The Economic Impacts of the Tobacco Settlement

David M. Cutler
Jonathan Gruber
Raymond S. Hartman
Mary Beth Landrum
Joseph P. Newhouse
Meredith B. Rosenthal

Abstract

Recent litigation against the major tobacco companies culminated in a master settlement agreement (MSA) under which the participating companies agreed to compensate most states for Medicaid expenses. Here the terms of the settlement are outlined and its economic implications analyzed using data from Massachusetts. The financial compensation to Massachusetts (and other states) under the MSA is substantial. However, this compensation is dwarfed by the value of the health impacts induced by the settlement. Specifically, Medicaid spending will fall, but only by a modest amount. More importantly, the value of health benefits ($65 billion through 2025 in 1999 dollars) from increased longevity is an order of magnitude greater than any other impacts or payments. The net efficiency implications of the settlement turn mainly on a comparison of the value of these health benefits relative to a valuation of the foregone pleasure of smoking. To the extent that the value of the health benefits is not offset by the value of the pleasure foregone, the economic impacts of the MSA will include a share of these health benefits. © 2002 by the Association for Public Policy Analysis and Management.

INTRODUCTION

The recent litigation undertaken by the Attorneys General of several states against the major tobacco companies culminated in November 1998 in a well-publicized settlement.[1] The settlement, the terms of which are made explicit in a master settlement agreement (the MSA), involves the largest sum of money paid in any civil litigation in American history.[2] While the final amount of the settlement is contingent upon certain future events, especially tobacco sales, the tobacco manufacturers have agreed to pay 46 states about $105 billion (in present value) through 2025 to compensate for health care expenses the Medicaid program has incurred.

In this paper the authors analyze the economic impacts of the MSA, showing that the main result of the settlement is equivalent to a 45¢ per pack tax increase and computing its effect on state revenues and longevity. The analysis focuses on Mas-

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[1] A copy of the settlement can be found at www.naag.org/tobac/index.html. The MSA resolves payments to 46 states. Florida, Minnesota, Mississippi, and Texas had previously reached a settlement with the tobacco manufacturers.

[2] See http://www.courttv.com/trials/tobacco/national/111698_ctv.html. Although the claim to be the largest settlement is likely based on nominal undiscounted values through 2025, the authors believe the settlement is the largest sum paid in real terms as well.

sachusetts, the state for which the authors have particular expertise and data, but key conclusions will generalize to other states.[3] That is because the conclusions are driven by the health benefits and other effects on smokers, which should be independent of the state of residence, rather than details of the state's Medicaid program, which differs among the states with respect to coverage, eligibility, and reimbursement levels.

The MSA has several components. First, the MSA specifies monetary payments from the tobacco companies to state governments. For Massachusetts, the payments are estimated to be $4 billion in present value through 2025.[4] These payments are being financed by higher cigarette prices. Additional revenues to state governments are valuable for those entities and the citizens they represent. But for the economy as a whole they are simply transfers from one party, future smokers, to another party, all the citizens of the state. Transfers do not by themselves affect economic efficiency.[5]

The increase in cigarette prices to finance the payments, however, will reduce the demand for cigarettes. In addition, the MSA prohibits or restricts certain forms of advertising, such as cartoon characters and tobacco-company sponsorship of public events. Furthermore, the MSA funds tobacco counter-advertising that may convince people to quit or not begin smoking. The increase in prices and counter-advertising will likely reduce cigarette consumption, and ultimately reduce smoking by an estimated 11–13 percent of baseline amounts. Almost all of this reduction, 90 percent of it, stems from the price increase, and the remaining 10 percent from the counter-advertising campaign.

The reduction in cigarette consumption will affect society in two ways. First, reduced cigarette consumption will reduce the external costs associated with cigarettes. Lower rates of smoking in the future will translate into lower Medicaid spending, the savings from which directly benefit taxpayers. Indeed, taxpayers benefit both from the reduced taxes needed to finance Medicaid and the reduced deadweight loss from lower overall tax rates. The gains of reduced Medicaid spending are calculated to be relatively small, however—only about $0.1 billion to Massachusetts in present value from 1999 to 2025. This savings is perhaps one-fortieth of the direct payments to the state and less than a tenth of a percent of the present value of future direct spending by the state.[6] The savings in deadweight loss, of course, is substantially smaller. Given the size of these numbers, the authors believe they can ignore other effects on state programs, such as state employee health insurance.[7]

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[3] The Commonwealth of Massachusetts retained the authors as experts on Medicaid costs incurred because of smoking (see Cutler et al., 1998a,b,c). Massachusetts has 2.3 percent of the national population and its Medicaid spending is 3.3 percent of the national total. Thus, the values for Massachusetts can be roughly extrapolated to the nation as a whole by multiplying the Massachusetts values by a factor of 30 to 40.

[4] Though the MSA in some cases predicts payments through the year 2548 (for 550 years!), the authors carry calculations through the year 2025. Not only are any forecasts beyond the first 10–25 years subject to considerable uncertainty, they will be relatively unimportant at usual discount rates.

[5] One might contend that the increase in state revenues reduces deadweight loss by lowering revenue needs from other sources, for example, the state income tax. But the increase in nominal wages from lower income tax rates is exactly offset by the increase in prices from the implicit cigarette taxes. There is no real wage change from this substitution. The only net effect of changing the mix of taxes is the change in cigarette consumption relative to other consumption, addressed separately. This tax mix point is similar to the "double dividend" debate in environmental economics (Goulder, 1995).

[6] It is about half a percent of current annual spending.

[7] The change in smoking brought about by the settlement will also affect federal spending, especially for Medicare and Social Security. Although no effort here has been made to calculate savings at the federal level, the authors also believe they can ignore these changes for two reasons. First, prior work (Manning et al., 1989) has shown that changes in smoking roughly offset spending on medical care and pensions at both the state and federal level. Second, the effect on Medicaid spending is relatively small, and Medicare spending is only about 30 percent larger than the Medicaid program nationally (Cowan et al., 1999).

The second, and far larger, effect of reduced cigarette consumption is that people will live longer, healthier lives. An important reason these benefits are larger is that the price and counter-advertising effects apply to all smokers and potential smokers, whereas the Medicaid program effects apply only to Medicaid beneficiaries. The health benefits to Massachusetts citizens of additional longevity alone, ignoring the benefits from reduced morbidity, are estimated at $43 billion to $87 billion (in 1999 dollars) by 2025, with a "best guess" of about $65 billion. These values are about 15 times the size of the financial payments to the state under the MSA and several hundred times the gain in reduced Medicaid spending.

The health benefits are a net gain to society only if people did not account for them properly in their smoking decisions. In the rational addiction model of smoking (Becker and Murphy, 1988), smokers internalize the health costs of their smoking decision, and thus the internal benefits of reduced smoking are offset by the internal costs of lost cigarette pleasure, or else people would not smoke in the first place. The evidence for the rational addiction model, however, has been questioned in the litera-ture. In particular, the literature has developed other plausible models of smoking behavior, particularly those where individuals overly discount current benefits from smoking at the expense of future benefits (Gruber and Köszegi, 2000) and where peer group interactions influence smoking decisions (Laux, 2000). The authors do not take a stand on the exact share of the health gains that are a net efficiency improve-ment but note that even if only a relatively small share of the health benefits are a net gain to the individual, the health benefits of the MSA are the dominant efficiency effect of the settlement.

Other effects beyond changes in smoking and health appear unimportant. The reduced consumption of cigarettes will disadvantage some workers in the tobacco industry, and may result in some movement of resources out of tobacco and into other industries. These changes may reduce welfare of workers in the tobacco in-dustry and owners of tobacco farms, but they constitute an efficiency loss only for transition effects.

Many have noted that an increase in cigarette taxes is regressive, because smokers overwhelmingly come from lower income households. This argument is correct as far as it goes, but it ignores the distribution of the health benefits, which are over-whelmingly to smokers.[8] A full equity analysis would have to compare the payments with the net health benefits—the health benefits net of consumption losses—by in-come group.[9]

PAYMENTS TO THE STATES

Payments under the MSA are a product of a base amount and adjustments for a series of factors, including inflation and changes in the number of cigarettes sold. In this section the authors project payments for the nation as a whole and for Massa-chusetts. The MSA calls for six separate payments (Table 1) beginning with a pay-ment at the outset for all 46 settling states; it totals $12.7 billion (in nominal terms) between 1999 and 2003. The second type of payments, the heart of the settlement, are annual base payments for Medicaid damages. Across all 46 states these payments

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[8] There may be costs to non-smokers because of effects of second-hand smoke. The authors did not believe the evidence on second-hand smoke was as compelling as the evidence for effects on the smoker and therefore made conservative estimates by not accounting for any benefits from the reduction of second-hand smoke.
[9] Such an analysis would have to take into account the characteristics of those who quit smoking. Because education is positively correlated with quitting, it is possible that in fact the lowest quartile of smokers by income will get few of the benefits.

Table 1. Total payments to the states under the MSA.

Type of payment	Amount (nominal dollars)	Adjustments
Initial payments	$12.7 billion total from 1999–2003	Volume and non-settling states
Base payments	$4.5 billion in 2000 up to $9 billion in 2018 and beyond	All
Strategic contribution payments	$861 million per year, 2008–2017	All except previously settled states
National Foundation to Reduce Teen Smoking and Substance Abuse	$25 million per year, 1999–2008	No adjustments
Public Education Fund National Association of Attorneys General for enforcement of the settlement	$1.45 billion over 1999–2003 $51.5 million over 1998–2007	Inflation and volume No adjustments

Note: Terms describing adjustments are explained in Table 2.

totaled $4.5 billion in 2000, growing to $9.0 billion in 2018 and remaining at that level in each year thereafter. To put these amounts in perspective, in 2000 these two payment streams combined amounted to 32¢ per pack of cigarettes sold, and are expected to reach 37¢ per pack in 2010. The third payment is strategic contribution payments of $8.6 billion to reward states whose litigation efforts contributed to the settlement. Additional funds support education and public outreach. The settlement creates a National Foundation to Reduce Teen Smoking and Substance Abuse ($250 million) and establishes a National Public Education Fund ($1.45 billion) to sponsor tobacco counter-advertising. Finally, payments to the National Association of Attorneys General for enforcement of the settlement ($51.5 million) are assumed to be spent by the National Association of Attorneys General and are thus not allocated to the states.[10]

Several adjustments are made to some of these payments (right-hand column of the table), which are detailed in Table 2. The first adjustment is for inflation. The MSA allows for annual payment increases of 3 percent or the increase in the consumer price index (CPI), whichever is greater; the 3 percent figure is used here. The most notable adjustment, shown in the second row, is for volume changes. Payments are reduced by 98 percent of the percentage decline in cigarette sales. There are smaller adjustments for previously settled states, for non-settling states, for non-participating manufacturers, for any future federal legislation that might pre-empt the MSA, and for violation of a litigation release agreement.

In addition to statutory adjustments, there was initially a question as to whether the states would keep all of the settlement proceeds, or whether the federal government would reclaim the federal Medicaid share. This issue has now been resolved, so that all of the money remains with the states (absent that going to the National Association of Attorneys General).

Because the volume adjustment is important to the value of the settlement, and is also central to the health benefits from the MSA, this model analysis volume changes in some detail.

Changes in the Volume of Cigarettes Consumed

The MSA has three factors that are designed to reduce the demand for cigarettes. The first is the 45¢ price increase per pack that the participating manufacturers imposed

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[10] These payments should in principle be deducted from efficiency gains, but because of their modest size in relation to the estimated benefits, the authors ignore them.

Table 2. Adjustments to payment streams.

Adjustment	Description	Key assumptions
Inflation adjustment	Annual payments increase by 3 percent or the increase in the CPI, whichever is larger.	Assumed inflation, 3 percent or less per year.
Volume adjustment	Payments reduced by 98 percent of the percentage decline in cigarette sales. Adjustment reduced by 25 percent of any profit increases.	Annual volume of cigarette sales modeled as a function of secular trend and price elasticity of demand. Assume no increase in profitability of tobacco companies.
Previously settled states' adjustment	Accounts for payments already made to MS, FL, TX, and MN.	As directed by MSA, no additional assumptions necessary.
Non-settling states' adjustment	Accounts for any states that did not sign the MSA.	All states have signed; no adjustment.
Non-participating manufacturers' adjustment	Addresses the possibility that participating manufacturers will lose market share to non-participating manufacturers. States are given incentives to pass laws to tax non-participating firms at same level as MSA.	Incentives are for all states to tax non-participants and therefore for all manufacturers to participate; no adjustment.
Federal tobacco legislation offset adjustment	Reduces obligations of participating manufacturers dollar for dollar for federal legislation passed by 11/30/ 2002.	Assume no new federal legislation before 11/30/2002; no adjustment.
Litigating releasing parties' offset	Reduces the obligations of the participating manufacturers dollar for dollar for settlements against which they should have been released under the MSA.	Assume that no such settlements are reached.

immediately following the settlement in November 1998 to finance the costs of the settlement. Non-participating manufacturers are expected to implement comparable price increases after most states pass the model legislation set forth in the MSA, which effectively taxes manufacturers who do not participate in the settlement.[11]

The ultimate price increase might be higher than the 45¢ previously enacted for two reasons. First, if wholesalers and retailers mark up manufacturers' price increases, consumers will face a higher price increase. In fact, however, past empirical studies of the impact of cigarette tax increases on the retail price of cigarettes have uniformly concluded that there is no appreciable additional markup (Barnett et al., 1995; Merriman, 1994; Sumner, 1981). This is because wholesalers and retailers generally set their markup as an absolute dollar amount above their costs of business, rather than a percentage, consistent with the competitive nature of the retail industry. Second, states may respond to the settlement by raising their excise taxes in an attempt to partially recoup lost excise tax revenue (as a result of sales reductions). But essentially all of the settlement receipts are passed back to the states themselves, and thus will exceed the lost state excise tax revenues from the decline in cigarette volume. Thus, it is even possible that states could lower excise taxes in response to this inflow. The following analysis assumes that the 45¢ price increase is the amount that will prevail.

The extent to which demand will decline as a result of the price increase depends on the elasticity of demand for cigarettes. A substantial literature has examined this issue. The most recent and complete review is by Chaloupka and Warner (2000).

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[11] As of October 1, 2000, model legislation has been enacted in all of the 46 settling states and the District of Columbia. An NPM statute has been passed in 1 of the 5 settling territories (Puerto Rico) and is pending in another.

They conclude that a consensus estimate of the demand elasticity for cigarettes is – 0.4.[12] An elasticity of –0.4 is used for the following estimates.

The price increase of 45¢ is a 20 percent increase.[13] Assuming a demand elasticity of –0.4, one would expect a demand reduction of about 8 percent. The 1999 data indicate a reduction in cigarette sales of approximately 6.5 percent, somewhat lower than this calculation predicts, but clearly other factors may have been at play (Economic Research Service, 2000). If, however, 6.5 percent is the long-run value of the demand response, the estimated payments to the state are low; i.e., the authors may have over-adjusted for volume decline. The estimated health effects, however, use a lower elasticity value. Both these factors make these estimates of the benefits conservative.

The second factor affecting cigarette demand is the restrictions on advertising. The MSA embodies a number of restrictions on industry advertising. These limitations, however, affect only a small share of total tobacco advertising and promotional expenditures. According to the Federal Trade Commission (FTC, 1998), outdoor and transit advertising was only 6.3 percent of tobacco industry advertising expenditures in 1996, and public entertainment (which is a restricted and not eliminated category) was only 3.4 percent. There may be some additional reductions in advertising, but the reductions altogether are unlikely to exceed 10 percent of total advertising spending.

In addition, there is no restriction on the tobacco industry's increasing advertising expenditures through other venues to compensate for these restrictions. Tobacco advertising is very fluid; in just 2 years (from 1994 to 1996), for example, promotional allowance rose from 34.7 percent to 42.1 percent of total spending. Furthermore, outdoor and transit advertising has been in decline; in 1986, these categories were twice as large a share of total advertising dollars. The industry might well substitute for the advertising bans by increasing ads in other areas.

Partly as a result of this, the literature does not exhibit a very strong consensus on the role of cigarette advertising in affecting smoking. Chaloupka and Warner (2000) conclude that aggregate cigarette advertising has a small effect on total cigarette sales, and that previous advertising bans such as the ban on television advertising did not appreciably affect cigarette smoking. In their review of the advertising literature, Andrews and Franke (1991), who found a much more favorable disposition toward advertising effects, estimated an elasticity of smoking with respect to advertising dollars of only 0.06. Hence, a 10 percent reduction in advertising, which is the largest effect that could be envisioned from this settlement, would lower smoking by only 0.6 percent—a very small amount. As a result of this evidence, no impact of advertising restrictions on smoking behavior is assumed.

The third part of the MSA that will influence cigarette demand is the funding for smoking counter-advertising and education. Anti-smoking programs will be funded in two ways: the National Foundation to Reduce Teen Smoking and Substance Abuse is funded for $250 million over the next 10 years, to study programs to reduce youth smoking and substance abuse; and the National Public Education Fund is funded for $1.45 billion over the next 5 years to carry out sustained advertising and education programs to counter youth tobacco use and educate consumers about tobacco-related disease.

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[12] The –0.4 value is also consistent with the review of the literature by the Congressional Budget Office (1998) and Evans, Ringel, and Stech (1998).

[13] The percentage increase is 20.5 percent if an average of the baseline and final price is used as a denominator, consistent with the assumption of a calculation using arc elasticity. If the baseline price is used as a denominator, the percentage increase in price is 22.8 percent.

Current spending on counter-advertising and education in the United States is approximately $150 million per year.[14] The Public Education Fund alone would increase counter-advertising and education spending by up to $300 million per year for 5 years, a 200 percent increase in spending.

The literature suggests that counter-advertising deters smoking. The Fairness Doctrine, which was in place from 1967 until 1971, mandated counter-advertising in proportion to direct cigarette advertising on television. Smoking fell by an estimated 5 percent in those years (Warner, 1977). Indeed, some have claimed that the net effect of the subsequent ban on television advertising of cigarettes was to raise consumption, because it also eliminated the counter-advertising (Chaloupka and Warner, 2000). A study of California's substantial counter-advertising initiative that began in the late 1980s estimated an elasticity of smoking with respect to counter-advertising of –0.05 (Hu et al., 1994; Hu, Sung, and Keeler, 1995). This study is hampered by having time series evidence for only one state, California, in a period shortly after a substantial price increase. Thus, it is difficult to separate long-run price effects from the effects of the counter-advertising. Still, if Hu and colleagues' elasticity is taken at face value, the 200 percent increase in spending induced by the MSA would lead to a 10 percent decline in smoking.

The following analysis makes a more conservative assumption—that the increase in counter-advertising and education will have roughly the same effect as the Fairness Doctrine, a 5 percent decline in smoking, phased in at 1 percent per year for the 5 years that the public education fund is supported.

The decline in smoking from the price increase, the advertising restrictions, and the counter-advertising campaign comes on top of a substantial trend over time of lower cigarette consumption. Over the past 20 years, cigarette consumption per person has declined by about 1.2 percent per year. However, according to the Tobacco Institute (1998), cigarette smoking has remained roughly constant since 1994. In the analyses here, the decline in smoking is assumed to resume, but at half the previous rate, or 0.6 percent per year.

Figure 1 shows the estimated volume of cigarettes consumed nationally before the MSA baseline and with the provisions of the MSA.[15] The settlement will lower smoking by an estimated 11 percent by 2003, relative to the non-settlement baseline. In later years, the percentage decline relative to the baseline is slightly larger (13 percent in 2025), as baseline smoking declines.

Estimated Payments

This analysis combines the payment and adjustment assumptions to estimate total payments under the MSA to Massachusetts. Massachusetts has 2.3 percent of the nation's population and 3.3 percent of its Medicaid spending. Massachusetts' current share of Foundation spending and Public Education Fund spending is not clearly

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[14] Based on data collected by Centers for Disease Control and Prevention (Jeff McKenna, Office on Smoking and Health, personal communication, January 14, 1999). This consists of roughly $85 million in counter-advertising and education spending by the states; roughly $12 million of spending by federal agencies (FDA, CDC, and NCI); and roughly $50 million in spending by the federal government on its ASSIST and IMPACT programs that are designed to provide infrastructure for state anti-smoking efforts.

[15] Analysis of baseline price and consumption data (Gary Black, Sanford Bernstein Company, December 15, 1998) show that cigarette prices in 1998 averaged $1.97 per pack, with 23.8 billion packs sold. Built into the baseline are a federal tax, increased scheduled by 10¢ in 2000 and scheduled to increase 5¢ more in 2002. For the Massachusetts-specific analysis, the authors use price data specific to that state. In 1998, cigarette prices averaged $2.79 per pack in Massachusetts, well above the national average.
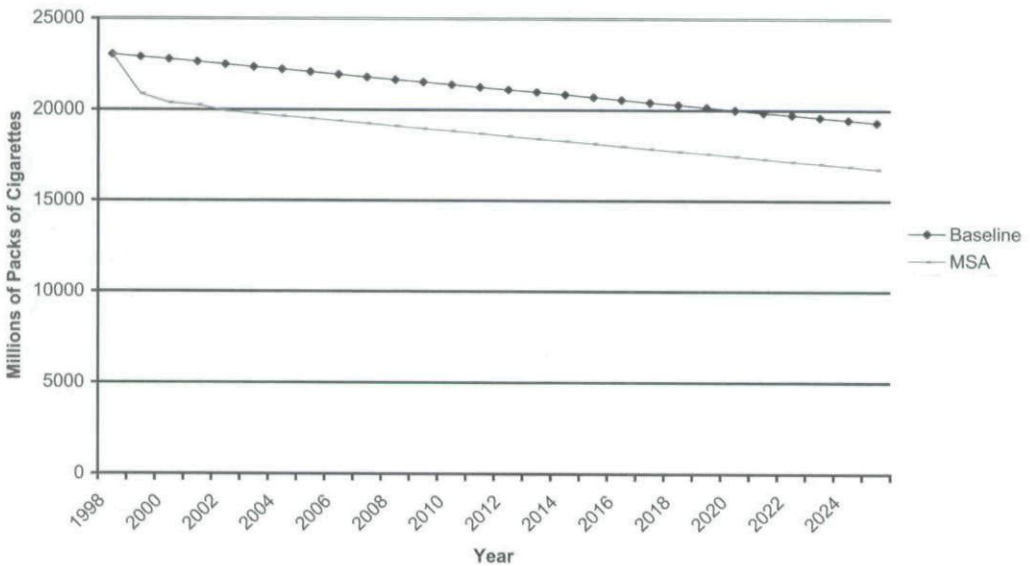
Figure 1. Cigarette consumption with and without provisions of the MSA, 1998–2025.

delineated. Therefore the most conservative assumption is made, namely that the state receives no payments from these two sources. Because these payments are small, calculations are not substantially affected by their treatment. Throughout the paper, a nominal discount rate is used, 7 percent per year, or 4 percent in real terms. This was a consensus discount rate of investment bankers in their proposals to securitize (convert a stream of future income into a tradable asset) the financial payment streams to the plaintiffs' attorneys. Thus, it incorporates factors such as the risk that the tobacco companies will default.

Table 3 shows the present value of payments to states as a whole, and to Massachusetts in particular, beginning in 1999 and continuing through 2010 and 2025. States as a whole will receive an estimated $58.8 billion in present value through 2010, and $104.7 billion through 2025. Massachusetts will receive $2.3 billion through 2010 and $4.2 billion through the year 2025.[16] These amounts represent roughly 2 percent of state tax receipts.

But the effects do not end here. The increased price of cigarettes and other provisions of the settlement will result in substantial reductions in cigarette consumption.

INDIRECT BENEFITS

This consumption decline will have two indirect effects: It will reduce the external costs of smoking and it will generate longevity benefits.

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[16] For comparison, under the same assumptions but absent the volume adjustment, the payments to the Commonwealth would be $2.6 and 4.8 billion through 2010 and 2025, respectively.

Table 3. Estimated payments under the MSA, net present value in billions of 1999 dollars.

Group	Through Period	
	2010	2025
Nation (46 states)	$58.8	$104.7
Massachusetts	2.3	4.2

Note: The 46 states comprising the settlement have 85 percent of the national population.

Reduced Medicaid Spending

By reducing the prevalence of smoking, the MSA will reduce the cost of smoking-related illnesses to the Medicaid program.[17] In addition, there is the effect of reducing deadweight loss from financing this spending. Savings to Medicaid from the MSA has been estimated previously at some length in earlier research (Cutler et al., 1998a, b, c, 2000). This section summarizes those findings.

Medicaid spending is divided into spending for adult inpatient care, adult outpatient care, long-term care, and low-birthweight infant care. These values are projected to 2025 assuming that expenditures will grow at a nominal rate of 6 percent for each age and gender group.[18]

To calculate the proportion of the Medicaid expenditures attributable to smoking, Medicaid spending is multiplied by a smoking attributable fraction (SAF) of expenses. For adult inpatient and outpatient care, the SAF is estimated using regression models relating health care use at the individual level to indicators for whether the individual was a current, former, or never smoker, controlling for other individual covariates. The smoking coefficients, when weighted by the share of current and former smokers in the population, indicate the share of medical spending attributable to smoking. For long-term care and low-birthweight babies, published data on relative risks of particular diseases for smokers were used, in combination with data on smoking rates by these populations. Overall the authors estimate that about 7 percent of adult Medicaid spending is attributable to smoking for the period 1992–1998, although in 1998 the percentage had fallen to 5 percent.

The first two columns of Table 4 show estimates of Medicaid spending attributable to smoking. Absent the MSA, the authors forecast that the present value of Medicaid spending in Massachusetts on smoking-related diseases would be $3.4 billion through 2010, and $7.2 billion through 2025. This is larger than, but of the same order of magnitude as, the financial payments to the state. Indeed, in earlier work (Cutler et al., 2000), the authors estimated that, in the first years of the settlement, the financial payments under the MSA would about equal the costs to Medicaid from smoking. Over time, the settlement covers less of the costs to Medicaid of smoking because the increase in medical costs forecast in the baseline is greater than the increase in payments provided for under the MSA.

How these amounts will change with the change in smoking prevalence is then estimated, noting that such estimates may understate, perhaps substantially, the savings to Medicaid from the MSA. The sample of former smokers in the survey data

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[17] Because the authors analyze annual spending, rather than lifetime spending, long-run cost savings to Medicaid may be overestimated. Savings based on lifetime spending may be less, because increased longevity is likely to entail additional health costs.

[18] This growth rate reflects the following assumptions: inflation of 3 percent, real growth in services per capita of 2 percent, and population growth of 1 percent.

Table 4. Forecasts of Medicaid spending attributable to smoking and savings under the MSA, net present value in millions of 1999 dollars.

	Baseline Spending through		Savings from MSA through	
	2010	2025	2010	2025
Expenses for:				
Adult acute care	$2,256	$4,550	$6	$29
Long–term care[1]	1,143	2,581	22	32
LBW babies	27	61	1	3
Total	$3,427	$7,192	$29	$65
Reduced deadweight loss			9	20

[1]To give some idea of the importance of increased life span for computiong Medicaid cost savings, results were recomputed assuming that the long-term care population grows at a rate that is 10 percent above the baseline (11 percent per year), beginning in the first year of the MSA. Under this scenario, the present value of total Medicaid savings fall to $22.7 million and $30 million in 2010 and 2025, respectively.

used to estimate the medical costs of smoking includes a number of individuals who stopped smoking because they were being treated for active disease. Not surprisingly, those former smokers have very high Medicaid expenses. Those who quit because of the MSA, in contrast, will disproportionately quit for non-health reasons and thus are not likely to spend as much. In effect, because the spending habits of past quitters are attributed to future quitters, the effects of quitting smoking on medical spending are underestimated. However, existing data prevent producing better effects.

The second two columns of Table 4 show the expected reduction in Medicaid spending because of the MSA.[19] As a result of the MSA, Massachusetts is expected to save $29 million to $65 million in Medicaid spending over this period. These savings amount to about 1 percent of the costs attributable to smoking.

In addition to these savings, are reduced deadweight costs because governments do not need to raise as much money. Standard estimates in the economics literature suggest that the marginal deadweight loss from the existing tax system is about 30¢ per dollar raised (Ballard et al., 1984). The savings in deadweight loss are therefore $9 million to $20 million. The net savings are therefore $38 million through 2010 and $85 million through 2025. Thus, the overall effect of the MSA on Medicaid costs and economic efficiency are very small.

Other effects on state budgets have not been estimated. Spending for state employee health insurance and for direct delivery systems of health care, such as city hospitals, will fall and for defined benefit pension plans for state employees will rise. Medicaid, however, is a large program in the state budget, and the modest effect on Medicaid gives us confidence that ignoring these other programs will not cause a large error.[20]

Valuation of Lives Saved and Health Improved by the Settlement

Smoking is the leading preventable cause of death in the United States (McGinnis and Foege, 1993). Therefore, reductions in smoking translate into substantial gains

[19] These savings are calculated based on the change in the number of smokers, not the total number of cigarette packs sold.
[20] Spending on the Massachusetts Medicaid program in 1997 was $5.927 billion (Cutler et al., 2000:Table 1; Statistical Abstract, 1999:328), which was 29 percent of direct state spending if one excludes transfers to local government and 23 percent of spending accounting for transfers to local government.

in life expectancy. The analysis values the longevity effects of the MSA resulting from reduced numbers of smokers only—quitters and people who never begin. Although health benefits accrue from continuing smokers' consuming fewer packs, data limitations make estimating these benefits more difficult. Moreover, in some calculations, the authors rely on published disease-specific relative risks, which are available only as a function of whether a person smokes and not as a function of the number of cigarettes smoked. Ignoring the reductions in amount smoked among smokers, of course, makes estimates of health benefits conservative, as does not accounting for any effects of second-hand smoke.[21]

Changes in the Number of Smokers

The impact of the MSA on the number of smokers is estimated using a methodology similar to that developed above. The same 45¢ increase in prices was assumed in Massachusetts as elsewhere in the nation. Because baseline cigarette prices are higher in Massachusetts than elsewhere (see footnote 15), the percentage increase in prices in Massachusetts is smaller, approximately 15 percent.[22]

The elasticity for smoking participation is smaller than the elasticity of total packs of cigarettes consumed, because some of the response to higher prices is among existing smokers' consuming fewer packs. Estimates of participation elasticities are drawn from the literature. For adult smokers, a participation elasticity of –0.25, based on research by Evans and colleagues (1998), is used.[23] Essentially all of the response for current adults will be increased quitting, as opposed to reduced initiation because few adults initiate smoking. Among individuals who have ever smoked daily, 77 percent began smoking daily before age 20, and 91 percent first tried a cigarette by that age (DHHS, 1994).

Traditional estimates of the elasticity of youth initiation rates are higher, around –0.7 (Chaloupka and Warner, 2000). But these studies generally do not control for omitted state characteristics that might be correlated with both taxes and smoking rates. Evans and Huang (1998) control for these factors and estimate a youth participation elasticity of –0.5, which is used in the estimates presented here.[24] Because of the uncertainty in the literature about this value, the authors experiment with elasticities of –0.25 (one-half of the baseline value) and 0.

Again restrictions on tobacco company marketing are assumed not to affect smoking prevalence but counter-advertising is assumed to affect smoking habits. Prior to the MSA, Massachusetts already had a significant amount of tobacco counter-advertising: $13 million of the $150 million spent nationally. Hence, if the authors assume that the $300 million in the Public Education Fund is allocated to each state in rough proportion to that state's population, Massachusetts' share ($6.6 million) is only a 51 percent increase over current levels, compared with the 200 percent nationwide increase. Thus, instead of assuming a cumulative 5 percent effect on smoking rates from counter-advertising (1 percent per year for 5 years), as the authors did nation-

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[21] Potentially offsetting this conservative bias is the fact that the authors do not account for possible selection of who quits smoking. If individuals who quit (or never start) smoking are (or would have been) relatively light smokers, there is a bias in the other direction.

[22] This approximation is calculated using the midpoint of the prior $2.79 price and the assumed price increase of 45¢.

[23] This compares to their total elasticity estimate of –0.41.

[24] In addition, recent work by Glied (in press) and Gruber (in press) suggests that price changes lower adult smoking by much less than they lower youth smoking, because they partly serve to delay initiation rather than prevent smoking. These findings suggest that the long-run elasticity may be considerably lower, perhaps 0.

ally, the authors assume a cumulative 1.28 percent impact in Massachusetts (0.255 percent per year for 5 years). This difference between Massachusetts and the nation, however, is in a payment type that does not much affect the total estimate.

Finally, the authors differentiate the secular time trend in smoking rates into quitting rates, cutbacks among existing smokers, and reduced initiations. According to the Centers for Disease Control and Prevention (CDC), about 70 percent of the trend decline in smoking is a result of fewer numbers of smokers, while 30 percent is a result of fewer cigarettes per active smoker (CDC, 1998). The authors therefore assume the baseline reduction in smoking rates among adults is 0.42 percent per year (70 percent of the 0.6 percent per year decline). Forecasting the time trend in youth smoking is more difficult. Youth smoking declined substantially in the late 1970s, was relatively flat in the 1980s, and rose precipitously in the 1990s. In Massachusetts, the trend in youth smoking has been flat in recent years (Abt Associates, 1997). In the absence of a good model of youth smoking initiation, the authors assume no secular trend in smoking initiation by youths.

Using these assumptions, the authors estimate a decline in the number of adult smokers resulting from the MSA (increased number of quitters) of 45,000, or 5 percent. For youths, assuming a price elasticity of –0.5, the authors estimate a decline in the number of smokers (increased number of never smokers) of 13,000, or 8 percent. Approximately 1,400 of these never smokers are replaced each year by a new cohort.[25] With the lower elasticity estimate of –0.25 for youths, youth never-smokers rise only 7,800 (5 percent), with a new cohort of approximately 990 each year. With the elasticity of 0, the only changes in youth smoking occur in the first 5 years, due to the counter-advertising measures. Under this 0 elasticity assumption, youth smoking is reduced by 2,100 persons (1.8 percent) by 2004.

Although the authors do not know the distribution of the 6.5 percent decline in cigarette sales in 1999 and therefore how health might have been affected, the elasticities the authors are using to estimate health benefits appear if anything to be low. Thus, the health benefits the authors estimate may be somewhat low.

Longevity Benefits from Reduced Smoking

To compute the number of life-years saved by the MSA, estimates of the difference in life expectancy for smokers compared with non-smokers was taken from the simulation model developed for the Healthier People Network.[26] This model projects life expectancy using a probabilistic model of disease and survival and assumed values of demographic characteristics (current age, sex, height, weight, smoking status). The authors ran simulations for men and women separately for youth "never starters" (assumed to be age 20) and adult quitters (assumed to be age 40).[27] Characteristics of these representative individuals were set equal to the mean values for smokers of their age and sex from the National Health Interview Survey.

[25] The number of children who become smokers each year under current law is derived from CDC data that report that 3,000 children in the United States start smoking every day. Multiplying by 365 and taking the Massachusetts share of youth (approximately 2 percent), yields an annual estimate of new youth smokers in Massachusetts of 21,882.

[26] HPN Health Risk Appraisal V6.0, The Healthier People Network, Decatur, Georgia, 1997. The model also incorporates CDC life-table data: National Center for Health Statistics. Vital Statistics of the United States, 1995, preprint of vol. II, mortality, part A sec 6 life tables. Hyattsville, MD. 1998. This model has been independently validated. See, for example, Foxman and Edington (1987) and Gazmararian et al. (1991).

[27] Although this method is not exact because of the non-linear effect of smoking on mortality, the purpose is to demonstrate that the effect size is large relative to the monetary settlement. The approximation should be good enough for that purpose.

Table 5. Life expectancy in years for smokers, quitters, and never starters.

	Men	Women
"Never starter"		
Life expectancy at age 20 if never smoker	55.5	61.5
Life expectancy at age 20 if smoker	49.0	55.8
Difference in years	6.5	5.7
"Quitter"		
Life expectancy at age 40 if quitter	37.2	41.9
Life expectancy at age 40 if remain smoker	31.2	36.8
Difference in years	6.0	5.1

Table 5 shows the change in longevity expected for people who quit or never start smoking. Life expectancy increases by 5.1 to 6.5 years. The increase is greater for men than for women and is greater for never-starters than for quitters.

Aggregate life-years saved per year by the MSA are the product of the reduced number of smokers and the increase in life-years expected for people who quit or never begin smoking. The first row of Table 6 shows the number of life-years saved in Massachusetts. An estimated 550,000 additional years of life will have been lived by people alive by 2025.

To assign monetary value to these health benefits, a value per life-year must be applied to the gains in life expectancy.[28] The estimates in the literature range from $70,000 to $175,000 in 1990 dollars, which is roughly $100,000 to $200,000 in 1999 dollars (Tolley, Kenkel, and Fabian, 1994).[29] The authors consider a benchmark value of $150,000 per year, with alternatives of $100,000 per year and $200,000 per year.

The bottom rows of Table 6 present the estimated cumulative net present value of gains in life expectancy induced by the MSA in Massachusetts. The benchmark estimate is a value of $56 billion through 2010 and $65 billion through 2025. The lower and higher valuations of a year of life change this range accordingly.

Because of the uncertainty surrounding the point estimate of the youth price elasticity, the sensitivity of the estimates of the value of lives saved by the MSA is estimated assuming the elasticity was –0.25 and 0, respectively. With a youth price elasticity of –0.25, the authors found that the MSA saved 460,000 life-years through 2025. Assuming no response to price by teen smokers, the MSA saved 267,000 life-years through 2025. At the medium value of a life-year of $150,000, the net present value of these gains in life expectancy is $54.4 billion and $36.7 billion, respectively.

Morbidity Benefits from Reduced Smoking

Although morbidity is a much more common outcome of smoking than is mortality, it is more challenging to value the reduced level of illness. The problem of identifying

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[28] The monetary value of a life-year is frequently estimated by studying individuals' willingness to pay to reduce specific risks of mortality. The valuation of risk reduction is then extrapolated to compute the value of a "statistical" life, from which the value of a single life-year is computed. There are a number of alternative approaches to measuring the value of reductions in mortality caused by illness. The quality-adjusted life-years method is a commonly used alternative. This method accounts not only for the shortened life span of smokers but also for the pain and suffering caused by the fatal illness and its treatment. A study by Jones-Lee, Hammerton, and Philips (1985) indicates that preventing death from cancer or heart disease (the primary intermediate causes of death from smoking) should be valued at two to three times instant death. Our approach is both simpler and more conservative in that it ignores these quality of life factors.

[29] As above, the authors assume a 3 percent rate of inflation in the value of a life-year after 1999 and discount all measures at 4 percent real and 7 percent nominal rates.

Table 6. Valuation of increased life expectancy in Massachusetts.

	Through 2010	Through 2025
Life-Years Saved	424,000	552,000
Present discounted value of increased life expectancy ($ billion) assuming:		
Medium value per life-year = $150,000	$56.2	$65.0
Low value per life-year = $100,000	37.5	43.3
High value per life-year = $200,000	74.9	86.7

new cases of disease is significant, and individuals' willingness to pay to avoid sickness is less well understood than willingness to pay to avoid mortality.

An illustrative calculation using a single disease category, chronic bronchitis, indicates the potential magnitude of the value of morbidity reductions induced by the MSA. Because smokers are nearly 10 times more likely to contract chronic bronchitis than non-smokers, about 90–95 percent of chronic bronchitis is a result of smoking. Using data on current prevalence rates and estimated changes in smoking, the authors calculate that 696 cases of chronic bronchitis in Massachusetts will be prevented by the MSA (8 percent of the baseline number).

How much do people value the reduction in bronchitis? The literature offers two pieces of evidence. First, people are willing to pay about $100 to avoid a single day of coughing spells (Tolley et al., 1994). So even if each case of bronchitis involved only 50 days of coughing per year, the value for a single year for Massachusetts would be $3.5 million. Second, it has been estimated that to avoid chronic bronchitis altogether, people are willing to pay between $600,000 and $800,000 in 1999 dollars (Viscusi, Magat, and Huber, 1991). The cumulative value of the benefits of the MSA, by this metric, are about $500 million. Clearly, if the authors extend such calculations to the morbidity induced by other smoking-related diseases, the measured health benefits of the settlement could substantially increase.

Implications

In conventional welfare economics any benefits of smoking to the smoker would be netted out from the value of the health benefits the authors have estimated here. Indeed, the presumption would be that such benefits exceed even these very large health benefits or the individual would not have smoked. Thus, for example, the well-known rational addiction model argues that far from being a welfare gain, the price increase induced by the settlement would cause a net loss of welfare (Becker, Grossman, and Murphy, 1991, 1994; Becker and Murphy, 1988).[30]

The authors do not consider this argument decisive and do not attempt to net out these benefits for several reasons. First, most of the evidence in the literature supporting consumers' forward-looking behavior is also consistent with the theory that firms rather than consumers are forward looking. In particular, much of the evidence supporting the rational-addiction model comes from studies demonstrating that when price increases in the future are learned about today, consumption declines today, as smokers anticipate the declining value of consumption in the future. As Showalter (1999) has pointed out, in the case of an addictive good, the response may be on the part of firms rather than consumers. Firms that can discriminate through price-setting should subsidize initial consumption and charge a markup on later consump-

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[30] This statement does not consider any deadweight losses from taxes or premiums to finance medical care or other collectively financed goods, but, as noted above, these appear to be small.

tion. Firms' forward-looking behavior is consistent with the industry's targeting of promotional materials to adolescents and children (Arnett and Terhanian, 1998; DiFranza et al., 1991; Fischer et al. 1991).

Second, a calculation of welfare loss using the rational-addiction model assumes consumer sovereignty. But as already noted, most smokers begin to smoke—and presumably become physiologically addicted—in adolescence. Given the *de jure* prohibition against sales to those under 18, an assumption of consumer sovereignty with respect to smoking decisions is weakened. In addition to the sales prohibition, an assumption of consumer sovereignty is further weakened by the observation that adolescents are overly optimistic about their ability to quit subsequently. In a 1991 survey of high school seniors who smoked, 56 percent said they would not be smoking in 5 years, but in fact only 31 percent had quit by 5 years later (DHHS, 1994).[31]

Third, the rational-addiction model assumes time-consistent discount rates, but the implied discount rates in the prominent estimates of the rational-addiction model are exorbitantly high, suggesting that the discount rate current smokers apply to the future costs of smoking may be around 90 percent per year. One would expect a discount rate to be the same as for other consumption, presumably in the single digit percentages (Laux, 2000). With such a high discount rate for the costs of smoking, Laux estimates that smokers may underestimate the future costs that they themselves bear, primarily reductions in health, by approximately 40 percent.

Gruber and Köszegi (2000) have recently put forward a similar argument; they point out that there is a strong case for hyperbolic discounting in smoking—discount rates that value today too much over tomorrow, but annual discount rates after today at the expected rate (Laibson, 1997). Substantial psychological evidence indicates that individuals apply a higher discount rate to decisions involving shorter time horizons (Laux, 2000). If hyperbolic rather than conventional discount rates are used, a large portion of the costs borne by the smoker would be relevant to welfare calculations.

Fourth, Laux (2000) notes that smoking may involve peer-group effects. Smoking participation rates, for example, are higher among white adolescents than African-American adolescents, and rates are differential by sex in several countries. Peer-group effects may imply an externality, such that there may be a welfare gain from additional taxes or regulations.[32]

None of the foregoing arguments, of course, implies that no benefits accrue to the smoker from smoking, or that any such benefits should not be netted out from the estimated health gains. But they do undercut the usual welfare economics presumption that the price increase from the settlement was a welfare loss because of unmeasured losses of pleasure among smokers.

In the absence of more definitive quantitative evidence, the authors do not take a firm stand on what share of the health benefits are offset by the value of foregone cigarette consumption. Since the health benefits are so much larger than the reduced external costs, however, this issue is fundamental to estimating the overall efficiency consequences of the settlement.

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[31] Orphanides and Zervos (1995) suggest a rational-addiction model in which adolescents sample cigarettes but are uncertain whether they will become addicted. Some then do become addicted. Orphanides and Zervos, however, assume that adolescents are unbiased in their forecasts of their ability to quit, an assumption the data do not seem to support.

[32] With peer-group effects, individual demand curves shift with overall market demand. The welfare gain assumes that the individual demand curve post-tax or post-regulation is the relevant demand curve. If individuals do not choose their peer group, this change would be an external effect. See Laux (2000).

Table 7. Summary of MSA effects in Massachusetts.

	Estimates Through	
	2010	2025
Reduced Medicaid spending	$0.0	$0.1
Reduced mortality	$37.5–74.9	$43.3–86.7
Total[1]	$37.5–74.9	$43.4–86.8

[1] These estimates summarize the information in Tables 4 and 6. If the authors assumed no response to price by teen smokers, the lower bound of the range would be $24.5 billion by 2025.

SUMMARY

Health-related impacts of the MSA have been identified and their magnitude estimated (Table 7). First, there are modest benefits from reduced Medicaid spending brought about by lower smoking, and the lower deadweight loss from lower required tax collections. These benefits total about $100 million in present value through 2025. That they are so small relative to the other items suggests that ignoring effects on other state programs is a reasonable approximation.

The second, and far larger, source of gain is the longevity benefits of reduced smoking. The authors value the longevity benefits at $43.3 billion to $86.7 billion for Massachusetts through 2025, with a best estimate of $65.0 billion, using the middle estimate of the value of a life-year and the preferred estimate of the youth price elasticity of demand (–0.5). Gains for the nation may be some 30 to 40 times this amount. To the extent that the authors have not included valuation of the benefits of decreased morbidity, the longevity benefits understate the overall health benefits.

Hence, the health benefits of the MSA are hundreds of times greater than the reduced external costs. By another metric, the authors estimate that for every dollar transferred from cigarette companies (and future smokers) to the state, the health gains amount to $6. How much of this longevity gain should be counted is uncertain. If reliable valuations of the foregone pleasures of smoking were available, the authors would net them against these estimated health benefits. Available evidence suggests, however, that these gains are unlikely to be outweighed by losses to smokers of the pleasures of smoking.

These benefits should be compared with the transaction costs of achieving the settlement. The settlement calls for payments to all plaintiffs' attorneys nationally of $500 million per year for 25 years, the present value of which is $5.8 billion. The authors do not know the costs of the defense attorneys, although it was surely much less than $5 billion (given that it will not continue into the future). If the authors take as a rough figure the Massachusetts share of the $5.8 billion as 3 percent or $175 million, the costs are clearly modest compared with the health gains.

To be sure, the transactions costs of the litigation were on their face much higher than simply legislating a tax increase, which would have had much the same effect. Any legislative action, however, also carries transaction costs in the form of lobbying expenses, though presumably not on the same scale as the costs of litigation. Moreover, increased federal taxes on cigarettes were not likely in the near term, and increased state taxes bring with them the problem of bootlegging or smuggling from other states. Thus, if the health gains dominate a calculation of overall welfare effects, the MSA was overall a welfare gain.

DAVID M. CUTLER is Professor, Department of Economics, Harvard University

JONATHAN GRUBER is Professor, Department of Economics, MIT

RAYMOND S. HARTMAN is Special Consultant, Lexecon, Inc., Cambridge, Massachusetts

MARY BETH LANDRUM is Assistant Professor, Department of Health Care Policy, Harvard Medical School

JOSEPH P. NEWHOUSE is Professor, Kennedy School of Government; and Department of Health Policy and Management, Harvard School of Public Health, Department of Health Care Policy, Harvard Medical School

MEREDITH B. ROSENTHAL is Assistant Professor, Department of Health Policy and Management, Harvard School of Public Health

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