Tobacco Control Program Saves Money

Dilley JA, Harris JR, Boysun MJ, Reid TR. Program, policy, and price interventions for tobacco control: quantifying the return on investment of a state tobacco control program. Am J Public Health 2012;102:e22–8.

Study Overview

Objective. To examine the health effects of 3 tobacco control programs in Washington State: a comprehensive state tobacco control program, a policy banning smoking in public places, and cigarette price increases.

Design. Combination of survey, hospital administrative, and cancer registry data to quantify the return on investment (ROI) of a state tobacco control program over a 10-year study interval.

Setting and participants. The Behavioral Risk Factor Surveillance System was used to estimate the state prevalence of adult cigarette smoking from 1990 to 2009, and the National Health Interview Survey was used to estimate national adult smoking trends from 1990 to 2008. The Washington State Comprehensive Hospital Abstract Reporting System was used to obtain data on diagnoses (ICD-9 codes for ischemic heart disease, cerebrovascular disease, and respiratory diseases) and billing for hospitalizations related to smoking-related health outcomes. Cancer diagnoses were obtained from the Washington State Cancer Registry (lung, bronchus, tracheal, lip, oral cavity, pharynx, larynx, and esophageal cancer). The state's comprehensive tobacco control program was launched in 2000 and included a state-wide media campaign, tobacco quit line, and community and school programs. To study the program's effect, the authors created an interaction term as a product of the program and year, centered on the year 2000 so that the effect between 1999 and 2000 was 0, and increased incrementally over the subsequent years. The authors created similar interaction terms for smoke-free policy (in the workplace and in public places) and price effects.

Main outcome measures. The 2 outcomes measured were annual smoking prevalence and annual age-adjusted rates (per 100,000) for tobacco-related health outcomes (measured as hospitalizations and cancer incidence). The authors developed 2 linear models to independently assess the effects of the tobacco control program, smoke-free policy, and price on annual smoking prevalence and smoking-related health outcomes. Model 1 was the baseline model and model 2 adjusted for the declining national trend in tobacco use during the study period. ß coefficients represented the change in annual smoking prevalence or age-adjusted health outcomes associated with implementation of the program, policy, or price increase. The authors estimated the reductions in hospitalizations from smoking-

related health conditions that were associated with implementation of the program over the study time period. To calculate the ROI, the authors divided the average savings from reductions in hospitalizations by the total cost of the program over the same 10-year period.

Main results. Adult smoking prevalence in Washington State was slightly lower than the national average during the study time period. In Model 1, the program, policy, and price effects were associated with decreases in annual smoking prevalence; however, only the program effect was statistically significant (ß coefficient for the program effect –0.0088, $P < 0.01$). In Model 2, the program effect remained statistically significant (ß coefficient for the program effect –0.0097, $P < 0.02$) even after adjusting for declining national trends in smoking prevalence.

For age-adjusted smoking-related health outcomes (Model 1), the program effect significantly reduced the annual rate of hospitalizations for ischemic heart disease (ß coefficient for the program effect –9.51, $P < 0.001$), cerebrovascular disease (ß coefficient for the program effect –6.74, $P < 0.001$), and esophageal cancer incidence (ß coefficient for the program effect –0.37, $P < 0.004$). However, the program effect did not significantly reduce hospitalization rates for chronic respiratory diseases or incidence of larynx, oral, or lung cancers. While the coefficients for the smoke-free policy effect were negative for most conditions (ie, a smoke-free policy decreased annual hospitalizations rates for most smoking-related health outcomes), they attained statistical significance only for ischemic heart disease and cerebrovascular disease hospitalizations. The coefficients for the price effects were negative for most conditions, but were not statistically significant in any model. Adjusting for declines in national smoking trends over the study time period (Model 2) attenuated the coefficients for the program, policy and price effect on smoking-related health outcomes. While the program effect remained statistically significant for cerebrovascular disease hospitalizations and esophageal cancer incidence after adjusting for national trends, the effect on ischemic heart disease was no longer significant.

Because the program effects yielded significant declines in annual hospitalization rates for ischemic heart disease and cerebrovascular disease, the authors calculated reductions in hospitalizations for these 2 conditions. After adjusting for declining smoking prevalence, the study found that the program effect was associated with nearly 23,000 fewer ischemic heart disease and 13,000 fewer cerebrovascular disease hospitalizations over the study time period. Over a 10-year period, the cost savings was estimated to be $1.1 billion for ischemic heart disease and $400 million for cerebrovascular disease. An estimated $259.7 million was spent on the program over the study period, resulting in a ROI of $5 for every $1 spent on the program over the study period.

Conclusion. The implementation of a state tobacco control program prevented 36,000 hospitalizations from ischemic heart disease and cerebrovascular disease, yielding cost savings of $1.5 billion over a 10-year time period. The ROI for a comprehensive state tobacco control program was $5 for every $1 spent on the program.

Commentary

While previous studies estimated reductions in health care costs associated with a comprehensive tobacco control program [1,2], few have examined reductions in costs related to specific tobacco-related diseases. The current study examined the association of Washington State's comprehensive tobacco control program, smoke-free policy, and price increases and reductions in hospitalizations from tobacco-related cardiovascular, respiratory, and cancer conditions. The study found that the tobacco control interventions were associated with significant declines in smoking prevalence and in tobacco-related health outcomes over the 10-year study interval. Although the policy and price effects reduced rates of hospitalizations for some health conditions, the effect of the comprehensive tobacco control program was larger and more often significant. The authors estimated cost savings of $1.5 billion, and a ROI of $5 for every $1 spent on the program over a 10-year time period.

The 5-to-1 ROI calculated in this study was lower than the 50-to-1 ROI [1] observed in California and the 10-to-1 ROI in Arizona [2]. One possible reason for the large discrepancy in the ROI between the 3 studies is the manner in which savings were estimated. In this study, the $1.5 billion savings was restricted to reductions in hospitalizations from a select group of tobacco-related diseases and did not include savings from reductions in hospitalizations from other diseases where tobacco could have been a contributing factor (eg, diabetes), outpatient management of these diseases, or tobacco-related diseases that did not require hospitalizations. Thus, the

$1.5 billion savings is likely an underestimate of the total health care savings from such a program. Another possible reason is that the California and Arizona studies examined the combined effects of program, policy and price on reducing health care costs, whereas the current study estimated cost savings from only program implementation. Due to insufficient power, the authors were unable to examine the synergistic effects of program, policy, and price on decreases in smoking prevalence and age-adjusted health outcomes. Given that all 3 tobacco control interventions mostly reduced smoking prevalence and smoking-related health outcomes, the impact of the 3 interventions together might have been greater than any single intervention alone. As tobacco control interventions are rarely implemented in isolation, an analysis of the combined effects of the interventions would have strengthened this study and resulted in a more accurate estimate of cost savings.

It is noteworthy that the policy and price effects on smoking prevalence and age-adjusted health outcomes were less robust than the program effects, even as policy and price have been shown to be effective tobacco control interventions [3,4]. The authors suggested that over time the price increases might have been offset by inflation, suggesting that continuous increases in cigarette prices are necessary to balance the effect of inflation. In Washington State, many counties had voluntarily implemented clean air policies prior to the implementation of the state policy; the effects on smoking prevalence and health outcomes may have been partially achieved prior to the study time period. The statewide program may have had some overlap with the policy and price components, which could have further attenuated the effects of the latter.

The authors note that evidence of declines in smoking prevalence may result in states erroneously withdrawing funding for tobacco control programs. The authors present a case example of Oregon State where decreases and increases in cigarette consumption paralleled funding and de-funding of a state tobacco control program. This study adds to the growing body of evidence that the costs related to funding a tobacco control program are largely offset by the savings from reduced health care costs over a relatively short period of 10 years.

The study has several limitations. To link the effects of tobacco control interventions with smoking-related health outcomes and health care costs, the authors had to rely on disparate sources of data that did not overlap for the entire study time period. Data on national trends were unavailable for the entire time period of the study, thereby limiting the power for the nationally adjusted models. The authors did not have hospitalization data after 2008 or cancer incidence data after 2007, and had to rely on earlier data to estimate effects for 2009–2010. This may have underestimated the effects because they did not account for population growth and the medical cost inflation between 2009 and 2010. The authors excluded hospitalizations for Washington residents who received treatment in other states or in military hospitals, thereby underestimating total hospitalization numbers. The absence of an effect on some tobacco-related health conditions such as chronic respiratory diseases and larynx and oral cancers suggests that the study may have benefitted from a longer analysis time to discern a measurable effect. As with all administrative data, there is a potential for misclassification of heath outcomes, which could have contributed to the absence of an effect for some tobacco-related health conditions.

Applications for Clinical Practice

The results of this study suggest that tobacco control interventions have resulted in decreases in hospitalizations from smoking-related health conditions such as ischemic heart disease, stroke, and cancer. These reductions resulted in substantial savings over a period of 10 years, with a ROI of $5 for every $1 spent on the program. From a population perspective, these results suggest a need for continued funding of tobacco control programs to yield further declines in smoking prevalence and smoking-related health outcomes.

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References

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