

PENNS<sup>T</sup>ATE

---



## **Potential Costs and Benefits of Smoking Cessation for New Jersey**

Jill S. Rumberger, PhD

Assistant Professor

Pennsylvania State University, Capital College, School of  
Public Affairs, Harrisburg, PA

Christopher S. Hollenbeak, PhD

Associate Professor

Pennsylvania State University, College of Medicine, Departments of Surgery and  
Public Health Sciences, Hershey, PA

David Kline

Research Associate Intern

Pennsylvania State University, College of Medicine, Department of Health  
Evaluation Services, Hershey, PA

April 30, 2010

### **Acknowledgements**

This study was made possible by a grant from Pfizer Inc.

## Executive Summary

**Background.** Cigarette smoking is the single leading cause of preventable disease and preventable death in the United States (US), leading to more than 400,000 deaths annually. The CDC and the U.S. Department of Health and Human Services have both issued guidelines on smoking cessation to help people to quit smoking that include: access to counseling, access to all FDA-approved over-the-counter and prescription medications; multiple quit attempts; and reduced or eliminated co-pays. However, access to these aids is limited since many payers do not cover these treatments. The objective of this study was to determine whether the cost of making such smoking cessation programs available at the state level could be justified by the benefits.

**Methods.** We performed a cost-benefit analysis of access to smoking cessation programs using a societal perspective using state specific data. Smoking cessation programs based on three treatment alternatives were studied: nicotine replacement therapy (NRT), bupropion, and varenicline. Each approach was evaluated with and without individual counseling. Benefits were estimated as reductions in medical expenditures, premature deaths and increased workplace productivity. Costs were estimated as direct cost of the smoking cessation programs, the lost tax revenue to the public sector and the lost revenue to retailers and distributors, since smokers who quit will no longer purchase cigarettes. Other model parameters included how many smokers take advantage of the programs and the programs' effectiveness in helping smokers to quit. The cost-benefit model was parameterized using data from CDC, and various national surveys, including the Behavioral Risk Factors Surveillance Survey and the Current Population Survey.

**Results.** Results from our model suggested that in New Jersey the annual direct costs to the economy attributable to smoking were in excess of \$8.3 billion, including workplace productivity losses of \$1.8 billion, premature death losses of approximately \$2.9 billion, and direct medical expenditures of \$3.6 billion. While the retail price of a pack of cigarettes in New Jersey is on average \$7.48, the combined medical costs and productivity losses attributable to each pack of cigarettes sold are approximately \$30.29 per pack of cigarettes. The ratio of benefits to cost varies from \$0.91 to \$2.65 saved per dollar spent on smoking cessation programs, depending upon the type of intervention. Nicotine replacement therapies, generic bupropion and varenicline showed substantial benefits to costs from the societal perspective across the sensitivity ranges used for treatment effectiveness. Only brand name bupropion did not have a positive benefits to cost ratio at the low end of the range. Detailed results can be found in Tables 1-8, which are attached.

**Conclusions.** For most smoking cessation treatments, the benefits of smoking cessation programs statewide greatly outweigh the cost to implement them.

## Tables

Table 1: Baseline data on smokers and smoking in New Jersey.

<b>Variable</b>	<b>Total</b>
Resident Smokers in NJ <sup>1</sup>	1,181,224
Visiting Smokers in NJ <sup>2</sup>	93,785
Total Smokers	1,275,009
Total Packs Sold to Residents	275,153,827
Total Packs Sold to Visitors	21,846,173
Total Packs Sold <sup>3</sup>	297,000,000
Average Packs Per Resident Smoker Per Year	233

<sup>1</sup> Data from the Behavioral Risk Factor Surveillance System, New Jersey Calculated Variable Data Report, 2005. Retrieved on October 5, 2009 from:

[http://apps.nccd.cdc.gov/s\\_broker/htmsql.exe/weat/freq\\_analysis.hsqli?survey\\_year=2005](http://apps.nccd.cdc.gov/s_broker/htmsql.exe/weat/freq_analysis.hsqli?survey_year=2005)

<sup>2</sup> Data from <http://visitnj.org/sites/visitnj.org/files/2008-04-tourism-ecom-impact.pdf>, New Jersey Tourism Preliminary 2008 Results.

<sup>3</sup> Data from <http://www.tobaccofreekids.org/research/factsheets/pdf/0099.pdf>, Campaign for Tobacco Free Kids.

Table 2: Total productivity losses attributable to smoking. Includes productivity losses due to premature death, and workplace productivity losses due to absenteeism and the net loss of productive work time.

<b>Component</b>	<b>Total</b>	<b>Per Pack</b>	<b>Per Smoker</b>
<b>Premature Death<sup>1</sup></b>			
Men	\$1,829,077,272	\$12.87	\$2,996.80
Women	\$1,060,672,518	\$7.98	\$1,857.96
<b>Combined</b>	\$2,889,749,790	\$10.50	\$2,446.40
<b>Workplace Productivity<sup>2</sup></b>			
Current Smokers <sup>3</sup>	\$1,234,089,494	\$4.49	\$1,044.75
Former Smokers <sup>4</sup>	\$580,673,170	\$2.11	\$491.59
<b>Combined</b>	\$1,814,762,665	\$6.60	\$1,536.34
<b>Total Productivity Losses</b>	\$4,704,512,454	\$17.10	\$3,982.74

Adjusted for inflation to 2009

<sup>1</sup>. SAMMEC. Adult Smoking-Attributable Mortality, Morbidity, and Economic Costs Calculator. Atlanta, GA: CDC; 2008.

<sup>2</sup>. Data from Bunn WB, 3rd, Stave GM, Downs KE, Alvir JM, Dirani R. Effect of smoking status on productivity loss. J Occup Environ Med 2006 Oct;48(10):1099-108.

<sup>3</sup>. Per Bunn et al. total cost per current smoker in the labor force is \$4430, with a net effect of lost productivity of \$1807.

<sup>4</sup>. Per Bunn et al. total cost per former smoker in the labor force is \$2623, with a net effect of \$623.

Table 3: Direct expenditures on medical care attributable to smoking and smoking-related events in New Jersey. Total expenditures per pack for both medical care and productivity losses are \$30.29 per pack.

<b>Cost Component<sup>1</sup></b>	<b>Total</b>	<b>Per Pack</b>	<b>Per Smoker</b>
<b>Adult Expenditures</b>			
Ambulatory Care	\$546,280,113	\$1.99	\$462.47
Hospital Care	\$1,723,628,826	\$6.26	\$1,459.19
Rx	\$686,786,749	\$2.50	\$581.42
Nursing Home	\$369,435,553	\$1.34	\$312.76
Other Care <sup>2</sup>	\$299,182,235	\$1.09	\$253.28
<b>Total</b>	<b>\$3,625,313,476</b>	<b>\$13.18</b>	<b>\$3,069.12</b>
<b>Neonatal Expenditures</b>	<b>\$4,699,584</b>	<b>\$0.02</b>	<b>\$3.98</b>
<b>Total Expenditures</b>	<b>\$3,630,013,060</b>	<b>\$13.19</b>	<b>\$3,073.09</b>

Adjusted for inflation to 2009

<sup>1</sup>. SAMMEC. Adult Smoking-Attributable Mortality, Morbidity, and Economic Costs Calculator. Atlanta, GA: CDC; 2008.

<sup>2</sup>. Other Care includes home health, nonprescription drugs, and nondurable medical products.

Table 4: Components of cigarette prices, including taxes, distributor markups, and retailer markups.

<b>Component</b>	<b>Price</b>
Factory Price <sup>1</sup>	\$2.36
Total Taxes	\$4.20
Federal Tax <sup>2</sup>	\$1.01
State Tax <sup>2</sup>	\$2.70
State Sales Tax <sup>3</sup>	\$0.49
Distributor & Retailer Mark-ups <sup>1</sup>	\$0.92
<b>Final Retail Price</b>	<b>\$7.48</b>

Adjusted for inflation to 2009

<sup>1</sup> Economic Research Service, U.S. Department of Agriculture, Tobacco Briefing Room, "Most Frequently Used Tables," Number 9, <http://www.ers.usda.gov/Briefing/tobacco>, downloaded January 23, 2007 (adjusted to reflect Philip Morris price cuts to four of its major brands).

<sup>2</sup> Data from <http://www.tobaccofreekids.org/research/factsheets/pdf/0099.pdf>, Campaign for Tobacco Free Kids.

<sup>3</sup> Data from <http://www.rjrt.com/StateMsaPayments.aspx>, State MSA Payments.

Table 5: Costs for smoking cessation treatments. Costs are for a full course of treatment, which varies by treatments.

<b>Treatment</b>	<b>Alone</b>	<b>With Counseling</b>
NRT	\$231	\$371
Bupropion (Brand)	\$354	\$494
Generic Bupropion	\$203	\$343
Varenicline	\$300	\$440

Source: Treatment costs are at national retail pricing from Drugstore.com (2009). Prices were adjusted to 2009 dollars.

Table 6: Marginal treatment effectiveness, including baseline values and ranges used in sensitivity analysis.

Treatment Option	Marginal Treatment Effectiveness		
	<i>Baseline</i>	<i>Low</i>	<i>High</i>
NRT <sup>1</sup>	5.8%	5.0%	6.6%
Bupropion (Brand) <sup>2</sup>	7.0%	5.4%	8.6%
Generic Bupropion <sup>2</sup>	7.0%	5.4%	8.6%
Varenicline <sup>3</sup>	14.9%	10.2%	20.4%
NRT Plus Counseling	8.0%	7.1%	8.9%
Bupropion (Brand) Plus Counseling	9.3%	7.6%	11.3%
Generic Bupropion Plus Counseling	9.3%	7.6%	11.3%
Varenicline Plus Counseling	18.5%	13.0%	24.8%

<sup>1</sup>. Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev* 2004(3):CD000146.

<sup>2</sup>. Hughes JR, Stead LF, Lancaster T. Antidepressants for smoking cessation. *Cochrane Database Syst Rev* 2007(1):CD000031.

<sup>3</sup>. Cahill K, Stead LF, Lancaster T. Nicotine receptor partial agonists for smoking cessation. *Cochrane Database Syst Rev* 2007(1):CD006103.



Table 7: Results of cost-benefit analysis at baseline marginal effectiveness

<b>Costs/Benefits</b>	<b>No Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$48,236,465	\$58,072,442	\$58,072,442	\$124,226,041
Costs of Cessation Program	\$27,286,274	\$41,851,948	\$23,932,779	\$35,382,384
Lost Tax Revenue	\$6,687,242	\$8,050,849	\$8,050,849	\$17,222,026
Lost Business Revenue	\$1,466,476	\$1,765,508	\$1,765,508	\$3,776,698
<b>Benefit/Cost Ratio</b>	<b>1.36</b>	<b>1.12</b>	<b>1.72</b>	<b>2.20</b>

  

<b>Costs/Benefits</b>	<b>Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$66,473,508	\$77,784,881	\$77,784,881	\$153,861,521
Costs of Cessation Program	\$43,823,410	\$58,389,084	\$40,469,915	\$51,919,520
Lost Tax Revenue	\$9,215,527	\$10,783,675	\$10,783,675	\$21,330,529
Lost Business Revenue	\$2,020,916	\$2,364,802	\$2,364,802	\$4,677,670
<b>Benefit/Cost Ratio</b>	<b>1.21</b>	<b>1.09</b>	<b>1.45</b>	<b>1.97</b>

Adjusted for inflation to 2009

Table 8: Sensitivity analysis of cost-benefit analysis at low values of marginal effectiveness

<b>Costs/Benefits</b>	<b>No Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$41,723,797	\$45,290,860	\$45,290,860	\$84,960,636
Costs of Cessation Program	\$27,286,274	\$41,851,948	\$23,932,779	\$35,382,384
Lost Tax Revenue	\$5,784,361	\$6,278,880	\$6,278,880	\$11,778,483
Lost Business Revenue	\$1,268,479	\$1,376,925	\$1,376,925	\$2,582,958
<b>Benefit/Cost Ratio</b>	<b>1.22</b>	<b>0.91</b>	<b>1.43</b>	<b>1.71</b>

  

<b>Costs/Benefits</b>	<b>Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$58,983,940	\$63,086,063	\$63,086,063	\$108,706,305
Costs of Cessation Program	\$43,823,410	\$58,389,084	\$40,469,915	\$51,919,520
Lost Tax Revenue	\$8,177,214	\$8,745,910	\$8,745,910	\$15,070,454
Lost Business Revenue	\$1,793,219	\$1,917,931	\$1,917,931	\$3,304,870
<b>Benefit/Cost Ratio</b>	<b>1.10</b>	<b>0.91</b>	<b>1.23</b>	<b>1.55</b>

Adjusted for inflation to 2009

Table 9: Sensitivity analysis of cost-benefit analysis at high values of marginal effectiveness

<b>Costs/Benefits</b>	<b>No Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$54,632,109	\$72,053,177	\$72,053,177	\$169,852,214
Costs of Cessation Program	\$27,286,274	\$41,851,948	\$23,932,779	\$35,382,384
Lost Tax Revenue	\$7,573,900	\$9,989,063	\$9,989,063	\$23,547,392
Lost Business Revenue	\$1,660,916	\$2,190,548	\$2,190,548	\$5,163,817
<b>Benefit/Cost Ratio</b>	<b>1.50</b>	<b>1.33</b>	<b>2.00</b>	<b>2.65</b>

  

<b>Costs/Benefits</b>	<b>Counseling</b>			
	<i>NRT</i>	<i>Bupropion (Brand)</i>	<i>Generic Bupropion</i>	<i>Varenicline</i>
Medical Expenditures Avoided Plus Productivity Gains	\$73,828,499	\$93,862,727	\$93,862,727	\$206,331,620
Costs of Cessation Program	\$43,823,410	\$58,389,084	\$40,469,915	\$51,919,520
Lost Tax Revenue	\$10,235,184	\$13,012,621	\$13,012,621	\$28,604,699
Lost Business Revenue	\$2,244,521	\$2,853,598	\$2,853,598	\$6,272,857
<b>Benefit/Cost Ratio</b>	<b>1.31</b>	<b>1.26</b>	<b>1.67</b>	<b>2.38</b>

Adjusted for inflation to 2009