Effectiveness of comprehensive tobacco control programmes in reducing teenage smoking in the USA

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Abstract
Objective—To describe the extent to which comprehensive statewide tobacco control programmes in the USA have made progress toward reducing teenage smoking.

Data sources—Literature search of Medline for reviews of effectiveness of programme and policy elements, plus journal articles and personal request for copies of publicly released reports and working papers from evaluation staff in each of the state programmes of California, Massachusetts, Arizona, Oregon, and Florida.

Study selection—All studies, reports, and commentaries that provided information on aspects of programme implementation and evaluation.

Data synthesis—Statewide comprehensive programmes show high levels of advertising recall and generally positive improvement in smoking related beliefs and attitudes among teenagers. More fully funded programmes lead to increased mass media campaign advertising and community initiatives; a greater capacity to implement school based smoking prevention programmes; and an increase in the percentage of money from that state’s excise tax on cigarettes, with part being allocated to fund a tobacco control programme. Such programmes were first initiated in the USA in California (from 1989) and then in Massachusetts (from 1993), Arizona (from 1994), and Oregon (from 1996). In addition, Florida began a comprehensive programme from 1997, which was funded by a percentage of money from that state’s settlement with the tobacco industry, rather than a tax increase. These comprehensive programmes involve some mix of the following elements, public education through electronic, outdoor, and print media campaigns; development and enforcement of policies to prevent youth access to tobacco, restrict tobacco advertising, and/or create smoke-free environments; community initiatives, involving grants to local organisations to facilitate worksite programmes, training and assistance for health professionals to improve cessation services, and policy development; school based programmes focusing on curriculum development, school policy, and prevention; direct cessation services for smokers, such as telephone helplines and other quit smoking materials; and research and evaluation.

The aim of this paper is to review and synthesise the publicly available findings from the five statewide comprehensive tobacco control programmes in the USA, and to draw conclusions about the extent to which they have reduced teenage smoking, or are making progress along a pathway likely to lead to ineffective smoking.
reductions in teenage smoking. This information is important to assist decision making by those who would fund such programmes, such as other US states considering how to allocate funding from the multi-state settlement agreement, and for other countries who may be looking to the experience of these states as a model for establishing their own comprehensive tobacco control programmes.

**The research context underpinning comprehensive tobacco control programmes**

Controlled research studies can identify tobacco control strategies with the potential to reduce teenage tobacco use when applied more widely. However, evaluation of the extent to which they achieve these aims when implemented in practice as part of comprehensive statewide tobacco control programmes is rather more difficult to determine. In any assessment of the effectiveness of tobacco control programmes in reducing teenage tobacco use, it is vital to understand why this is so. There are five main factors that can mislead: (1) changing population smoking prevalence is likely to be a relatively slow process, even in response to comprehensive programmes; (2) smoking prevalence is usually only measured yearly or less frequently and sampling variation and different survey methodologies make these measures insensitive tools for assessing early change; (3) changes in smoking behaviour and prevalence can reflect societal influences unrelated to new tobacco control programmes; (4) actual implementation of programme strategies may differ substantially from intended implementation and the extent of disparity may vary over time and between programmes; and (5) tobacco industry activities may undermine tobacco control programmes and falsely suggest the programmes are ineffective when, in fact, they could be very effective in the absence of industry efforts. For all these reasons, assessment of progress requires much more than a cursory comparison of teenage smoking prevalence in states with and without such programmes.

We argue for taking a larger view that takes account of the amount of programme expenditure and extent of implementation, and evaluates markers of progress in factors known to mediate teenage tobacco smoking, as well as change in tobacco smoking itself. From the outset, it is important to have a clear assessment of the evidence for reducing adolescent smoking for the elements that comprise a comprehensive tobacco control programme. This provides a rationale as to why such programmes might be expected to reduce adolescent smoking when implemented on a statewide basis. Much of the evidence for effectiveness of these elements has been gained from research applied to relatively small, discrete populations in controlled experimental studies. Unlike examination of the effects of school based prevention programmes, community wide tobacco policy research has only recently been possible to undertake, since policies are less amenable to experimental simulation and need to be actually implemented in whole populations before effects can be judged. Nonetheless, in the past decade, great strides have been made in our understanding of the types of policies that influence smoking. However, the precise mechanisms by which such policies affect teenage smoking are often unclear. For example, while some policies seem to exert more immediate influence on overall measures of tobacco consumption and adult smoking prevalence in the short term, they may affect teenage use in the longer term through distinctly changing societal norms about smoking. However, these indirect effects are no less important and may be more enduring.

Reviews of the effectiveness of school based smoking prevention programmes suggest that programmes using the social influences model are most effective for reducing tobacco use,6–8 Effects dissipate over time,9–11 but can be sustained with mass media interventions or community-based tobacco control strategies.12–14 Mass media campaigns alone can reduce population smoking behaviour15–16 and are associated with attitudes more disposed to quitting or not starting among teenagers.17–19 However, as already noted, the most stable effects are observed once mass media campaigns are combined with social influences school based prevention programmes.12

Recent controlled intervention studies of reduced youth access to tobacco,20–21 a study relating serial cross sectional surveys of US school children with youth access laws,22 and a comprehensive review23 have suggested that a very high level of retailer compliance, coupled with community involvement, may be necessary before youth smoking rates are affected. In terms of restrictions on smoking, it is known that schools with comprehensive policies that ban smoking on school premises have significantly lower rates of student smoking.24 The extensiveness of restrictions on smoking in public places has been found to be associated with reduced smoking among US schoolchildren25 and young adults.26 A recent comprehensive review indicates that complete, but not partial, bans on advertising do influence aggregate cigarette consumption.27 Evidence generally supports the argument that cigarette advertising and promotion directly and indirectly increases cigarette demand and brand share, particularly among youth.28–30 Level of interest in tobacco advertising and promotions is related to uptake of smoking.30–32 Finally, numerous studies conclude that higher cigarette prices lead to reductions in overall smoking,27 and many studies have confirmed that teens and young adults are relatively more price responsive than adults.33–37

In summary, there is good reason to expect that school based prevention programmes using a social influences approach, mass media campaigns, restrictions on smoking in schools and public places, strongly enforced limits on youth access, a complete ban on tobacco advertising, and real price increases in
cigarettes, will lead to reductions in teenage smoking. In providing a brief overview of this evidence, it is plain that individual tobacco control strategies are not independent, but can reinforce each other in the pursuit of reducing teenage smoking. Therefore, a community wide sustained effort using multiple channels of influence has the most likelihood of producing real and durable changes in adolescent smoking.

**Approach to the review**

In evaluating comprehensive programmes, consideration needs to be given to a range of indicators, which assess both the amount and type of tobacco control “input”—namely, what was actually implemented as part of the programmes—as well as the amount and type of promotional and other strategies used to encourage and promote smoking on the part of tobacco companies. This helps to establish whether one might reasonably expect change at the population level for the actually implemented level of programme input and policy change, as well as an explanation for any variation over time in markers of progress towards reduced teenage tobacco use.

If we accept the evidence that particular policies and programmes have been shown to influence teenage tobacco use, then measures of actual policy enactment and implementation, as well as measures of programme delivery and receipt, should be viewed as markers of progress towards the longer term aim of achieving reduction in adolescent smoking. In reviewing evidence for the effectiveness of comprehensive tobacco control programmes in reducing teenage tobacco use, we focus upon: measures of programme implementation and strength, such as overall programme funding and allocation to different strategies, and tobacco industry efforts to counter the aims of these programmes; intermediate markers of progress (including awareness of campaign messages by youth, beliefs about smoking and passive smoking, and support for tobacco control strategies); changes in factors that denormalise smoking (such as decreasing youth access to tobacco, creating more restrictions on smoking, restricting tobacco advertising); consumption; adult smoking; adolescent intentions and uptake continuum measures; and finally teen smoking prevalence.

**Study selection**

Medline was searched for all published studies of aspects of programme implementation and evaluation pertaining to each of the state programmes. In addition, contact was made with each of the evaluation coordinators in each state and a request made for publicly available evaluation reports and commentaries about their programmes up to October 1999.

**Data synthesis**

**CALIFORNIA (1989–PRESENT)**

The California Tobacco Control Program (CTCP), funded by Proposition 99, was the first comprehensive statewide tobacco control programme in the USA. In the main, the

### Table 1  Overview of elements of five comprehensive statewide tobacco control programmes in the USA to 1998-99.

<table>
<thead>
<tr>
<th></th>
<th>California</th>
<th>Massachusetts</th>
<th>Arizona</th>
<th>Oregon</th>
<th>Florida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme funding</td>
<td>1989: tax increase by 25 cents to 35 cents/pack, earmarked 20% of revenue for tobacco control</td>
<td>1993: tax increase by 25 cents to 51 cents per pack</td>
<td>1994: tax increase by 40 cents to 58 cents/pack and increased tax on other tobacco products, earmarked 23% of revenue for tobacco control</td>
<td>1996: tax increase by 30 cents to 68 cents per pack, earmarked 10% of increase for tobacco control</td>
<td>1997: Florida tobacco settlement funding, but no tax increase</td>
</tr>
<tr>
<td>Tobacco industry intervention</td>
<td>Lobbying to divert funding from tobacco control programme</td>
<td>Lobbying to divert funding from programme</td>
<td>Thought responsible for 1 year delay in programme spending, so baseline measures not gathered, and for limiting early programme activity to teens and pregnant women</td>
<td>Unsuccessful attempts to divert funding and limit the scope and target groups of the programme</td>
<td>Probable behind scenes lobbying to reduce programme funding and fire programme director</td>
</tr>
<tr>
<td></td>
<td>Mass media 17%</td>
<td>Mass media 33%</td>
<td>Mass media and sponsorships 54%</td>
<td>Public awareness and education 27%</td>
<td>Mass media 37%</td>
</tr>
<tr>
<td></td>
<td>Local lead agency grants 26%</td>
<td>Local lead agency grants for cessation, education, advocacy 43%</td>
<td>Local lead agency grants for school education, cessation, protection from ETS 25%</td>
<td>Public awareness and education 27%</td>
<td>Education/training 23%</td>
</tr>
<tr>
<td></td>
<td>Competitive grants 22%</td>
<td>School programmes 15%</td>
<td>School programmes 15%</td>
<td>Local lead agency grants 36%</td>
<td>Youth and community programmes 21%</td>
</tr>
<tr>
<td></td>
<td>School based programmes 31%</td>
<td>Statewide services e.g. training and quitline 5%</td>
<td>Statewide services e.g. training and quitline 5%</td>
<td>Statewide/Regional projects for quitline, tribal programmes 16%</td>
<td>Enforcement 12%</td>
</tr>
<tr>
<td></td>
<td>Administration and evaluation 5%</td>
<td>Research/evaluation 4%</td>
<td>Research/evaluation 4%</td>
<td>Statewide projects, admin and evaluation 16%</td>
<td>Evaluation 6%</td>
</tr>
<tr>
<td>Programme focus</td>
<td>Adults</td>
<td>Adults</td>
<td>Pre-teens</td>
<td>Adults</td>
<td>Teenagers</td>
</tr>
<tr>
<td>Adults</td>
<td>Teenagers</td>
<td>Protection of non-smokers from ETS</td>
<td>Teenagers</td>
<td>Pregnant women</td>
<td>Protection of non-smokers from ETS</td>
</tr>
<tr>
<td>Teenagers</td>
<td>Protection of non-smokers from ETS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ETS, environmental tobacco smoke.
Table 2a  Overview of evaluation approach and reported outcomes of statewide comprehensive tobacco control programmes to 1999 (part 1)

<table>
<thead>
<tr>
<th>Evaluation elements</th>
<th>California</th>
<th>Massachusetts</th>
<th>Arizona</th>
<th>Oregon</th>
<th>Florida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing cross sectional population surveys of adults and teens; Cohort study of teens; Tracking of per capita consumption; Early fragmented documentation of uptake of services; Recent more detailed evaluation of programme elements.</td>
<td>Ongoing population surveys of adults and teens; Cohort studies of teens and adults; Tracking of per capita consumption; Documentation of uptake of services, programme and policies.</td>
<td>Surveys of recall and appraisal of campaigns; Tracking of per capita consumption; Population surveys of teens and adults.</td>
<td>Standardised reports on programme implementation, placement of mass media, quitline calls; Surveys of store advertising/promotions, clean indoor air and youth access policies; Tracking of per capita consumption; Surveys of adult and teen smoking.</td>
<td>Information system to track number and type of activities undertaken; Teen and adult surveys to assess recall of campaign and beliefs and attitudes; School surveys to assess smoking behaviour; Monitoring of smoking in teenage mothers; Surveys of law enforcement personnel.</td>
<td></td>
</tr>
<tr>
<td>High levels of campaign awareness among adults and teenagers.</td>
<td>Not yet reported</td>
<td>Not yet reported</td>
<td>1998: 2/3 teens, pregnant women and adults reported seeing advertising in last 30 days.</td>
<td>Sept 1998: 28% of teens reported seeing one advertisement each day and 66%, at least one each week. Jan 1999: 48% of adults aware of Truth campaign.</td>
<td></td>
</tr>
<tr>
<td>90% teens exposed to pro-smoking messages.</td>
<td>1993-96: high but stable levels of exposure to pro-tobacco advertising on billboards (80%), magazines (74%), and on clothing (74%).</td>
<td>Not yet reported</td>
<td></td>
<td>March 1999: 56% of stores had tobacco advertising less than 3 feet from the ground.</td>
<td></td>
</tr>
<tr>
<td>Majority support in 1996 for a range of tougher measures to regulate the industry.</td>
<td>Teens who recall campaign advertising express attitudes consistent with campaign intent. Nearly all adults understand smoking is unhealthy, see few benefits to smoking and view industry with scepticism.</td>
<td>Change data not yet reported.</td>
<td></td>
<td>Other data not yet reported.</td>
<td></td>
</tr>
<tr>
<td>Over 3200 local programme staff trained to conduct cessation counselling.</td>
<td>27% of teenagers had visited the mobile interactive exhibit called “the Ashkicker” which demonstrates dangers of smoking. Other uptake data not reported.</td>
<td>By 1998-99, all counties had local coalitions, 24 school prevention projects were being implemented, all 9 Native American tribes and 5 organisations representing ethnic groups received funds for prevention and education, and 5 demonstration projects serving pregnant women and other patient groups were underway.</td>
<td></td>
<td>Feb 1999: 8000 youth had participated in anti-tobacco activities. Jan 1999: approved CDC smoking prevention curricula implemented in over 100 schools.</td>
<td></td>
</tr>
<tr>
<td>Failed retailer compliance checks fell from 52% in 1994 to 22% in 1997, but no change in perceived access by teens. Increase in % smoke free workplaces and smoke free homes. No change in perceived compliance by teens with school bans.</td>
<td></td>
<td>Change data not yet reported.</td>
<td></td>
<td>March 1999: 12000 citations issued for possession by underage youth.</td>
<td></td>
</tr>
</tbody>
</table>

California legislature has not fully implemented the Proposition 99 funding mandate for tobacco control programmes, and with the exception of the year 1990-91, underfunded tobacco control programme efforts by between 14% and 51% of what was promised (and by an average of 32% between 1989 to 1996). As table 1 indicates, per capita funding of tobacco control efforts was not only reduced by lower funding in later years of the programme, but was more aggressively counteracted by tobacco industry promotional activities.

The evaluation of the CTTCP (table 2a) has involved statewide surveillance of tobacco related attitudes and behaviours of adults and adolescents, tracking of programme implementation, and more recently an “independent evaluation” linking programme implementation to outcome measures. However, at the time of writing, only the base-
Table 2b  Overview of evaluation approach and reported outcomes of statewide comprehensive tobacco control programmes to 1999 (part 2)

<table>
<thead>
<tr>
<th>Per capita consumption</th>
<th>Adult prevalence</th>
<th>Teen smoking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California</strong></td>
<td>Significant decline during 1993-96 compared with baseline period of 1990-92 and for rest of USA, greater than expected for price increase alone.</td>
<td>Relative increase in 30 day prevalence less than for rest of US for 8th and 10th graders from 1993 to 1996. Relative increase for 9th to 12th graders less than for rest of US from 1993-97.</td>
</tr>
<tr>
<td><strong>Massachusetts</strong></td>
<td>Significant decline during 1993-96 compared with baseline consumption and by comparison with rest of USA and greater than expected from price increase alone.</td>
<td>Change data not yet reported.</td>
</tr>
<tr>
<td><strong>Arizona</strong></td>
<td>Decline of 5.4% in 1995 after adjustment for stockpiling of lower priced cigarettes—due to price increase only, since programme did not start until 1996.</td>
<td>Change data not yet reported.</td>
</tr>
<tr>
<td><strong>Oregon</strong></td>
<td>Significant decline compared with baseline consumption and by comparison with rest of USA.</td>
<td>Relative decline of 6.4% to 21.9% in 1998, but no national comparison.</td>
</tr>
<tr>
<td><strong>Florida</strong></td>
<td>Unknown.</td>
<td>Change data not yet reported.</td>
</tr>
</tbody>
</table>

line survey from the independent evaluation was available.

Evaluation of message reach and comprehension has generally shown high levels of media campaign awareness among teenagers, despite few advertising messages having been targeted specifically to them. Details of the dissemination of other programme strategies through 1995 are sketchy, but the baseline surveys undertaken for the independent evaluation for 1995/96 provide a much richer source of information on programme activities (table 2a). Overall, the programme appears to have documented increased awareness over time in the harm of smoking and passive smoking, stronger support for policy measures, positive change in the extent to which workplaces and homes are smoke free, and reduced access to cigarettes by minors from retail outlets, although there are no comparative analyses that have assessed the rate of change in other states. Cigarette advertising and promotions have been highly prevalent over this period.

Table 2b shows that several econometric studies have demonstrated that the CTCP was associated with a significant decline in per capita cigarette consumption in California, compared with baseline trends in California and trends for the rest of the USA. These studies also provide good evidence that investment in the tobacco control programme exerts independent effects from those of price alone, upon cigarette consumption in California. The introduction of the CTCP was associated with a greater relative decline in adult smoking prevalence in California compared with other states, although this did not persist during 1993-96. From cross sectional surveys conducted within California, standardised 30 day smoking prevalence did not change among 12 to 17 year olds from 1990 to 1993 (9.2%), but from 1993 to 1996 it increased significantly from 9.2% to 12.0%, coincident with the reduced amount of tobacco control funding and the increased ratio of tobacco industry to tobacco control funding. In addition, there was an increase in the percentage of 12 to 14 year olds who were susceptible to becoming smokers (from 34.5% in 1993 to 42.0% in 1996). Comparison of data from the school based Monitoring the Future surveys shows that although smoking increased in California between 1993 and 1996 in both eighth (relative increase of 16%) and 10th graders (relative increase of 6%), this was less than was observed for eighth (increase of 29%) and 10th graders (increase of 23%) in the rest of the USA.

In summary, in the early period of the programme, when programme expenditure was highest and the ratio of tobacco control expenditure to tobacco industry expenditure was most favourable, there was good evidence that progress was made in reducing overall population cigarette consumption and prevalence beyond what would have been expected from a price increase alone. During this period, teenage smoking prevalence stabilised at a time when it increased in the rest of the nation. Since 1994, however, some evidence indicates that effects on both teenage and adult smoking prevalence appear to have been diminished, but trends have remained more positive than for the rest of the nation.

At the beginning of 1999, a voter approved tax increase of 50 cents came into effect. It included a provision to refund the CTCP at earlier levels to make up for the reduction in revenues that otherwise would have occurred as sales fell in response to the new tax increase. These developments in the programme will be of considerable interest and ongoing surveillance and evaluation will document whether it will be associated with more positive future change in teen smoking.
MASSACHUSETTS (1993–PRESENT)

As the result of a ballot referendum known as “Question 1”, Massachusetts increased the excise tax on tobacco products to take effect in 1993, and established the Massachusetts Tobacco Control Program (MTCP) in October 1993. Of all states, the MTCP had the highest level of per capita funding (table 1), despite the fact that for the programme’s first three full fiscal years, the MTCP budget experienced a pattern of decreasing expenditure.55

Although the tobacco industry has been active in Massachusetts, attempting to divert funding away from the programme, their response has been less aggressive than was observed in California.54

To assess the effectiveness of the MTCP (table 2a), an independent evaluation was commissioned.55 The MTCP uses a management information system to document uptake of products and services and change in local policies. Population based surveillance of adult tobacco related knowledge, attitudes, and behaviours was undertaken,56 as were surveys of public high school and secondary school students.57

In addition, the Youth Risk Behaviour Survey (YRBS) was administered in schools every two years from 1993 to 1997.58 Tracking and evaluation studies (table 2a) suggest that the population, including adolescents, experienced high levels of exposure to the MTCP media campaign messages and that there have been positive changes in smoking related beliefs, attitudes, and public support for funding of tobacco control programmes.54–57 Within Massachusetts, over the programme period, there has been substantial progress at the local policy level to reduce retailer cigarette sales to minors, increase restrictions on smoking in public places, restrict placement of vending machines, and require permits for tobacco retailers, and at the state level to require disclosure of cigarette nicotine levels and additives.55 57 58

Like California, however, perceived compliance with bans on smoking in school premises has not changed.57 58 Access to tobacco from retail outlets appears more difficult, but most teenagers reported that cigarettes were still easy to obtain. Tobacco advertising and promotional efforts continued to be prevalent in Massachusetts following the commencement of the MTCP.54–59

When Massachusetts “Question 1” became effective on 1 January 1993, the real price of cigarettes increased sharply but was eroded from April 1993 by a significant industry initiated price cut that soon offset the tax increase.60 Despite this, the resulting short term real price increase combined with the ongoing tobacco control programme activities was associated with a decline in per capita cigarette consumption in Massachusetts for the period 1993 to 1996, greater than that observed for the remainder of the US (excluding California), and for the pre-programme period 1990–92 in Massachusetts.61–63 The extent of these changes was greater than that expected for a short term price increase alone. Surveys of teenagers in 1993 and 1996, follow-
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decline in failed retailer compliance checks, 71 OTPEP 70 is highly consistent with what has been observed in California and Massachusetts (table 2b). Similarly, the observed reduction in adult smoking prevalence mirrors that found in Massachusetts and the early programme period in California, 69 although final judgement will need to await release of comparable national data. Trends in tobacco use by adolescents in Oregon mirrored national trends for the first two years following commencement of the programme. 69

FLORIDA (1997–PRESENT)

Unlike the other statewide comprehensive programmes, the Florida Tobacco Pilot Program (FTPP) did not begin its programme with a tax increase, since funding was provided through the provisions of the settlement between the state and tobacco companies (table 1). A strategic plan was released in June 1998 70 which explained that the programme was particularly aimed at reducing tobacco use among teenagers aged 12–17 years, and a major component has been an aggressive youth oriented media campaign. The so-called “Truth” campaign began in April 1998, and placed particular emphasis on engendering unfavourable attitudes towards the tobacco industry. The programme also fostered community partnerships with all 67 Florida counties, school based initiatives, an education and training initiative, enhanced enforcement of youth tobacco access laws, and a law that penalised youth for possession of tobacco.

The evaluation elements of the programme are summarised in table 2a. To evaluate the media campaign, a media tracking survey was conducted, with successive cohorts of adolescents sampled by telephone, recruited in April (before the campaign), June, and September 1998, and followed up in 1999. 74–76 and an adult survey was conducted in 1999. 77

Within the first six weeks after the campaign launch, change was evident in youth attitudes about the behaviour of the tobacco industry, in a direction consistent with a positive impact of the campaign, 78 and this persisted in a follow up survey in September. 79 Over the course of the programme, substantial progress has been reported in implementing school based smoking prevention curricula and in involving youth in extracurricula peer education activities. 80 There was also a heavy emphasis on enforcement of the youth tobacco possession law (table 2a).

In surveys undertaken by the Florida Department of Health, the prevalence of current cigarette use (use in the past 30 days) among middle school students significantly declined between 1998 and 1999 from 18.5% to 15.0% (decline of 18.9%) and among high school students from 27.4% to 25.2% (decline of 8.0%). 81 Almost all of the decline was among non-Hispanic white students (rather than non-Hispanic black or Hispanic students), who had the highest rates of cigarette use at baseline. The trends observed in Florida are larger than any decline observed nationally among youth since 1980, 66 and substantially larger than the modest relative declines observed (of 6.9% and 1.4% for middle and high school students, respectively) between 1998 and 1999 from the Monitoring the Future surveys. 81

Although no tax increase was associated with the start of the campaign, the industry announced a price increase before the start of the campaign and another supposed price increase of 45 cents per pack after the state settlement was announced. Because of promotional discounting practices employed by the tobacco companies, it is unclear to what extent this increase took effect. For example, at the time of writing, Marlboro, Virginia Slims, and some other brands were still discounted by 35 cents per pack. It is not unexpected that, given the nature of the campaign, the tobacco industry might have been active in lobbying to have funding reduced—a mission they may have successfully accomplished in 1999, when the Florida Department of Health announced it would substantially cut back funding to approximately $2.61 per capita. 82

Comparison of state programmes

Each of the programmes underway in the five states differ by virtue of: their length of time in the field and per capita expenditure on tobacco
control; the circumstances under which they were initiated; background trends in teenage smoking prevalence against which they will be judged; the relative allocation of funding to control programmes, coupled with other research, that price increases influence overall and adolescent tobacco use and that the addition of programme activity reduces consumption more than expected because of price alone. Variation in per capita cigarette consumption reflects changes in the numbers of cigarettes smoked by smokers and the number of people who smoke. Monthly sales data based on tax receipts from wholesale cigarette deliveries are relatively sensitive instruments for detecting change at the population level.

One of the potential limitations of taxable sales data for cigarettes is that estimates of per capita consumption are based on tax receipts at the wholesale level, rather than the number of packs consumed. Distributors may delay or advance shipments in anticipation of announced wholesale price changes or tax increases, thereby producing year to year changes in tax receipts that do not reflect changes in consumption. Aggregation of data over several years, as has been done in most state evaluations, will help to minimise the influence of these practices, and reflect actual consumption more accurately. A second potential limitation is that the data reflect only sales made within the state, so that if smokers increasingly travel out of state to obtain cheaper cigarettes, taxable sales data will not reflect this. While this is possible, and the tobacco industry have often used this argument to provide an alternative explanation for reductions in per capita consumption, it is very unlikely to be the case in practice. As demonstrated in various analyses, bordering states have similar or even higher tax rates (for example, Oregon), have not evidenced increases in consumption (for example, Arizona), are not easily accessible for cigarette purchase for most of the population (for example, California), or would make a negligible difference to per capita consumption, even if all increases in sales in a neighbouring state with lower tax were explained by cross-border purchases (for example, Massachusetts). Taken together, there is strong evidence from these comprehensive programmes, coupled with other research, that price increases influence adolescent tobacco use and that the addition of programme activity reduces consumption more than that expected for price alone.

Third, there is consistent evidence that programmes are associated with a decline in adult smoking prevalence, with these effects observed to date in California, Massachusetts, and Oregon. Arizona and Florida, which are conducting more youth focused campaigns, have yet to examine change in adult prevalence associated with programme exposure. These changes in the normative environment for smoking, along with reduced opportunities to smoke and the message of social undesirability and greater prize for reductions in teenage smoking prevalence and uptake, is compelling. Plainly, for programmes like Arizona, which has yet to report follow up data, and Florida, which is early in its development, more research is needed to clarify and confirm important early indications of positive progress.

**Conclusions**

Given progress made by programmes in the field and other experimental and research evidence, it is concluded that comprehensive tobacco control programmes are an effective strategy for reducing teenage smoking. As US states decide what level of funding from their tobacco settlement money should be allocated to programmes to reduce teenage tobacco use, decision makers should not use “lack of evidence for benefit” as an argument to avoid making such allocations. Maine, Maryland,
Mississippi, and Minnesota have recently started comprehensive tobacco control programmes. By mid-1999, a number of states that had signed with the tobacco companies in the November 1998 multi-state settlement agreement, including Vermont, Hawaii, and Washington, had committed substantial funding for comprehensive programmes. Some other states have committed smaller amounts of funding, but most other states have yet to decide. Tobacco control advocates in other countries should take similar heed from the results of, and lessons learned by, the five US state comprehensive tobacco control programmes and pursue avenues for funding and implementation. Recently, the US Department of Health and Human Services issued guidelines for best practice for funding and implementation of comprehensive tobacco control programmes, thereby providing an additional important resource for decision makers. In addition, the Institute of Medicine has also just issued a report as a resource for tobacco control advocates and funding decision makers, summarising evidence that state comprehensive tobacco control programmes can reduce tobacco use.

The most difficult aspect of conducting this review has been that, in many cases, equivalent data from states without comprehensive tobacco control programmes were unavailable. Similarly, the data from states with comprehensive tobacco control programmes were often not directly comparable. Surveillance efforts undertaken by the National Cancer Institute as part of its ASSIST evaluation, by the Center for Disease Control and Prevention’s Office on Smoking and Health, and a few others are beginning to provide the comparable data from all states that are necessary for more systematic evaluations of state efforts. Continued collection of these data and their analysis will further enhance our understanding of the optimal mix of tobacco control strategies in reducing teenage smoking.

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