial costs (savings) from investments in tobacco control for a large health plan population. The ROI Calculator was adapted for use with Texas adult populations, including the 2008-12 TPCC program population (TPCC1), the 2013-18 TPCC program population (TPCC2), Medicaid eligible adults, college students associated with the Peers Against Tobacco program established in 2015, and young adults impacted by a hypothetical increase in the smoking age to 21 years. The value propositions related to the impacts of the tobacco quitline on smoking prevalence, and maternal smoking are examined outside the scope of the ROI Calculator. This study also examines emerging issues associated with the use of electronic nicotine delivery systems (ENDS).

Aim 1: Estimate the net financial costs (savings) associated with the comprehensive TPCC program spending during 2008-2015, compared to non-TPCC program areas

Aim 1 includes two components: a) estimate the cumulative annual healthcare expenditures and productivity costs over five years (2015-2019) associated with reduction in adult smoking during

2008-2015, overall and for Medicaid eligible adults and maternal outcomes; and b) estimate the net financial savings/costs from reductions in adult smoking associated with TPCC spending during 2008-2015.

The TPCC program is divided into two periods, the 2008-12 program (TPCC1) involving coalitions in six relatively large counties and 2013-18 program (TPCC2) involving 12 different and mostly smaller counties. Consequently, we present results for the overall population analyses for each of the two programs. The program areas have had similar impacts on overall smoking rate declines compared to non-program areas. Consequently, population sub-group analyses and statewide program evaluations were conducted using the 2008-12 TPCC1 program information. Federal and state excise taxes did not change during the study period, and were not analyzed.

Aim 2: Estimate the net financial costs (savings) associated with expanding TPCC programs to all Texas counties, including the Peers Against Tobacco in counties that have colleges and universities

Aim 2 includes the cost and net financial savings analyses conducted as part of Aim 1 associated with a statewide expansion of the TPCC program. For this analysis, we estimated total costs, cost savings, and net ROI using data from the TPCC1 program area. Subgroup analysis for the state Medicaid population is presented in this section.

Aim 3: Estimate the net financial costs (savings) associated with the Peers Against Tobacco (PAT) program during 2015-2017, compared to no program

We do not yet know the impact or effective reach of the PAT program to reduce smoking rates among college students compared to students who are unexposed to the program. Consequently, the simulation results will be the same for the PAT schools and hypothetical state-wide expansion, so we conducted the evaluation using assuming a state-wide PAT program.

Aim 4: Estimate the value of the Quitline's role in lowering the prevalence of tobacco use

The aim 4 evaluation includes two components: a) estimating the impact at current level of use among the general population vs. increase reach at the CDC recommended funding level; and b) estimating the impact at current level of use among those with mental health or substance abuse conditions vs increase reach with at the CDC recommended funding level.

For each analysis, we estimated the total number of quitline registered callers, number of quitters, program costs (quitline services and media campaigns), and cost effectiveness for the Texas general population and for smokers with mental health and/or substance abuse problems.

Aim 5: Evaluate the impact of legislation to increase the legal smoking age to 21 years

We use the ROI Calculator to estimate the healthcare and productivity cost savings associated with a hypothetical increase in the smoking age to 21 years, compared to no change in legal age.

Aim 6: Estimate the cumulative annual excess infant mortality and hospital costs over five years attributable to maternal smoking, and the potential benefits from reductions in maternal smoking

We address this aim using published data on maternal smoking, infant deaths, relative risks of deaths, and economic costs.

Aim 7: Discuss the status of impact research on ENDS, i.e. increase of youth prevalence of ENDs use and preliminary research on long term impact, and discuss the potential impact of implementing an excise tax on ENDS

This aim includes a brief overview of the evidence base for the use and health effects of Electronic Nicotine Delivery Systems (ENDS), primarily electronic or e-cigarettes. Establishing an excise tax for ENDs is considered, but the impacts of a tax on the demand for ENDs, or regular cigarettes, are unknown.

Modeling approach

In general, the specific aims of this study are assessed by adapting the CHR's ROI Calculator to incorporate tobacco control spending and effectiveness data for Texas. This section provides an overview of the ROI Calculator design and the specific modifications that were used to address each study aim. A more complete description of the ROI Calculator is available at BusinessCaseROI.org.[6] For each aim, we present cost estimates discounted 2015 dollars. We discounted future costs (health care expenditures and earnings) using a financial discount rate of 4.67%, which reflected the cost of capital for the medical services sector.[7] This study was reviewed and approved by the Kaiser Permanente Northwest IRB.

ROI Calculator model design

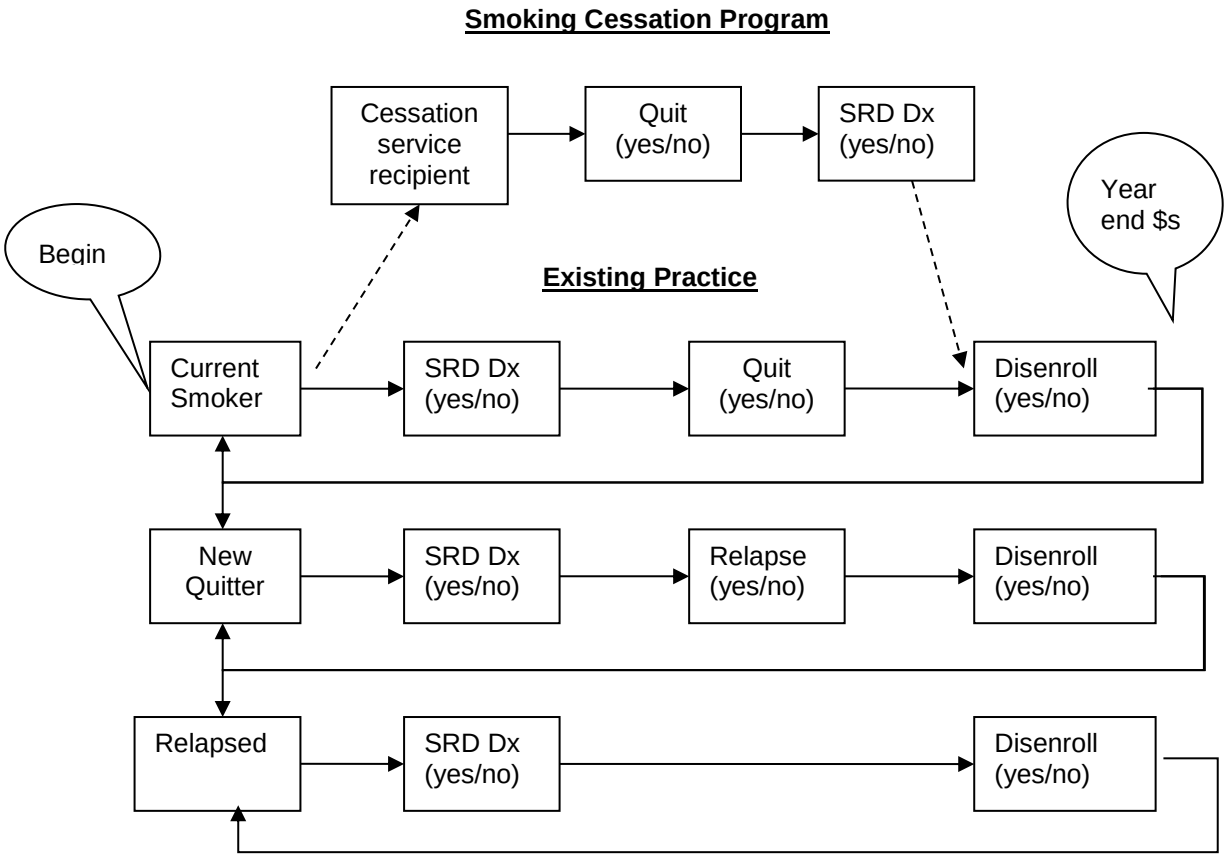
For each year, we used multivariate logistic regression to estimate the predicted probability of having at least one smoking-related disease (SRD) diagnosis, quitting given an SRD or not, and subsequent disenrollment by smoking and SRD status. We generated separate estimates for each sex; age group (18-34, 35-64, and 65+); and heavy (≥1 pack per day) and light (<1 pack per day) smokers. In years 2–5, the estimates included years since quit, prior-SRD-diagnoses, and relapse among quitters. We excluded data for disenrollees from subsequent annual estimates. To simplify the model, we averaged the annual probabilities overall years where year-to-year variations were not significant.

We calculated each year's annual healthcare expenditures for each group: continuing smokers, new quitters, existing former smokers, and never smokers. Mean annual medical expenditures were estimated separately for each smoking status group using one-part multivariate Generalized Linear Models.[8] Smoking-attributable productivity costs for current smokers and new quitters were estimated using work-time lost estimates from Warner and colleagues.[9]

A flow chart showing the model design is presented in Figure 1. The baseline cohort model is labeled the "existing practice." The intervention cohort has a different pathway during year 1, the intervention year, which is labeled "smoking cessation program." Figure 1 shows the pathway for current smokers at the time of the study. In the baseline existing practice condition, smokers could have a new SRD diagnosis or not, quit smoking or not, and disenroll or not. At the end of the year, medical and productivity costs are estimated. The cohort members remaining in the health plan return to the starting point as current smokers or new quitters. New quitters may relapse in subsequent years. Some people in the Kaiser Permanente Northwest (KPNW)

member population made an additional quit, but for model simplicity, we did not allow this pathway in the cohort model. Once someone relapsed, we assumed they stayed smoking.

Figure 1. ROI Calculator Flow Diagram for Years 1-5



For the intervention cohort, we separated current smokers into two groups: one group was reached by the intervention and either quit or stayed smoking based on the intervention efficacy; a second group was not reached by the intervention and either quit or stayed smoking based on the predicted probability of quitting in the baseline cohort. For intervention recipients, we estimated the probability of a new SRD diagnosis for continuing smokers and quitters. Cessation program recipients who remained smoking were modeled the same as if no intervention existed, i.e., they are treated the same as the baseline smokers. Program recipients who quit and have a new SRD are treated as if no intervention existed.

Estimating TPCC program effectiveness for two TPCC populations

The regions that make up the TPCC program population changed in 2013. From 2008-2012, the TPCC program included Travis, Bexar, Fort Bend, Gregg, Lubbock, and Smith counties (2015 population of 4,436,895). Beginning in 2013, the regions include Angelina, Brazos, Ellis, Galveston, Hidalgo, Lamar, Nacogdoches, Nueces, Red River, Rusk, Waller, and Wichita counties (2015 population of 2,748,004). The change in TPCC program population warranted separate analyses for some specific aims. This study uses TPCC1 and TPCC2 to reference the 2008-12 and 2013-2014 program populations, respectively. Population data were obtained from Census estimates for 2015.[10]

We use a difference in differences (DiD) approach[11] to estimate the impact of the TPCC1 and TPCC2 programs on adult smoking prevalence as of 2014, compared to the non-TPCC areas of Texas. A DiD methodology is useful for comparing population-level changes in some measure (e.g., smoking prevalence) between two populations, where one population is exposed to an intervention (e.g., the TPCC program), and the other is unexposed to the intervention but may otherwise be affected by other factors. For instance, adult smoking prevalence in Texas is substantially lower today compared to the mid-2000s prior to the beginning of the TPCC1 program. If the TPCC1 and TPCC2 programs are successful at reducing smoking rates, we would expect a higher rate of decline in prevalence in the TPCC program populations compared to the non-TPCC areas of the state. In other words, there should be a *difference* in the rates of decline in adult prevalence from 2004/7 to 2014 for the TPCC1 population compared to the non-TPCC1 Texas population (*differences*). Similarly, while it is too early to establish a trend for the TPCC2 population, we would expect a difference in the rates of decline in adult prevalence from 20011/13 to 2014 for the TPCC2 population compared to the non-TPCC2 Texas population.

For this report, we applied the DiD approach to estimates of adult smoking prevalence for the TPCC1, TPCC2, and non-TPCC Texas populations. The steps in this approach are presented in Tables 1 and 2 below. We obtained smoking prevalence data for Texas from the Behavioral Risk Factor Surveillance System (BRFSS)[12] by sex and age group. We created a weighted average (by county, age, and sex) 2014 smoking prevalence for the TPCC1 and TPCC2 populations using county-level population data for 2015, and BRFSS data from 2014 (the most recent available). Overall, smoking prevalence in Texas has declined from 19.4% in 2004/7 to 14.5% in 2014, a difference in prevalence of 4.9 points or 25.3% since 2004/7 (Table 1). In the

TPCC1 population, smoking prevalence declined from 19.2% in 2004/7 to 13.6% in 2014, a difference in prevalence of 5.6 points or 29.2% since 2004/7. These data indicate that there was a larger decline in smoking prevalence for the TPCC1 population compared to the non-TPCC1 Texas population of 0.7 prevalence points. Thus, smoking prevalence fell by 3.9% more from 2004/7 to 2014 compared to the non-TPCC1 Texas population.

Table 1. Estimating differences in changes in adult smoking prevalence from 2004/7 to 2014 for the 2008-2012 Tobacco Prevention and Control Coalition (TPCC1) program and non-TPCC1 Texas populations

				Smoking Prevalence 2004/7–14	
Population	**2004/7**	**2010**	**2014**	**Absolute decline**	**Percent decline**
Texas*	19.4%	15.8%	14.5%	4.9	25.2%
TPCC1	19.2%	14.8%	13.6%	5.6	29.2%
				0.7	**3.9%†**

*Excludes TPCC1 population. †Differences do match due to rounding. Source: Texas Behavioral Risk Factor Surveillance System.[12]

We used the same approach to compare changes in adult prevalence in the TPCC2 and non-TPCC2 Texas populations (Table 2). It is important to note that the Texas smoking rate estimates for 2010 and 2011/13 (Tables 1 and 2) are not directly comparable, so differences between the two rates should be ignored. The data indicate adult smoking declined from 18.2% in 2011/13 to 14.2% in 2014 in the TPCC2 population, a difference in prevalence of 4.0 points or 22.0% from 20011/13. In the non-TPCC2 Texas population, smoking prevalence declined from

Table 2. Estimating differences in changes in adult smoking prevalence from 2011/13 to 2014 for the 2013-18 Tobacco Prevention and Control Coalition (TPCC2) program and non-TPCC2 Texas populations

			Smoking Prevalence 20011/13–14	
Population	**2011**	**2014**	**Absolute decline**	**Percent decline**
Texas*	17.7%	14.5%	3.2	18.1%
TPCC2	18.2%	14.2%	4.0	22.0%
			0.8	**3.9%**

*Excludes TPCC2 population. Source: Source: Texas Behavioral Risk Factor Surveillance System.[12]

17.7% in 2011/13 to 14.5%, a difference in prevalence of 3.2 points or 18.1% since 20011/13. A comparison of the two populations suggests that adult prevalence declined 0.8 prevalence points more in the TPCC2 population compared to the non-TPCC2 Texas population, which represents a 3.9% difference between the two populations.

The TPCC2 results are preliminary, but similar to the TPCC1 results. Thus, we used the 3.9% difference in smoking rate decline to evaluate the TPCC1 and TPCC2 populations compared to no programs, respectively (Aim 1 below).

Aim 1: Net financial costs (savings) associated with the comprehensive TPCC program spending during 2008-2012 (TPCC1) and 2013-15 (TPCC2), compared to non-TPCC program areas.

Approach for Aim 1

This aim includes estimating: a) the cumulative annual healthcare expenditures and productivity costs over five years (2016-2020) associated with reduction in adult smoking during 2008-2015; and b) the net financial savings/costs from reductions in adult smoking associated with TPCC spending and changes in cigarette excise taxes during 2008-2014. Health care expenditures and productivity costs of smoking for Medicaid enrollees are also considered.

Separate analyses were conducted for the 2008-2012 (TPCC1) and 2013-2015 (TPCC2) populations. For the TPCC1 population, we used data from CHR's ROI Calculator to project mean annual healthcare expenditures and productivity costs over five years (2015-2019) for the population with and without the TPCC program. Costs were estimated assuming a 13.7% smoking rate for the TPCC1 population, which differed slightly from the 13.6% in Table 1 due to the additional population disaggregation (heavy/light smoking) adjustments used in the ROI Calculator. We used the DiD estimate to increase the overall smoking rate by 3.9% (to 14.1%) as if the program had not existed. We used the same procedure to estimate smoking rates for the TPCC2 population, with and without the program (14.2% and 14.8%, respectively).

We adjusted KPNW medical expenditure data to account for regional differences in medical costs and insurance plans to estimate medical expenditures for Texas smokers. Based on data from the Medical Expenditures Panel Survey, we multiplied all medical expenditures by 1.15 to

adjust West Coast figures into South region costs.[13] We then multiplied costs again by 1.06 to reflect cost differences between HMOs (such as KPNW) and all health plan types as a whole (including PPOs, fee-for service, and mixed plans).[14]

We estimated productivity losses from absenteeism and excess smoking breaks.[9] We estimated that men and women smokers had 3.9 and 2.1 extra absentee days per year, respectively, and spent an extra five minutes per workday on smoke breaks. We also assumed quitting would reduce absenteeism by a compounding rate of 25% per year for men and 45% for women. We further assumed that quitting would reduce smoke-break time by half in the first year. We did not include potential productivity costs while at work, smoking-related disability, or employee replacement costs. We also included the cost to employers associated with employee time spent receiving cessation services. Time lost from work was valued using private sector earnings data for Texas adjusted to 2015 using employment cost index.[15]

For our population-level analysis, we assumed all adults were covered by health insurance. About 25% of Texans lack health insurance coverage. We did not adjust the analysis for the uninsured because serious smoking-related disease incidence are typically treated regardless of insurance status, and the older age groups most likely to need care related to smoking are more likely to be insured than younger ages. Because we tested the impact of cessation for the entire population, including all health plans, we assumed no health plan disenrollment over the study period except for annual mortality.

We report total annual health care expenditures and productivity costs for each cohort, and expected total cost savings, costs per averted smoker, and savings per capita in discounted 2015 dollars over five years (2015-2019).[16]

Net financial returns on investment (discounted 2015 dollars) are estimated from cumulative spending in the TPCC1 and TPCC2 populations. We used state TPCC program spending data obtained from The Centers for Disease Control and Prevention (CDC). The Office on Smoking and Health tracks annual state and federal program allocation and expenditures, by program component, and made available through the STATE System.[5] We used state spending estimates for each year from 2008-2014 to estimate cumulative program spending, and annual per-capita spending, for each TPCC population.

Results for Aim 1

Cigarette smoking in the TPCC1 population. We estimated 13.7% of adults in the TPCC1 population smoked in 2014, based on the adjustments for heavy and light smoking by age and sex in the ROI Calculator. Assuming the TPCC1 program resulted in an additional 3.9% decline in smoking compared to the rest of the state, we estimated that the smoking rate in the TPCC1 population would have been 14.2% if the program had not existed (Table 3). We then estimated

Table 3. Healthcare and productivity costs and savings over 5 years from reductions in cigarette smoking in the 2008-12 Tobacco Prevention and Control Coalition (TPCC1) population (in millions)

	2015 Smoking Prevalence		
Cost Measure	**14.2%***	**13.7%**	**Cost Savings**
Healthcare Costs			
2015	$ 1,951	$ 1,917	$ 33
2016	$ 2,126	$ 2,107	$ 19
2017	$ 2,086	$ 2,069	$ 17
2018	$ 2,159	$ 2,138	$ 21
2019	$ 2,317	$ 2,304	$ 13
Total	**$10,639**	**$10,535**	**$ 104**
Productivity Costs			
2015	$ 477	$ 467	$ 9
2016	$ 439	$ 428	$ 11
2017	$ 402	$ 391	$ 11
2018	$ 368	$ 357	$ 10
2019	$ 335	$ 325	$ 10
Total	**$ 2,020**	**$ 1,969**	**$ 51**
Total Costs			
2015	$ 2,427	$ 2,385	$ 43
2016	$ 2,564	$ 2,535	$ 30
2017	$ 2,488	$ 2,460	$ 28
2018	$ 2,527	$ 2,496	$ 31
2019	$ 2,652	$ 2,629	$ 23
Total	**$12,659**	**$12,504**	**$ 154**

*Prevalence estimated assuming no TPCC1 (2008-12) program in the coalition population. Projected annual costs for the program area adults in 2015, in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

differences in healthcare expenditures and lost work time (productivity) for TPCC1 area adult smokers over five years beginning in 2015 (in discounted 2015 dollars).

Cost savings from the TPCC1 program. We estimated that adult smoking prevalence in the TPCC1 population would have been 14.2% without the tobacco control program instead of 13.7% with the program, or 17,830 fewer smokers in 2015 (Table 3). This decline in prevalence generated $154 million in costs savings associated with reduced healthcare expenditures ($104 million) and fewer lost days from work ($51 million) (reported in present value 2015 dollars). The TPCC1 program led to an estimated cost savings of $8,650 per quit and $46.50 per person in the TPCC1 population.

Return on Investment for TPCC1 program. We used program expenditure data to estimate the net financial return on investment (ROI) from tobacco control spending in the TPCC1 population. Between 2008 and 2012, about $19,842,500 was used to fund community coalitions, media campaigns, and cessation services in the TPCC1 area, or $0.89 per person per year in the six program counties. Another $32,448,500 was spent across the state during the same period, or $0.28 per person per year. We summed the per capita estimates into a single measure ($1.18) for the net ROI modeling.

We estimated that spending $1.18 per capita annually from 2008-12 for the TPCC1 program resulted in an overall net ROI of $8,735 per quit, $260 per smoker, and $28 per capita (discounted 2015 dollars) after five years (Table 4). After 5 years, net savings to health plans were $7,378 per quit, $220 per smoker, and $23 per person in the TPCC1 population. Net benefits to employers were positive and increasing overall all years. Neither health plans nor employers were assumed to share in the costs of the TPCC1 program.

Cigarette smoking among Medicaid eligible adults in the TPCC1 population. In Texas, 15.8% of adults received health care in 2015 that was covered by Medicaid.[17] Smoking prevalence is higher among Medicaid eligible adults compared to all adults. In 2015, male and female Medicaid recipients were twice as likely to smoke compared to the general population. Smoking rates in 2015 were 32.5% among adult males and 24.8% among adult females.[18] Using these proportions, we estimated that smoking prevalence for TPCC1 area Medicaid recipients was 26.8% in 2015.

Cost savings from reducing smoking among Medicaid eligible adults in the TPCC1 population. Assuming the TPCC1 program reduced smoking rates among Medicaid recipients by 3.9% between 2008 and 2014, we estimated that smoking prevalence would have been 27.8% for Medicaid recipients with no program (Table 5). This suggests that there are nearly 5,500 fewer smokers among Medicaid eligible adults because of the TPCC1 program. This decline in prevalence generated $48 million in cost savings associated with reduced healthcare expenditures ($32 million) and fewer lost days from work ($16 million) (reported in present value 2015 dollars). The TPCC1 program led to an estimated cost savings of $8,690 per quit and $91 per person in the TPCC1 Medicaid population.

Table 4. Cumulative annual net financial return on investment from total tobacco control spending during 2008-12 for the TPCC1 program area

	Total ROI*	Health plans	Employers
ROI per quit			
2015	$1,240	$2,370	$ 614
2016	$3,270	$3,729	$ 1,284
2017	$5,155	$4,965	$ 1,934
2018	$7,256	$6,463	$ 2,537
2019	$8,735	$7,378	$ 3,101
ROI per smoker			
2015	$37	$71	$18
2016	$97	$111	$38
2017	$154	$148	$58
2018	$216	$193	$76
2019	$260	$220	$92
ROI per capita			
2015	$3.92	$ 7.19	$ 1.94
2016	$10.34	$ 11.48	$ 4.06
2017	$16.30	$ 15.39	$ 6.12
2018	$22.95	$ 20.13	$ 8.02
2019	$27.62	$ 23.02	$ 9.81

*ROI estimates reflect added costs and benefits of tobacco control spending in the TPCC1 program population compared to no program spending. *Includes all employer, health plan, and TPCC program costs and savings. All costs are in discounted 2015 dollars.

Cigarette smoking in the TPCC2 population. Texas BRFSS data were used to estimate adult smoking prevalence before the TPCC2 program began (years 2011-13) and again in 2014. Even though only 2014 data were available, smoking prevalence among Texas adults

(excluding TPCC2 counties) fell from 17.7% in 2011-13 to 14.5% in 2014.[12] Over the same period, adult prevalence declined from 18.2% to 14.2% in the TPCC2 program population. We used a DiD approach to estimate that the TPCC2 program resulted in an additional 3.9% decline in smoking compared to the rest of the state. The additional decline in prevalence in the TPCC2 population is preliminary, but the effect is similar to what was found in the TPCC1 population. Consequently, we felt it was appropriate to assume that the TPCC2 program would

Table 5. Healthcare and productivity costs and savings over 5 years from reductions in cigarette smoking among Medicaid eligible adults in the TPCC1 population (in millions)

	2015 Smoking Prevalence		
Cost Measure	**27.8%***	**26.8%**	**Cost Savings**
Healthcare Costs			
2015	$605	$594	$10
2016	$659	$653	$6
2017	$647	$641	$5
2018	$669	$663	$6
2019	$718	$714	$4
Total	**$3,297**	**$3,265**	**$32**
Productivity Costs			
2015	$147	$144	$3
2016	$136	$132	$3
2017	$124	$121	$3
2018	$114	$110	$3
2019	$104	$101	$3
Total	**$624**	**$609**	**$16**
Total Costs			
2015	$752	$739	$13
2016	$794	$785	$9
2017	$771	$762	$9
2018	$783	$773	$10
2019	$821	$814	$7
Total	**$3,921**	**$3,873**	**$48**

*Prevalence estimated for Medicaid eligible adults assuming no TPCC1 (2008-12) program in the coalition population. Projected annual costs for the program area Medicaid eligible adults in 2015. All costs are in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

generate a 3.9% smoking rate decline in these counties compared to smoking prevalence if the program had not existed. We then estimated differences in healthcare expenditures and lost work time (productivity) for TPCC2 area adult smokers over five years beginning in 2015 (in discounted 2015 dollars).

Cost savings from the TPCC2 program. We estimated that adult smoking prevalence in the TPCC2 population would have been 14.7% without the tobacco control program instead of 14.1% with the program, or 11,020 fewer smokers in 2015 (Table 6). This decline in prevalence

Table 6. Healthcare and productivity costs and savings over 5 years from reductions in cigarette smoking as of 2015 in the 2013-18 Tobacco Prevention and Control Coalition (TPCC2) population (in millions)

	2015 Smoking Prevalence		
Cost Measure	**14.7%***	**14.1%**	**Cost Savings**
Healthcare Costs			
2015	$1,213	$1,192	$ 21
2016	$1,324	$1,312	$ 12
2017	$1,299	$1,288	$ 11
2018	$1,344	$1,331	$ 13
2019	$1,439	$1,432	$ 8
Total	**$6,619**	**$6,554**	**$ 65**
Productivity Costs			
2015	$ 291	$ 286	$ 6
2016	$ 268	$ 261	$ 6
2017	$ 246	$ 239	$ 7
2018	$ 225	$ 218	$ 6
2019	$ 205	$ 199	$ 6
Total	**$ 1,234**	**$ 1,203**	**$ 31**
Total Costs			
2015	$ 1,506	$ 1,478	$ 27
2016	$ 1,592	$ 1,574	$ 19
2017	$ 1,544	$ 1,527	$ 17
2018	$ 1,568	$ 1,549	$ 19
2019	$ 1,644	$ 1,630	$ 14
Total	**$ 7,854**	**$ 7,758**	**$ 95**

*Prevalence estimated assuming no TPCC2 (2013-18) program in the coalition population. Projected annual costs for the program area adults in 2015, in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

generated $95 million in costs savings associated with reduced healthcare expenditures ($65 million) and fewer lost days from work ($31 million) (reported in present value 2015 dollars). The TPCC2 program led to an estimated cost savings of $8,702 per quit and $48.25 per person in the TPCC2 population.

Return on Investment for TPCC2 program. We used program expenditure data to estimate the net financial return on investment (ROI) from tobacco control spending in the TPCC2 population. Between 2013-2015, about $14,014,400 was used to fund community coalitions, media campaigns, and cessation services in the TPCC2 area, or $01.70 per person per year in the six program counties. Another $20,435,400 was spent across the state during the same period, or $0.28 per person per year. We summed the per capita estimates into a single measure ($1.98) for the net ROI modeling. The results are presented in Table 7.

Table 7. Cumulative annual net financial return on investment from total tobacco control spending as of 2015 for the 2013-18 for the TPCC2 program area

	Society*	Health plans	Employers
ROI per quit			
2015	$1,259	$2,417	$607
2016	$3,317	$3,812	$1,270
2017	$5,216	$5,070	$1,912
2018	$7,322	$6,580	$2,507
2019	$8,797	$7,499	$3,064
ROI per smoker			
2015	$37	$71	$18
2016	$97	$111	$38
2017	$154	$148	$57
2018	$216	$193	$75
2019	$260	$220	$92
ROI per capita			
2015	$3.92	$7.19	$1.94
2016	$10.34	$11.48	$4.06
2017	$16.30	$15.39	$6.12
2018	$22.95	$20.13	$8.02
2019	$27.62	$23.02	$9.81

ROI estimates reflect added costs and benefits of tobacco control spending in the TPCC2 program population compared to no program spending. *Includes all employer, health plan, and TPCC program costs and savings. All costs are in discounted 2015 dollars.

We estimated that spending $1.98 per capita annually from 2013-15 for the TPCC2 program resulted in an overall net ROI of $8,797 per quit, $260 per smoker, and $28 per capita (discounted 2015 dollars) after five years (Table 7). After 5 years, net savings to health plans were $7,499 per quit, $220 per smoker, and $23 per person in the TPCC2 population. Net benefits to employers were positive and increasing overall all years. Neither health plans nor employers were assumed to share in the costs of the TPCC2 program.

Aim 2: estimate the net financial costs (savings) associated with expanding TPCC programs to all Texas counties, including the Peers Against Tobacco in counties that have colleges and universities

Approach for Aim 2

We address Aim 2 by estimating the incremental net financial savings (costs) over five years (2015-2019) associated with expanding the TPCC1 program to the entire state. We assumed a 14.5% Texas smoking prevalence rate would be reduced by 3.9% (to 13.9%) if the program were expanded to the state. We estimated total costs for the state-wide program using data from the 2008-2012 TPCC1 program. Cumulative program spending during that period amounts to $4.05 per capita for the TPCC1 population (2015 estimates). We thus assume a similar cumulative spending of about $111.2 million for the state that would achieve the observed 3.9% reduction smoking prevalence.

We report total annual health care expenditures and productivity costs for each cohort, and expected total cost savings in discounted 2015 dollars over five years (2015-2019). We also report total net ROI, ROI per quit, and ROI per capita. We also present results for health plans and employers.

Results for Aim 2

Assuming the TPCC1 program had been implemented statewide, we estimated that smoking prevalence among all Texas adults would have dropped to 13.9% instead of the current 14.5% (Table 8), or 114,400 fewer adult smokers in 2015 compared to no program. In 2015, there were about 2.9 million adult smokers in Texas.

We estimated that beginning in 2015, a 13.9% smoking rate would have generated a cumulative total costs savings of $991 million over five years compared to the current 14.5% smoking rate, from reduced healthcare expenditures and productivity losses (in discounted 2015 dollars). Potential healthcare cost savings over five years equaled $664 million, while productivity cost savings totaled $327 million. Overall, potential cost savings over five years equaled about $8,700 per quit and $49 per capita.

Table 8. Healthcare and productivity costs and savings over 5 years for Texas from a statewide expansion of the 2008-12 TPCC1 program compared to no program (in millions)

	2015 Smoking Prevalence		
Cost Measure	**14.5%***	**13.9%**	**Cost Savings**
Healthcare Costs			
2015	$12,223	$12,011	$212
2016	$13,342	$13,220	$123
2017	$13,105	$12,993	$111
2018	$13,588	$13,453	$135
2019	$14,578	$14,495	$83
Total	**$66,837**	**$66,172**	**$664**
Productivity Costs			
2015	$2,965	$2,905	$60
2016	$2,727	$2,659	$68
2017	$2,499	$2,430	$69
2018	$2,285	$2,219	$66
2019	$2,084	$2,020	$64
Total	**$12,560**	**$12,233**	**$327**
Total Costs			
2015	$15,189	$14,917	$272
2016	$16,069	$15,879	$191
2017	$15,603	$15,423	$180
2018	$15,873	$15,672	$201
2019	$16,662	$16,515	$147
Total	**$79,397**	**$78,406**	**$991**

*Prevalence estimated assuming no TPCC program. Projected annual costs for adults in 2015. All costs are in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

Return on Investment from expanding the TPCC1 program to the Texas population. We used program expenditure data from the TPCC1 program from 2005-12 to estimate the net

financial return on investment (ROI) from $1.18 per capita annual spending across 27.5 million Texas residents, or about $162 million in program spending over five years ($32.4 million each year).

We estimated that spending $1.18 per capita annually from 2008-12 for a statewide tobacco control program would have generated an overall net ROI of $8,785 per quit, $271 per smoker, and $29 per capita (discounted 2015 dollars) after five years (Table 9). After 5 years, net savings to health plans were $7,378 per quit, $220 per smoker, and $23 per person in the Texas population. Net benefits to employers were positive and increasing overall all years. Neither health plans nor employers were assumed to share in the costs of the TPCC1 program.

Table 9. Cumulative annual net financial return on investment from statewide expansion of the TPCC1 program compared to no program

	Net financial return on investment (ROI)		
	Society*	**Health plans**	**Employers**
ROI per quit			
2015	$1,284	$2,351	$616
2016	$3,316	$3,711	$1,288
2017	$5,201	$4,944	$1,940
2018	$7,301	$6,439	$2,544
2019	$8,785	$7,358	$3,111
ROI per smoker			
2015	$40	$73	$19
2016	$102	$114	$40
2017	$160	$153	$60
2018	$225	$199	$78
2019	$271	$227	$96
ROI per capita			
2015	$4.22	$7.42	$2.02
2016	$10.90	$11.89	$4.23
2017	$17.10	$15.94	$6.38
2018	$24.00	$20.85	$8.36
2019	$28.87	$23.87	$10.22

ROI estimates reflect added costs and benefits of tobacco control spending in the TPCC1 program population compared to no program spending. *Includes all employer, health plan, and TPCC program costs and savings. All costs are in discounted 2015 dollars.

Cost savings from reducing smoking among Texas Medicaid eligible adults. We assumed that if the TPCC1 program had been implemented statewide, 2015 smoking rates among Texas Medicaid recipients would be 3.9% lower than current estimates, or 28.4% instead of 29.2% (Table 10). This translates to about 24,500 fewer smokers in the Medicaid population, and an overall cost savings of $176 million over five years (2015-2019) compared to no program, including healthcare savings of $114 million and productivity savings of $62 million.

Table 10. Healthcare and productivity costs and savings over 5 years for Texas Medicaid eligible adults from a statewide expansion of the 2008-12 TPCC1 program compared to no program (in millions)

	2015 Smoking Prevalence		
Cost Measure	**29.2%***	**28.4%**	**Cost Savings**
Healthcare Costs			
2015	$3,902	$3,851	$51
2016	$4,260	$4,240	$21
2017	$4,185	$4,169	$16
2018	$4,341	$4,318	$23
2019	$4,657	$4,653	$4
Total	**$21,345**	**$21,230**	**$114**
Productivity Costs			
2015	$942	$931	$10
2016	$866	$853	$13
2017	$793	$780	$13
2018	$725	$713	$13
2019	$661	$649	$13
Total	**$3,988**	**$3,926**	**$62**
Total Costs			
2015	$4,843	$4,782	$61
2016	$5,126	$5,093	$33
2017	$4,978	$4,949	$29
2018	$5,066	$5,031	$35
2019	$5,318	$5,301	$17
Total	**$25,333**	**$25,156**	**$176**

*Prevalence estimated assuming no TPCC program. Projected annual costs for Medicaid eligible adults in 2015. All costs are in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

Aim 3: Estimate the net financial costs (savings) associated with the Peers Against Tobacco (PAT) program during 2015-2017, compared to no program

We do not yet know the impact or effective reach of the PAT program to reduce smoking rates among college students compared to students who are unexposed to the program. Consequently, the simulation results will be the same for the PAT schools and hypothetical state-wide expansion, so we conducted the evaluation using assuming a state-wide PAT program.

Approach for Aim 3

College students and smoking. About 52% of Texans ages 18-24 attend college, or a total of 1,444,116 students. Overall, 16.1%of Texas 18-24 year olds smoke. We used data from the Monitoring the Future (MTF) cohort studies to disaggregate this prevalence rate by college attendance and sex.[19] We also used MTF data to estimate the proportions of light and heavy smokers, by sex. Using these data, we estimated that 11.5% of Texas college students smoke. We assumed that the PAT program would achieve the same impact on smoking as the TPCC1 program, i.e., 3.9% reduction over five years. We prorated this effect over two years that the program has been in the field. After two years of a statewide PAT program, we expect the smoking rate among college students would decline to 11.3%. This modest effect is leading to an estimated 2-year prevalence decline to 11.2%.

Results for Aim 3

Cost savings from the PAT program. The estimated smoking prevalence reduction from a statewide program results in nearly 2,600 fewer smokers among Texas college students. We estimated that this reduced healthcare and productivity costs by $19 million over five years (in discounted 2015 dollars) (Table 11). Health plans could save $13 million and employers $6 million.

Net financial savings from the PAT program. The PAT program received $2.5 million in funding its first two years, or about $0.80 per college student. We used these data to estimate the net ROI for the program (Table 12). Cumulative net ROI per quit could be nearly $8,000 after five years, from a societal perspective (discounted 2015 dollars). Savings per quit are

substantial for both health plans and employers. Net ROI per capita was estimated to be about $11 overall.

Table 11. Healthcare and productivity costs and savings over 5 years for Texas from a statewide expansion of the PAT program compared to no program (in millions)

	2015 Smoking Prevalence		
Cost Measure	**11.5%**	**11.3%***	**Cost Savings**
Healthcare Costs			
2015	$550	$546	$5
2016	$578	$576	$2
2017	$554	$551	$2
2018	$530	$528	$2
2019	$556	$554	$1
Total	**$2,768**	**$2,755**	**$13**
Productivity Costs			
2015	$147	$145	$1
2016	$136	$134	$1
2017	$125	$124	$1
2018	$115	$114	$1
2019	$106	$105	$1
Total	**$629**	**$623**	**$6**
Total Costs			
2015	$697	$691	$6
2016	$714	$710	$4
2017	$679	$675	$4
2018	$646	$642	$4
2019	$661	$659	$3
Total	**$3,397**	**$3,377**	**$19**

*Prevalence estimated for 18-24 year olds assuming a hypothetical statewide PAT program reduced 2015 smoking rates among college students by 3.9% after FY2013-15 program spending. Projected annual costs for all 18-24 year olds in 2015. All costs are in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

Table 12. Cumulative annual net financial return on investment from a hypothetical statewide PAT program compared to no program

	Net financial return on investment (ROI)		
	Society*	**Health plans**	**Employers**
ROI per quit			
2015	$1,444	$2,482	$521
2016	$3,211	$3,684	$1,087
2017	$4,936	$4,859	$1,636
2018	$6,723	$6,118	$2,165
2019	$7,936	$6,842	$2,654
ROI per smoker			
2015	$17	$29	$6
2016	$37	$43	$13
2017	$57	$56	$19
2018	$78	$71	$25
2019	$92	$79	$31
ROI per capita			
2015	$1.91	$2.99	$0.69
2016	$4.26	$4.59	$1.44
2017	$6.55	$6.14	$2.17
2018	$8.92	$7.81	$2.87
2019	$10.52	$8.77	$3.52

ROI estimates reflect added costs and benefits of tobacco control spending for the PAT program for FY2013-15 in the 18-24 age group compared to no program spending. *Includes all employer, health plan, and TPCC program costs and savings. All costs are in discounted 2015 dollars.

Aim 4. Estimate the value of the Quitline's role in lowering the prevalence of tobacco use, including the impact at current level of use among the general population vs. increase reach at the CDC recommended funding level, overall and for smokers with mental health or substance abuse conditions.

Approach for Aim 4

We addressed Aim 4 for all Texas smokers, and smokers with mental health/substance abuse conditions, by first estimating quitline reach, utilization, program-related costs, and likely impacts on quitting over eight years (2008-15). Next, we used published information to estimate the potential utilization, program costs, and cessation for a hypothetical increase in tobacco control

program media campaign spending that meets the CDC's 2007 recommended funding level of $1.84 for Texas. We also estimated the impact of the existing program and expanded program on adult smoking prevalence overall and for adults with mental health and/or substance abuse conditions.

We obtained annual state quitline utilization and expenditure data for fiscal years 2008-15 from DSHS staff and CDC's Office on Smoking and Health STATE System.[16] CDC tracks state tobacco control program data that are made available on-line. Quitline utilization is available beginning in 2010 through the third quarter of FY2015. We obtained 2008-09 data from DSHS staff and projected FY2015 call volume for 4th quarter in order to complete the total quitline call estimate for 2008-15. Over eight years, data indicate that 81,844 smokers registered for quitline services (counseling and/or medications), or about 10,230 per year. This figure represents 0.35% of all Texas adult smokers in 2015. The CDC recommends that states enroll 6%-8% of smokers into a quitline program each year, which has been achieved when states make consistent efforts to promote smoking cessation and quitline services.[20] For this analysis, we used the existing quitline reach estimate of 0.35% and compared utilization, quitting, and costs assuming per capita media expenditures were increased to $1.84 per capita.

We obtained data on annual cessation expenditures for quitline services during 2008-2015 from DSHS staff. Total quitline program expenditures were about $8.4 million for state quitline services provided by Optum, Inc. (formerly Alere Wellbeing, Inc.). On average, total quitline program spending was about $103 per registered caller. An additional $2.4 million for non-telephone-based cessation programs was allocated during 2012-15 through the CPRIT program. This analysis assumes an average cost of $102.81 per quitline program recipient for the general Texas population.

A subgroup analysis was conducted for Texas adults with mental health and/or substance abuse problems. A 2013 national survey found that 18.5% of adults had at least one mental illness diagnosis, and 2.5% reported illicit drug dependence or abuse, in the past year.[21] Adults with a mental illness had much higher rates of drug dependence or abuse (7.1%) compared to adults with no mental illness (1.5%). Overall, 19.7% of adults reported having a mental illness and/or drug abuse condition. The same survey found that 32.6% of persons with mental illness reported smoking cigarettes. We applied these estimates to the Texas adult population for this evaluation.

Total media campaign expenditures for 2008-15, a primary resource for promoting quitting and quitline service use, were obtained from DSHS staff. Program expenditures for media campaigns totaled about $14.1 million during 2008-15, or an average of about $1.7 million per year. Annual per capita media campaign expenditures totaled $0.06 for the 2015 Texas population. CDC recommends (2007) that Texas allocate $1.84 per capita for media campaign expenditures, with would require an additional $1.78 per capita (about $5.2 million).

We assumed that 12.7% of quitline service recipients quit smoking successfully after six months, based on meta-analyses of research on quitline programs.[22] A recent follow-up study of quitline users in three states, including Texas, found similar results after adjusting for non-responders.[23] Smokers with mental health or substance abuse conditions have lower rates of successful quitting compared to the general population,[24] however, programs are effective. For this evaluation, we assumed that smokers could achieve an equivalent 12.7% quit rate if quitline callers received an intensive multi-session counseling program with eight weeks of quit medications and online support. We assumed callers enrolled in Optum's Quit for Life® program at a cost of $365 per recipient.

Results for Aim 4

The Texas state quitline provides cessation services to 10,231 adult smokers each year, at a cost of about $1.1 million dollars for quitline services (Table 13). Annual media campaign expenditures of nearly $1.8 million helps to drive smokers to the quitline. Assuming 12.7% of quitline users quit smoking, we estimated that the program helped 1,299 adult smokers quit at a cost per quit of $2,165, or $0.10 per capita.

We found that increasing media spending to match the CDC's 2007 recommendation of $1.84 per capita increased total annual media expenditures to about $50.5 million. We assumed the additional spending would increase quitline reach by 6% to a total smoking population rate of 6.35% for 2015. We estimated the annual costs for treating 185,828 registered quitline users would total about $19.1 million. If 12.7% of callers successfully quit smoking, there would be 23,600 new quitters at a total cost per quit of $2,951, or $2.54 per capita.

Table 13. Texas quitline utilization, program costs, and outcomes associated with existing and CDC recommended per capita media campaign spending

	TPCC media campaign spending	
	Existing	**CDC recommended**
Texas population in 2015		
Total, all ages	27,469,114	27,469,114
Adults (≥18 years)	20,183,646	20,183,646
Adult smokers (14.5%)	2,926,629	2,926,629
Media spending, annual*		
Per capita	$0.06	$1.84
Total	$1,760,998	$50,534,170
Quitline utilization, annual		
Register callers	10,231	185,828
% of smokers	0.35%	6.35%†
Quitline program costs, annual		
Total costs,	1,051,867	$19,105,309
Per recipient	$102.81	$102.81
Media and quitline effectiveness, annual		
Quit rate	12.7%	12.7%
New quitters	1,299	26,600
Total cost per quit	$2,165	$2,951
Total cost per capita	$0.10	$2.54
Quitline-related reduction in adult smoking prevalence, annual		
Adult smoking prevalence	14.50%	14.50%
Prevalence with quitline	14.49%	14.38%

*Annual estimates are the quotient of total program spending during 2008-15 and the number of years of expenditures.
†CDC suggests well-funded quitlines and media campaigns can reach 6-8% of smokers. We assumed the added media spending would increase reach by 6% above the existing 1.1% estimate.

We estimated that there are nearly 4 million Texas adults with a mental health or substance abuse (MH/SA) condition, and about 1.3 million smoking cigarettes (Table 14). If 0.35% of MH/SA smokers use the quitline, more than 4,500 are served annually at a cost of nearly $1.7 million (assuming each receive intensive treatment). Assuming 12.7% of MH/SA quitline users quit smoking, we estimated that the program helped 576 smokers quit at a cost per quit of $3,318, or $0.20 per capita.

We found that increasing media spending to match the CDC's 2007 recommendation of $1.84 per capita, and reach to 6.35%, would lead to 82,399 quitline participants among MH/SA smokers. The estimated the annual treatment costs would total about $30.1 million. If 12.7% of callers successfully quit smoking, there would be 10,465 new quitters at a total cost per quit of $3,574, or $1.36 per capita.

Table 14. Texas quitline utilization, program costs, and outcomes associated with existing and CDC recommended per capita media campaign spending for adults with mental health and drug abuse conditions

	TPCC media campaign spending	
	Existing	**CDC recommended**
Texas population in 2015		
Total, all ages	27,469,114	27,469,114
Adults (≥18 years) with MH/SA*	3,980,720	3,980,720
Adult smokers with MH/SA (32.6%)	1,297,715	1,297,715
Media spending, annual*		
Per capita	$0.06	$1.84
Total	$255,197	$7,324,525
Quitline utilization, annual		
Register callers	4,536	82,399
% of smokers	0.35%	6.35%‡
Quitline program costs		
Total costs, annual	1,655,775	$30,075,734
Per recipient†	$365	$365
Media and quitline effectiveness		
Quit rate	12.7%	12.7%
New quitters	576	10,465
Total cost per quit	$3,318	$3,574
Total cost per capita (Texas pop)	$0.07	$1.36
Quitline-related reduction in smoking prevalence for adults with MH/SA		
Adult smoking prevalence	32.60%	32.60%
Prevalence with quitline	32.59%	32.34%

*MH/SA: refers to persons with a mental health or substance abuse condition; 19.7% of Texas adults.†We assumed that smokers with MH and/or SA conditions would require multi-session coaching and 8 weeks of nicotine replacement therapy to achieve a 12.7% quit rate common in the general population. ‡CDC suggests well-funded quitlines and media campaigns can reach 6-8% of smokers. We assumed the added media spending would increase reach by 6% above the existing 1.1% estimate.

Quitline impact on smoking prevalence. Meta-analyses of quitline program effectiveness suggests that 12.7% of quitline participants are abstinent after six months,[22] which translates to 10,394 fewer smokers in Texas since 2008. In 2015, there were just over 2.9 million adult smokers in Texas. This suggests that the 14.5% smoking prevalence among Texas adults would have been about 14.55% if the quitline had not existed. In one year, if the state increased media campaign spending to the CDC recommended level, adult smoking prevalence would decline to 14.38% from 14.5%. For smokers with MH/SA conditions, smoking prevalence would decline from 32.6% to 32.3%.

Aim 5: Evaluate the impact of legislation to increase the legal smoking age to 21 years

Interest in increasing the smoking age and minimum age of purchase of all tobacco products has been steadily building in legislative circles. To date, Hawaii and California are the only states to have enacted Tobacco 21 laws (meaning that tobacco purchasers must be at least 21 years of age), but as of October 2016, 200 counties and cities across the U.S. have adopted similar measures as a tool for decreasing the burden of death and disease wrought by tobacco use.[24,25] Researchers and public health proponents have cited this legislation as a previously unused youth tobacco control measure that has the capacity to address early smoking initiation (which overwhelmingly leads to nicotine addiction and smoking as an adult and the primary means by which youth obtain their cigarettes—peer purchasers).[27-29]

While the U.S. Food and Drug Administration (FDA) has broad authority over the restriction of sales of tobacco products and marketing of these products to youth, it cannot mandate a minimum age of sale. A 2015 Institute of Medicine (IOM) report commissioned by the FDA outlined the projected potential public health outcomes of raising the minimum age of legal access to tobacco products (MLA) based on complex modeling.[28] It was projected that raising the MLA to 21 years of age would have its greatest impact on 15 to 17 year olds and that there would be a 12% reduction in smoking prevalence (when models calculated the change from 2015 to 2100). For the cohort born from 2000-2019, an immediate MLA increase would translate over time into 249,000 fewer premature deaths, 45,000 fewer deaths due to lung cancer, and 4.2 million fewer years of life lost. Additionally, by 2100, it was projected that there would be 286,000 fewer pre-term births, 38,000 fewer low birth weights, and 4,000 fewer sudden infant

death syndrome (SIDS) cases.[28] In addition to the projected long-term health effects, immediate health effects would ensue due to diminished smoking-related issues.

Approach for Aim 5

We used the ROI Calculator to estimate the healthcare and productivity cost savings associated with a hypothetical increase in the legal smoking age to 21 years across Texas, compared to no change in legal age. Increasing the smoking age to 21 can be an appealing method to reduce smoking. Most smokers begin regular smoking before age 18, and underage smokers typically obtain cigarettes through social sources. The impact on smoking prevalence among ages 18-20 is not well established. However, a recent study[30] estimated that over many decades, increasing the legal smoking age to 21 will reduce smoking rates by 12%. Assuming this reduction applies to each age, we modeled the impact on prevalence in the youngest age group in the ROI Calculator (ages 18-34) after a 3-year period. We reduced the existing smoking rate of 18-20 year olds within the 18-34 age group, essentially distributing the 12% reduction across 17 years in the age group. This reduced the smoking rate by from 15.6% to 15.2%.

Results for Aim 5

Cost savings from increasing the smoking age to 21. The reduction in smoking prevalence among Texas 18-34 year olds would lead to almost 30,500 fewer smokers in 2015 (Table 15). This decline in prevalence generated $185 million in costs savings over five years associated with reduced healthcare expenditures ($105 million) and fewer lost days from work ($80 million) (reported in present value 2015 dollars). While there are no programmatic costs associated with this policy change, the state would see a drop in excise taxes of about $110 per smoker each year, assuming a 1.5 pack per week consumption among quitters. The lost tax revenue totals about $3.4 million per year. Increasing the smoking age to 21 years could generate a net financial savings of nearly $182 million over five years.

Table 15. Healthcare and productivity costs and savings over 5 years for Texas 18-34 year olds from increasing the legal smoking age to 21 years compared to age 18 (in millions)

	2015 Smoking Prevalence		
Cost Measure	**15.6%**	**15.2%***	**Cost Savings**
Healthcare Costs			
2015	$3,509	$3,479	$30
2016	$3,698	$3,683	$15
2017	$3,498	$3,480	$19
2018	$3,394	$3,370	$24
2019	$3,584	$3,566	$18
Total	**$17,683**	**$17,577**	**$105**
Productivity Costs			
2015	$917	$903	$14
2016	$850	$834	$16
2017	$785	$768	$17
2018	$723	$706	$17
2019	$665	$649	$16
Total	**$3,940**	**$3,860**	**$80**
Total Costs			
2015	$4,426	$4,382	$45
2016	$4,548	$4,517	$31
2017	$4,283	$4,248	$36
2018	$4,117	$4,076	$41
2019	$4,249	$4,215	$34
Total	**$21,623**	**$21,437**	**$185**

*Prevalence decrease estimated assuming a hypothetical smoking age increase to 21 years as of 2012, reducing smoking rates for 15-17 year olds by 12% and for 18-34 year olds by 2.12% in 2015. Projected annual costs for 18-34 year olds in 2015. All costs are in discounted 2015 dollars. Discount rate reflects a 4.67% cost-of-capital for the medical services sector.

Aim 6. Estimating the impact of smoking on pregnant women, infants and unborn children

Approach for Aim 6

We addressed this aim by estimating the cumulative annual excess infant mortality and hospital costs over five years attributable to maternal smoking, and the potential benefits from reductions in maternal smoking. We used published data on infant mortality risks and hospitalization costs attributable to maternal smoking.

Smoking rates are modest among women of child bearing age (18-44 years) and declining. In Texas, 13.1% of women age 18-44 are current smokers.[31] Reported smoking during pregnancy is even lower, and also declining.[32] In 2010, 4.9% of women reported smoking during pregnancy. This rate fell to 3.9% in 2014. It is not known what proportion of this decline can be attributable to the TPCC program. County level data for 2013 indicate only 16% of births in the state were from counties in the 2008-12 TPCC program area.

Results for Aim 6

There were nearly 2 million live births in Texas from 2010 to 2014 (Table 16), and nearly 100,000 were born to women who smoked during pregnancy. Smoking during pregnancy is a known risk factor for premature birth and low birth weight, and increased risk of neonatal intensive care unit (NICU) admission.[33] Adams and colleagues estimated that smoking-attributable NICU admissions added $279 (2004 dollars) to the delivery costs for each mother who smoked, or $406 in 2015 dollars. Using these data, we estimated that that maternal smoking-attributable excess delivery costs for Texas were $34.6 million over five years (2010-14), or $1.26 for each Texas citizen.

Maternal smoking also increases the relative risk of death from sudden infant death syndrome (SIDS) by 2.7 times and short gestation/low birth weight (SGLBW) by 1.5 times.[34] Infant deaths are rare for SIDS and SGLBW, about 4 and 8.8 deaths per 10,000 population, respectively.[35] Using these data, we estimated that 207 infant deaths in Texas from 2010 to 2014 could have been prevented if mothers had not smoked during pregnancy.

The ROI calculator was not designed to estimate net financial savings from interventions that reduce maternal smoking. If the TPCC program reduced the percentage of Texas mothers who smoke during pregnancy by the same percentage as in the overall smoking population, perhaps 10 infant deaths could have been prevented from 2010-2014, and about $1.3 million could have been saved from reduced NICU admissions, or about $0.05 for each Texas citizen. This per capita savings would be in addition to the cumulative $28.87 per capita savings from a statewide TPCC program.

Table 16. Maternal smoking-attributable infant morbidity, mortality, and economic costs in Texas (2010-2014)

Maternal smoking prevalence	
Women age 18-44 (2014)	13.1%
Smoked during pregnancy (2010–14)	4.9%–3.9%
Number of live births (2010-14)	1,932,050
Number born to women who smoked	98,535
Maternal smoking RR of infant death	
Sudden infant death syndrome	2.7
Short gestation & low birth weight	1.5
Smoking-attributable infant deaths (2010-14)	
Sudden infant death syndrome	100
Short gestation & low birth weight	107
Smoking-attributable neonatal intensive care costs (2010-14) ($406 per smoker)	$34.6 million

Aim 7: discuss the status of impact research on ENDS, i.e. increase of youth prevalence of ENDs use and preliminary research on long term impact, and discuss the potential impact of implementing an excise tax on ENDS

This aim includes a brief overview of the evidence base for the use and health effects of Electronic Nicotine Delivery Systems (ENDS), primarily electronic or e-cigarettes. Establishing an excise tax for ENDs is considered, but the impacts of a tax on the demand for ENDs, or regular cigarettes, are unknown.

The Status of Impact Research on ENDS. Emerging data regarding patterns of use and the health consequences of using electronic nicotine delivery systems (ENDS) has fueled a public health debate about the future of these devices and the accompanying public policy implications. ENDS refer to a group of battery-operated devices that deliver a mixture of nicotine and other ingredients (typically propylene glycol or glycerin, flavorings, and other chemicals) to the user in an aerosol form.[36,37] E-cigarettes are the most highly utilized form of ENDS and nearly all available information on ENDS is informed by e-cigarette research. E-cigarettes—whose advertising has not been subject to the same regulations as traditional cigarettes—have been marketed as means for avoiding anti-smoking laws, as an alternative to traditional cigarettes, and as a smoking cessation aid.[38-40] In order to evaluate the long-term impact of ENDS utilization on individual users and the general public, this report describes what is currently known about ENDS, focusing on e-cigarettes and prevalence of use, regulation, public health debate, health effects, smoking cessation, and smoking initiation.

Adult Prevalence. Since the introduction of e-cigarettes into the marketplace around 2007, awareness and use among adults has increased rapidly. Data from the Center for Disease Control and Prevention's (CDC) nationally representative National Health Interview Survey (NHIS) indicated that in 2014, 12.6% of adults had ever tried an e-cigarette and 3.7% were current e-cigarette users.[38] Nearly half of current smokers (47.6%) and more than half of recent former smokers (55.4%) had tried e-cigarettes, while 15.9% of current smokers (dual-users) and 22.0% of recent former smokers (had quit cigarettes within the past year) were current users of e-cigarettes. Of adults who had never smoked combustible cigarettes, 3.2% had tried e-cigarettes, and this rate was the highest among adults between 18-24 years of age (9.7%).[38,41]

Youth Prevalence. Adolescent e-cigarette use has increased substantially in recent years.[37,42-45] According to National Youth Tobacco Survey data, between 2011 and 2015, past 30-day use of e-cigarettes by high schoolers went from 1.5% to 16.0% and by middle schoolers went from 0.6% to 5.3%.[44] With more than 3.0 million students using e-cigarettes, they became the most commonly used tobacco product among both middle and high school students in 2015. Data from the highly representative 2014 Texas Youth Tobacco Survey showed that about one quarter of middle and high school students had ever tired e-cigarettes (23.6%) and 14% of those students were current users.[45] At the time of data publication, the rate of use among Texas students was the highest state prevalence reported. Additionally, nearly 25% of the current e-cigarette users in the Texas sample had never smoked a combustible cigarette.[45]

Regulation & Public Health Debate. While the U.S. Food and Drug Administration (FDA) has not traditionally had regulatory power over e-cigarettes, they finalized a rule in May 2016 extending their authority over all tobacco products, including e-cigarettes.[46] As of August 8, 2016, it became illegal across the United States to: sell e-cigarettes to anyone under 18 years of age, provide free samples of e-cigarettes, and sell e-cigarettes in vending machines where anyone under 18 years of age would have access to the machine.[47] The FDA will also be requiring these newly regulated tobacco products to receive marketing authorization and to meet all applicable legal public health standards within a two-year period.[46] Prior to legislation passed in May 2015, the State of Texas did not prohibit sales of e-cigarettes to minors under 18 years of age.[48]

A public health debate continues over the potential benefits and harms of e-cigarette use on individuals and the general population. Many agree that the ideal role for e-cigarettes would be to aid current smokers in completely quitting (rather than dual-using) combustible cigarettes and to ultimately move society in a direction where there is little to no cigarette use.[37,39,40] However, there is concern that e-cigarettes have great potential to produce harm, especially to adolescents, pregnant women, and current smokers if they: re-normalize smoking behavior; lead to tobacco product use by youth and non-smokers (including serving as a gateway for future tobacco use); are used by pregnant women (harming the mother and fetus); lead former smokers to relapse; delay smoking cessation among those wanting to quit; and result in nicotine poisonings.[39,40,46] Aside from public health surveillance research, much of the current research findings surrounding e-cigarette use patterns, potential health effects, and their relationship to smoking cessation is mixed, complicating the picture for policymakers.

Health Effects. It is generally agreed that the long-term health effects of e-cigarettes are currently unknown.[39,49-51] Evidence is inconclusive with respect to the safety of short-term e-cigarette use, partially due to the non-standardized nature and sheer number of different ENDS products.[49,51] While the use of e-cigarettes is thought to provide less exposure to toxicants than traditional cigarettes, concern has been raised over its component ingredients and its aerosol product. E-cigarette aerosols are not purely water vapor, as is sometimes claimed; to date, studies have found evidence of the presence of heavy metals, ultrafine particulate, and cancer-causing agents (such as acrolein) within e-cigarette aerosol.[52,40] Some of these aerosols also contain glycerin, flavorings, and/or propylene glycol, whose safety is asserted by manufacturers

because of the general recognition that these substances meet the FDA definition of “Generally Recognized as Safe” (GRAS). It has been pointed out, however, that the GRAS definition only applies to the ingestion of substances, not their inhalation. Therefore, the safety of inhaling the substances present in e-cigarette aerosol, as well as secondhand exposure to this aerosol, is currently unknown.[39,40]

Nicotine, another e-cigarette ingredient, is highly addictive and particularly harmful to developing fetuses (exposed during pregnancy) and adolescents. It has been found to adversely affect fetal brain and lung development and to impact adolescent brain development.[53] Nicotine has also been demonstrated to have stronger rewarding effects on adolescents than adults, often leading to greater dependence on nicotine by adolescent smokers than adult smokers.[53]

In an effort to further characterize e-cigarette safety, the CDC analyzed calls to poison control centers in the U.S. between 2010 and 2014. Calls related to exposure to the e-cigarette device or to its accompanying liquid nicotine rose dramatically from 1 per month in 2010 to 215 per month in 2015. E-cigarette exposure calls were more likely to lead to later adverse health events than calls related to combustible cigarettes and were more likely to involve 0-5 year olds and >20 year olds.[54]

Although some instances of serious injuries or illness have been reported from e-cigarette use, the most commonly reported adverse health consequences of use are: mouth and throat irritation, nausea, vomiting, and coughing.[39]

ENDS and Smoking Cessation. The greatest potential public health benefit of e-cigarette use is as an aid to smoking cessation. E-cigarette manufacturers often cite this as a reason for e-cigarettes use, and physicians and quitlines are increasingly being asked about the safety and efficacy of e-cigarettes as a quit aid.[40] Current evidence about the efficacy of ENDS to promote smoking cessation is mixed and is generally treated as inconclusive.[39,40] Although early meta-analyses concluded that e-cigarettes may help smokers quit combustible cigarettes, the methodological soundness of the few randomized, controlled trials available at the time of analysis has been questioned, undermining the confidence of those initial conclusions.[39,55] A recent meta-analysis—in an effort to replicate and extend previous reviews by considering observational real-world studies and the use of control groups—concluded that the odds of

quitting smoking were actually 28% lower in those who had used e-cigarettes in comparison to those who had not, minimizing if not reversing, prior conclusions.[56]

Further, in 2015, the U.S. Preventive Services Task Force (a group of health authorities who make recommendations about preventive care and evidence-based medicine) published a report deeming the current evidence insufficient to recommend e-cigarettes be used as a tobacco cessation aid for adults, including pregnant women, and cited a lack of well-designed research trials on adverse events and smoking abstinence as a "critical gap" (p. 624) in the available evidence.[55] To conduct studies comparing e-cigarettes to FDA-approved smoking cessation methods in a clinical setting would require Investigational New Drug approval from the FDA and would need to be obtained by the e-cigarette companies; this has not occurred to date.[56]

ENDS and Smoking Initiation. E-cigarette facilitation of smoking initiation among adult non-users and adolescents is of great concern given that the U.S. Surgeon General has reported that the "burden of death and disease from tobacco use in the United States is overwhelmingly caused by cigarettes and other combusted tobacco products."[57] As with much of the research on e-cigarette use, the available evidence is unclear about the relationship between e-cigarette use and smoking initiation. Concern is high regarding e-cigarettes' potential to lead to adolescent smoking initiation.[36,40] The National Youth Tobacco Survey (2011-2013) determined that by 2013, more than 250,000 youth who had never smoked had used e-cigarettes, and they exhibited greater intention to smoke (43.9%) than did non-users (21.5%).[43]

Additional research has provided behavioral support for studies suggesting greater intention to smoke among adolescent e-cigarette users than their peers. One study found that the use of e-cigarettes at baseline significantly increased the odds that adolescents would smoke cigarettes a year later, even when the adolescents were classified as attitudinally non-susceptible (exhibited no intentions to smoke) to smoking.[58] Similarly, a study of Los Angeles high school students found that baseline use of e-cigarettes increased the odds that students would use any combustible tobacco product (cigarettes, cigars, and/or hookah) at both 6-months and 12-months post baseline. The authors note that the high association between adolescent dual users is unlikely to be purely the result of the progression from e-cigarettes to cigarettes; rather, it is likely that the relationship is bi-directional and/or that some other unknown factors are at play.[59] These early associations between baseline e-cigarette use and initiation of combustible

cigarette use cannot be taken as proof of causality, and further research is needed to clarify these observed relationships.[58,59] Lastly, concern has also been expressed that e-cigarettes may be recruiting medium-risk adolescents to tobacco use, meaning that youth who would not typically meet the risk criteria for becoming smokers are trying e-cigarettes and becoming tobacco users.[60]

State Policy Implications. State policymakers will need to determine how best to balance the potential benefits and harms of ENDS use without the conclusive knowledge about their long and short-term effects on health. The CDC's Office on Smoking and Health suggested states should: a) prohibit the use of ENDS where smoking is not currently allowed; b) enact prohibitions on sales or marketing of ENDS that encourages youth use of all tobacco products, including prohibiting sales to minors, strongly enforcing sales prohibitions, and allowing localities to enact more stringent guidelines to further prevent youth access to these products; and c) continue to uphold the strategies to reduce and prevent combustible tobacco use, "including tobacco price increases, comprehensive smoke-free laws, high-impact media campaigns, barrier-free cessation treatment and services, and comprehensive statewide tobacco control programs".[1]

Taxing ENDS. State and federal excise taxes have been an effective method for reducing cigarette consumption and prevalence. Econometric studies show that a 10% increase in the price of cigarettes (as the result of an increase in excise taxes) leads to consumption declines of 2%-6%.[60-62] The impact of a price increase on ENDS consumption has not been established. However, a recent study by Huang and colleagues[60] showed that a 10% increase in price led to a 12% decline in consumption of disposable e-cigarettes and a 19% decline for reusable e-cigarettes. The authors noted that this was 2-3 times the demand elasticity of regular cigarettes. Most e-cigarette users also smoke regular cigarettes. It is unknown whether making e-cigarettes more expensive to users will change their consumption of regular cigarettes.

Policymakers may opt to tax ENDS products using an excise tax or ad-valorem mechanism. The mechanism used will have different implications. For tobacco control purposes, excise taxes are effective and easy to administer; however, the impact on demand from a fixed excise tax will erode over time as general prices increase. An ad-valorem tax based on a percentage of the product price will adjust to prices over time, but will be more variable if prices fluctuate.[56]

Report Summary

This report quantifies the substantial health care and productivity cost savings in Texas that have been achieved from efforts to reduce adult smoking. Adult smoking prevalence has declined from 19.4% in 2007 to 14.5% in 2014. However, tobacco control program efforts in two coalition populations has led to an additional 3.9% cumulative decline in adult smoking. In the 2008-12 TPCC program area, smoking prevalence fell from 19.2% to 13.7% in 2014. Without the TPCC program, we estimated that 14.2% of adults would be smoking in 2015, which would have increased healthcare expenditures and productivity costs by $154 million from 2015 to 2019. We found that program spending of $19.8 million ($1.18 per capita annually) generated a net return on investment over five years of nearly $28 per capita (discounted 2015 dollars). Net savings per capita were about $23 for health plans and almost $10 for employers.

Since 2013, the TPCC program has achieved similar prevalence rate declines in a new group of 12 Texas counties. Smoking prevalence fell from 18.2% in 2010 to 14.1% in 2014. Without the TPCC program, we estimated that 14.7% of adults would be smoking in 2015, which would have increased healthcare expenditures and productivity costs by $95 million from 2015 to 2019. We found that program spending of about $14.0 million ($1.98 per capita annually) generated a net return on investment over five years of nearly $28 per capita (discounted 2015 dollars). Net savings per capita were about $23 for health plans and almost $10 for employers. Nearly identical results compared the 2008-12 TPCC program area.

We estimated the effects of a statewide TPCC program that matched the cumulative per capita costs and smoking rate decline from the 2008-12 TPCC program population. Over five years, total per capita of $4.05 led to a 3.9% reduction in adult smoking. A 3.9% smoking rate reduction would have reduced 2015 smoking prevalence from 14.5% to 13.9%, at a total cost of approximately $111 million. The potential costs savings were considerable. We estimated this program would save the state $991 million dollars over five years (2015-2019), including $664 million in reduced healthcare expenditures and $327 million in smoking-attributable lost work time. The net financial savings over five years would total about $29 per capita.

We evaluated the impact of the 2008-12 TPCC program on smoking prevalence and healthcare and productivity costs for the 15.8% of adults covered by Medicaid. We also considered the impact of a statewide program expansion for the Medicaid population. Smoking rates are higher

among adults with Medicaid compared the general population. We estimated that smoking prevalence was 26.8% in the adult Medicaid population. We then estimated that without the 2008-12 TPCC program, prevalence would have been 27.8%. Consequently, the TPCC program led to an estimated cost savings of $48 million over five years (2015-19). Statewide expansion of the 2008-12 TPCC program would have saved $176 million compared to no program.

In 2015, the TPCC program implemented the Peers Against Tobacco (PAT) program in 20 colleges and universities in selected areas across the state. The program appears to be well received by students and administrators, however, data are not yet available on the program impacts on college smoking. There are nearly 1.5 million college students in Texas. Given the lack of outcome data, we estimated potential impacts on smoking after years assuming PAT achieved similar cumulative reductions in smoking as was found with the 2008-12 TPCC program. We estimated that smoking prevalence among Texas college students was 11.3%, based on a 13.1% smoking rate for 18-24 year olds and data suggesting college students smoked at half the rate as similarly aged adults not in college. We estimated that a fully functioning statewide PAT program would reduce smoking prevalence from 11.3% to 11.2% after two years. We further estimated that this small reduction could save $19 million over five years from reduced healthcare expenditures and productivity losses. We estimated a net ROI of about $11 per capita after including the $2.5 million program expenditures over two years.

We evaluated the potential impact on young adult prevalence and costs savings associated with an increase of the legal age of smoking to 21 years. We used data suggesting a long-term decline in smoking rates of 12% due to a policy change. After a three-year period where 15-17 year olds aged into the ROI Calculator's 18-34 age category, we estimated that smoking prevalence in this group would fall to 15.2% from 15.6%. This would result in 30,500 fewer smokers as of 2015. Over 5 years, this reduction would save $185 million in healthcare expenditures and productivity costs. We estimated that the state would lose about $110 in reduced cigarette excise taxes for each prevented smoker, or $3.4 million total. Increasing the smoking age to 21 years could generate a net financial savings of nearly $182 million over five years.

Effectiveness of the Texas state quitline. The Texas state quitline has been an important component of the comprehensive tobacco control program. We estimated that there are more

than 10,000 fewer smokers in Texas because of the quitline and associated media campaign spending. However, if the state increased media campaign spending $1.84 per capita and increased quitline reach to 6.35% if adult smokers, more than 23,400 smokers would quit each year. Increased spending on media campaigns could substantially reduce smoking prevalence among adults with mental health or substance abuse conditions.

Reducing maternal smoking prevalence. Smoking rates among Texas women in child bearing age (18-44 years) is relatively low at 13.1%. About 4% of women who gave birth in 2014 reported smoking during their pregnancy. During 2010-2014, there were 98,535 live births to women who smoked. We estimated that these births cost the state $34.6 million in additional neonatal hospitalization costs. We also estimated that 207 infants died from maternal smoking-attributable sudden infant death syndrome and short gestation and low birth weight.

Electronic Nicotine Delivery Systems. The evidence base is sparse for the impact on ENDS on smoking initiation, cigarette smoking prevalence, and health outcomes. It appears that most ENDS users are also smokers, which makes it difficult to determine whether e-cigarettes are a gateway to regular smoking. It is well-known that most smokers want to quit completely. If smokers are using e-cigarettes to help quit regular smoking, e-cigarettes do not appear to be an effective method for quitting smoking. ENDS may be a safer alternative than cigarette smoking, but they do appear to carry health risks for users. It is too early to know how ENDS users will respond to increases in prices after the implementation of an excise tax. A recent study showed that a 10% increase in price led to a 12% decline in consumption of disposable e-cigarettes and a 19% decline for reusable e-cigarettes, which was 2-3 times the demand elasticity of regular cigarettes.[60]

Overall, this report demonstrates that resources allocated to reducing smoking in Texas has led to substantial health and economic benefits. The data suggests that expanding the TPCC program to cover all Texas counties would dramatically reduce smoking and save nearly $1 Texas nearly $1 billion in preventable healthcare expenditures and productivity losses over five years.

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