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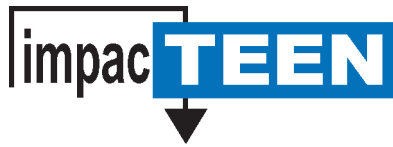
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to Reduce Youth Substance Use*

## **Effectiveness of Comprehensive Tobacco Control Programs in Reducing Teenage Smoking: A Review**

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# **Effectiveness of Comprehensive Tobacco Control Programs in Reducing Teenage Smoking: A Review**

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July 1999

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## *Executive Summary*

This review focuses on the extent to which comprehensive, statewide, tobacco control programs in the United States have induced change in teenage smoking or made progress towards this goal and under what circumstances such programs are likely to be most effective. The sources for this review include published journal articles, reports and documents, rather than any primary data analysis. We review evidence for the extent to which individual strategies that comprise a comprehensive tobacco control program are related to reducing teenage tobacco use, thereby providing a rationale as to why such comprehensive programs might be expected to reduce adolescent smoking when implemented on a statewide basis. This evidence suggests that school-based smoking prevention programs using the social influences approach, public education through counteradvertising, strongly enforced measures to: prevent youth from purchasing cigarettes, ban smoking in public places and ban tobacco advertising; and real increases in the price of cigarettes, all lead to reductions in teenage tobacco smoking.

When implemented as part of statewide programs, however, effects are difficult to assess and unwary legislators risk being poorly informed about the impact of comprehensive programs on teenage smoking. We identify five factors that can mislead: 1) changing population smoking prevalence is likely to be a relatively slow process, even in response to comprehensive programs; 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 behavior and prevalence can reflect underlying societal influences unrelated to new tobacco control programs; 4) actual implementation of program strategies may differ substantially from intended implementation and the extent of disparity may vary over time and between programs; and 5) tobacco industry activities may undermine tobacco control programs and falsely suggest the programs 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 look at teenage smoking prevalence. We argue for taking a larger view that takes account of the extent of program implementation and expenditure, and evaluates markers of progress in factors known to mediate teenage tobacco smoking, as well as change in tobacco smoking itself. Against this background, the report focuses mainly upon five states that have received funding for comprehensive programs: California, Massachusetts, Arizona, Oregon and Florida.

**California:** The California Tobacco Control Program, commenced in 1989, found the early program period to be associated with reduced aggregate cigarette consumption beyond what would have been expected from a price increase alone, an excess decline in adult smoking prevalence and stabilization of teenage smoking prevalence at a time when it increased in the rest of the nation. Since 1994 however, effects on both teenage and adult smoking prevalence appear to have been lost, or diminished, coincident with reduced program expenditure in this period. Importantly, these findings are largely supported in these time periods by concomitant change, or lack of it, in teenage tobacco-related beliefs and attitudes, perceptions of ease of access to tobacco, and compliance with school smoking restrictions, as well as an increase in the later period in tobacco advertising and promotion, as evidenced by tobacco industry expenditures and adolescent reports of exposure.

**Massachusetts:** Overall, evidence that the Massachusetts Tobacco Control Program (launched in 1993), was associated with influencing youth tobacco use is positive and consistent. This is especially true given

that trends in prevalence are contrary to those observed nationally since the program's inception. Evidence of decline in per capita consumption is particularly strong and available research suggests that some of this decline applied to adolescent smokers. Intermediate markers of progress are consistent with high levels of media message recall, acceptance by teenagers of the health risks of smoking and increased restrictions on smoking in public places. Like California, however, compliance with bans on smoking at school has not changed. Accessing tobacco at retail outlets appears more difficult, but most teenagers reported that cigarettes were still easy to obtain. Evidence suggests that social contacts are increasingly more likely to be sources for cigarettes.

**Arizona:** Information available to date from the Arizona Tobacco Education Program suggests that after a slow start in the development of the program, the predominantly youth-directed media campaign has been very intensive and well-remembered by adolescents. Effects on aggregate cigarette consumption were in line with expectations based on the extent of the 1994 price increase. Markers of progress with respect to youth attitudes, exposure to smoking restrictions, reduced youth access and smoking behavior will need to await completion of follow-up surveys later in the year. In addition, the adult-focused campaign which began in 1998 remains to be evaluated and a planned population survey of adults will provide important information about its impact.

**Oregon:** Since the Oregon Tobacco Prevention and Education Program has been in the field for only two full years, relatively limited data are available to assess progress. However, early reports suggest that media messages have reached both adults and teenagers. To date, there are no published measures of changes in tobacco-related knowledge or attitudes, restrictions on smoking in public places, youth access, or tobacco industry promotional activity, although these data are being collected. However, the decline in per capita consumption since the program's inception is highly consistent with what was observed in California and Massachusetts, being greater than expected from a price increase alone. Similarly, the observed reduction in adult smoking prevalence mirrors that found in Massachusetts and the early program period in California. However, final judgement will need to await release of comparable national data.

**Florida:** Despite being in the field for only one year, the Florida Tobacco Pilot Program has been extremely proactive in its use of media counteradvertising, choosing to focus upon further discrediting the tobacco industry as the prime strategy to discourage adolescents from smoking. In addition, the program has been active in developing programs at the community level. The media campaign is being seen and remembered by teens, and there is evidence that it has increased negative attitudes towards the industry. The indication from the school-based surveys in Florida that teen prevalence significantly declined between 1998 and 1999 is notable, but must await comparison with national trends to determine whether these changes were part of underlying change in teenage smoking patterns.

Each of the programs underway in the five states differ by virtue of: their length of time in the field and per capita expenditure on tobacco control; background circumstances under which they were initiated; background trends in teenage smoking prevalence against which they will be judged; the relative allocation of funding to general tobacco control strategies as opposed to youth-specific approaches; selection of messages and strategies within each program component; extent of actual compared with intended implementation; and measures used to assess progress. When appraised individually, it is difficult to draw firm conclusions about the effectiveness of particular mixes of program inputs in reducing teenage tobacco use. However, when taken together, a number of consistent findings emerge.

First, we find that one of the single most critical factors in program success seems to be the extent of implementation, and the degree to which this is undermined by the tobacco industry and other competitors for funding. More fully implemented programs lead to

increased counteradvertising and community initiatives; a greater capacity to implement school-based smoking prevention programs; and an increase in the passage of local ordinances that create smoke-free indoor environments and reduce youth access. These factors create an environment more favorable for reduced teenage tobacco use. There is strong evidence from these comprehensive programs, coupled with other research, that price increases influence overall and adolescent tobacco use and that the addition of program activity reduces consumption more than expected due to price alone.

There is consistent evidence the programs are associated with a decline in adult smoking prevalence, with these effects observed to date in California, Massachusetts and Oregon. These changes in the normative environment for smoking, coupled with reduced opportunities to smoke and the message of social undesirability offered by increased bans on smoking, are likely to be an important influence on youth smoking. Arizona and Florida -- conducting more youth-focused campaigns -- have yet to examine change in adult prevalence associated with program exposure.

Finally, despite the different strengths and combinations of program messages and strategies used in these comprehensive programs, the evidence that they lead to markers of change in factors that influence teenage smoking, and to reductions in teenage smoking prevalence and uptake, is compelling. Plainly, for programs 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. Notwithstanding these cautions, we find that the weight of evidence falls in favor of comprehensive tobacco control programs being able to reduce teenage tobacco use.

As states decide what level of funding from their tobacco settlement money should be allocated to programs to reduce teenage tobacco use, legislators should not use 'lack of evidence for benefit' as an argument to avoid making such allocations. Given progress made by programs in the field, research findings that strongly link tobacco policy advances, counteradvertising and school-based tobacco education programs to reduced youth smoking, and our theoretical understanding of factors that shape teenage tobacco use, comprehensive tobacco control programs are in fact the 'best buy' for reducing teenage smoking.



## ***Background and Aims***

As legislators come to make decisions about the amount of funding to allocate to tobacco control programs to reduce teenage smoking, this review seeks to provide an independent overview and discussion of available evaluation findings from comprehensive tobacco control programs in the United States. The review focuses on the extent to which these programs might have induced change in teenage smoking or made progress towards this goal, and under what circumstances comprehensive tobacco control programs are likely to be most effective. The sources for this review included published journal articles, reports and documents, rather than primary data analysis. Each of the comprehensive tobacco control programs in the US vary in their approaches to implementing tobacco control strategies and measuring progress. In this report, we focus mainly upon five states that received funding for comprehensive programs: California, Massachusetts, Arizona, Oregon and Florida.

The review summarizes evidence for the extent to which comprehensive tobacco control programs are related to reducing teenage tobacco use, and will provide a rationale for why such comprehensive programs might be expected to reduce adolescent smoking when implemented on a statewide basis. Making assessments about the success, or otherwise, of comprehensive tobacco control programs in reducing teenage tobacco use involves developing a clear understanding of the factors that can complicate or mask detection of such changes in the population. We point to five specific factors that can lead unwary legislators to erroneously make judgements against a program, and provide a rationale as to why it is important to look at the bigger picture – to take account of measures of program implementation and strength, and markers of progress in factors known or likely to lead to reductions in use, as well as observe what trends are apparent in teenage tobacco consumption and prevalence. The main body of the review summarizes what has been reported for each of the five statewide programs in terms of each of these types of measures and the review concludes with a commentary on these findings.

## ***What Is a Comprehensive Tobacco Control Program?***

Comprehensive tobacco control programs aim to involve a range of coordinated and coexisting tobacco control strategies, so that they reinforce and complement each other in a synergistic fashion. Most often, these programs have been characterized by an intended increase in the real price of cigarettes, initiated by an increase in the excise tax on cigarettes, with part of the increase being allocated to fund a tobacco control program. Such programs were first initiated in the United States in California (from 1989) and later, in Massachusetts (from 1993), Arizona (from 1994), and Oregon (from 1996). Most recently, Florida (from 1997) began a comprehensive program, but was funded by a percentage of money from that state's settlement with the tobacco industry, rather than a tax increase. Programs funded as a result of settlements with the tobacco industry may or may not be accompanied by a price increase. These comprehensive programs involve a mix of the following elements: (a) public education through electronic, outdoor and print

media counteradvertising campaigns; (b) community initiatives, involving grants to local organizations to facilitate worksite programs, training and assistance for health professionals to improve cessation services, and policy development; (c) school-based programs focusing on curriculum development, school policy, and prevention; (d) direct cessation services for smokers, such as telephone helplines and other quit smoking materials; (e) enforcement of policies to prevent youth access to tobacco, restrict tobacco advertising and/or create smoke-free environments; and (f) research and evaluation.

### ***Tobacco Control Strategies: An Overview of Evidence***

There is evidence that each of the elements of comprehensive tobacco control programs can reduce teenage tobacco use, or at a minimum, make significant progress along the pathway to achieving such change. Reviews of the effectiveness of school-based smoking prevention programs, the influence of counteradvertising on teenage smoking, and research undertaken to examine the effect of tobacco control policies on youth smoking (such as increasing real price, reducing youth access, restricting smoking in public places, and reducing tobacco advertising and promotion) all indicate likely beneficial effects on adolescent tobacco consumption and prevalence. Much of the evidence, however, has been gained from research applied to relatively small, discrete populations in controlled experimental studies, or in the case of policy research, from cross-sectional data where the direction of cause and effect relationships is not always clear, and the durability of any effects is difficult to determine. Unlike examination of the effects of school-based prevention programs, 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 tobacco use in the population in general and among adolescents in particular. However, the precise mechanisms by which such policies affect teenage tobacco use are sometimes 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 markedly changing societal norms about smoking. However, these indirect effects are no less important and may be more enduring. In providing a brief overview of this evidence, one critical factor that becomes clear is that individual tobacco control strategies are not independent, but can reinforce each other in the pursuit of reducing teenage smoking.

For example, field experiments and reviews of school-based interventions to reduce adolescent tobacco use show lower prevalence of smoking among students receiving peer-led programs and those dealing with social influences, than among students in equivalent comparison groups or randomly assigned control groups (Tobler, 1992; Bruvold, 1993, USDHHS, 1994). However, while programs that employ a ‘social influences’ model are the most effective for reducing tobacco use, these effects tend to dissipate over time (Botvin et al., 1983; Perry et al., 1988; Flay et al., 1989). Studies demonstrate that effectiveness can only be reliably enhanced and sustained when the

program is implemented in concert with mass media counteradvertising or community-based tobacco control strategies (Flynn et al., 1992; 1994; Perry, 1992; USDHHS, 1994). This is consistent with the notion that schools do not function in a vacuum, but are part of the community and the broader society in which they function; and that complementary and more comprehensive efforts may be needed for long-term success (USDHHS, 1994).

There is evidence from early controlled community studies that mass media counteradvertising alone reduces population smoking behavior (Pierce et al., 1986; 1990) as well as recent studies where other tobacco control strategies are few (eg. Mudde & De Vries, 1999). However, there is less evidence that mass media counteradvertising on its own may directly influence *teenage* smoking behavior, though such exposure does seem to be associated with attitudes more disposed to quitting or not starting (Bauman et al., 1988; 1989; 1991). Pechmann (1997) suggests that counteradvertising alone may be associated with a one-time drop in teenage smoking prevalence without affecting underlying smoking trends, a suggestion also made by Lewit et al. (1981). As already noted, the most reliable effects are observed once counteradvertising is combined with social influence school-based prevention programs (Flynn et al., 1992). This is not surprising since, conceptually, the media does more than directly educate its audience. Mass media can also support (reinforce old messages, support health changes, encourage maintenance of health changes or keep public health issues on the agenda), promote (publicize products and services) and play a supplementary role by being part of a larger and complimentary community-based program of tobacco control activity (Flora et al., 1989). The finding from research studies that programs need to use multiple channels of communication and influence applies equally to efforts to reduce teenage smoking, as it does to strategies to reduce smoking in adults.

There is evidence from studies of individual tobacco control policy factors that restrictions on youth access may reduce tobacco consumption by adolescents, but only when strongly enforced. For example, Chaloupka and Grossman (1996) found no evidence that existence of youth access policies were related to change in youth smoking, attributing their findings to the weak enforcement of the legislation in the period covered by their data. Case studies of communities with these laws have concluded that appropriate implementation and enforcement of these policies was critical to their success in reducing youth smoking (Jacobsen & Wasserman, 1997). Follow-up studies of teenagers in communities with restrictive youth access laws have found that increased compliance resulting from an intervention involving more rigorous enforcement practices reduced youth smoking (Jason et al., 1991, 1996; DiFranza et al. 1992). These studies, however, did not include comparison communities. A subsequent study, using cross-sectional data from the 1994 Monitoring the Future surveys (MTF), coupled with data on state implementation of the Synar amendment and resulting compliance rates (Downey & Gardiner, 1996), found that comprehensive, aggressively enforced efforts to limit youth access to tobacco products that resulted in increased retailer compliance could reduce youth smoking and estimated that an ideal implementation of Synar could reduce youth smoking by up to 18 percent (Chaloupka & Pacula, 1998). Recent controlled intervention studies (Forster et al., 1998; Rigotti et al., 1997) and a comprehensive review (Forster & Wolfson, 1998) have also suggested that a very high level of retailer

compliance coupled with community involvement may be necessary before youth smoking rates are substantially affected. However, other access-related policies, such as restrictions on product placement and bans on single cigarette sales, have not been researched.

In terms of restrictions on smoking, it is known that schools with policies that ban smoking on school premises have significantly lower rates of student smoking, and that more comprehensive policies (including banning smoking near the school and restricting students from leaving school grounds) are associated with even lower rates; as are policies that include implementation of smoking prevention education (Pentz et al., 1989). Other restrictions on smoking in public places can also affect youth smoking through decreasing opportunities to smoke and providing a message about the social unacceptability of smoking. Chaloupka and Grossman (1996) used cross-sectional data from the MTF surveys from 1992 through 1994 to show that restricting smoking in public places significantly reduces the prevalence of smoking among 8<sup>th</sup>, 10<sup>th</sup> and 12<sup>th</sup> graders. Similarly, restricting smoking in schools was found to be effective in reducing average daily cigarette consumption among young smokers. Tauras and Chaloupka (1999) found that clean indoor air laws were associated with reducing both the intensity and the propensity to smoke, in successive cohorts of young adults sourced from the MTF surveys from 1975 to 1993.

The empirical evidence on the impact of tobacco advertising on smoking is mixed, yet most recent comprehensive studies indicate that complete bans do influence aggregate cigarette consumption. Many econometric studies of partial bans conclude that they have little or no effect on aggregate cigarette advertising on sales (Chaloupka and Warner, forthcoming). Since the advertising bans examined in these studies were partial bans, and because advertising expenditures are so high, a marginal change in expenditure will be unlikely to have any impact on aggregate sales. In addition, the tobacco industry is able to compensate for inability to advertise in one medium, through increasing advertising in others, so that overall advertising expenditure does not substantially change (Warner, 1986; USDHHS, 1989; Pollay et al. 1996; Saffer, 1998). Indeed, the most recent studies of the impact of advertising bans are consistent with this argument. Saffer and Chaloupka (1999), for example, based on an analysis of data on 22 OECD countries from 1970-1992 concluded that *comprehensive* bans on advertising/promotion significantly reduce smoking, while limited bans have little or no effect. Similarly, the one published econometric study using more disaggregated measures of youth exposure to advertising provided some support for the hypothesis that pro-smoking advertising significantly increased youth smoking (Lewit, et al., 1981). Likewise, Pollay and his colleagues (1996), using data from several large surveys of youth and adult smoking, concluded that the brand share of cigarette advertising expenditures had a significant impact on brand choice among youth and adult smokers, with younger smokers about three times more sensitive to advertising than older smokers. The evidence from other disciplines generally supports the argument that cigarette advertising and promotion directly and indirectly increases cigarette demand, particularly among youth (Warner, 1986; USDHHS, 1989, 1994, 1998). These studies conclude that tobacco advertising is effective in getting children's attention and that the ads are recalled, with strength of

interest correlated with current or anticipated smoking behavior or smoking initiation (i.e. Goldstein et al., 1987; DiFranza et al. 1991; Evans et al. 1995; FDA, 1996; Pierce et al., 1998).

Finally, numerous studies conclude that higher cigarette prices lead to reductions in overall smoking (Chaloupka & Warner, forthcoming). While not all econometric studies have found consistent effects for teens and young adults (Chaloupka, 1991; Wasserman et al. 1991; Douglas & Hariharan, 1994; Douglas, 1998; DeCicca et al., 1998), methodological issues and data limitations in these studies tend to increase the likelihood of finding no effect. In contrast, many studies have confirmed that teens and young adults are relatively more price responsive than adults (Lewit et al., 1981; Lewit & Coate, 1982; Chaloupka and Grossman, 1996; Lewit et al., 1997; Chaloupka & Wechsler, 1997; Dee & Evans, 1998; Evans & Huang, 1998; Tauras & Chaloupka, 1999). Evans and Huang (1998), for example, based on MTFS data for the period from 1985 through 1992, estimate that a 10 percent increase in price would reduce youth smoking prevalence by nearly five percent. The weight of evidence does indeed suggest that adolescents are responsive to price increases.

Taken together, research conducted to date provides good reason to expect that real price increases, restrictions on smoking in schools and public places, a complete ban on tobacco advertising, strongly enforced limits on youth access, as well as school-based prevention programs using a social influence approach, coupled with mass reach counteradvertising campaigns, will lead to reductions in youth smoking. Comprehensive tobacco control programs recognize what theory and experience with evaluation of tobacco control efforts to change community tobacco norms and behaviors have long suggested: there is no magic bullet to reduce teenage tobacco smoking and a community-wide sustained effort using multiple channels of influence has the most likelihood of producing real and durable changes in adolescent smoking.

### ***Evaluating Comprehensive Tobacco Control Programs: Five Factors That Can Mislead***

While controlled research studies indicate tobacco control strategies with the potential to reduce teenage tobacco use when applied more widely, evaluation of the extent to which they achieve these aims when implemented in practice as part of comprehensive tobacco control programs is rather more difficult to determine. In any assessment of the effectiveness of tobacco control programs in reducing teenage tobacco use, it is vital to understand why this is so. Otherwise, legislators risk throwing the baby out with the bath water. Accurate assessment of the effects of these programs requires and deserves more than a cursory look at trends in teenage smoking prevalence.

First, the results of a considerable body of theory and research, as well as experience gained from the field, tell us that changing population smoking prevalence and sustaining this change, including among adolescents, is likely to be relatively slow and difficult to achieve. This means that making a judgment about the effectiveness of comprehensive tobacco control programs based upon *early* change or lack of change in teenage prevalence alone can be quite misleading. Measures of smoking prevalence among adolescents are relatively insensitive tools for evaluating the effects of comprehensive tobacco control programs. Programs require time to be implemented and time to exert their effects. Interpretation of trends in available data, and comparison with trends from non-exposed<sup>1</sup> populations, are likely to provide a more accurate picture.

Second, measures of smoking prevalence are generally only available once per year (though sometimes only every few years) and are subject to survey sampling error and dependent upon the mode of survey administration. For example, telephone surveys consistently yield lower estimates of smoking prevalence than self-administered school surveys (Siegel & Biener, 1997). This means that comparison between surveys over time, and between states, need to be made with caution.

Third, and complicating this picture further, is that there have been underlying changes in the population as a whole with respect to teenage smoking. Between 1991 and 1996, the numbers of 8th and 10th grade students smoking in the past month rose by nearly 50 percent, while the number of comparable 12th grade students rose by over 20 percent [University of Michigan News and Information Services (UMNIS), 1998]. These changes have also been evident in developed countries outside the US (Hill et al., 1998; Adlaf et al., 1997), suggesting that some kind of broad societal influence may be responsible. In the face of such change, effective programs may only be able to stabilize teenage smoking prevalence where increases are reported elsewhere, or may act to minimize an increase, where increases are larger elsewhere. It could be argued that such ‘damage control’ is equally or more important in influencing teenage tobacco use and preventing eventual addiction and excess death, as differentially increasing the rate of reduction in teenage prevalence during times when prevalence seems to be declining across the whole population.

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<sup>1</sup> Or more correctly, *less* exposed populations, since most states have at least some limited type of tobacco control programs or policies in place.

Fourth, the extent to which comprehensive tobacco control programs *actually implement* the strategies that are intended, varies between programs and over time, due to changes in political and financial commitment. Unlike research studies of tobacco prevention strategies where the interventions are controlled by research program staff who can ensure that they are fully implemented as intended, programs delivered in the real world are by their nature much less controllable. In comprehensive tobacco control programs, funding is provided for program components to reach the entire state, so the target group is more geographically and ethnically diverse. Program delivery needs to be coordinated across agencies with different interests and methods of working. This means that the process can often be slow because of competing priorities among the diverse array of agencies that need to be involved and whose energy and networks need to be harnessed. Because there are vast practical problems in coordinating programs of this size, there is plenty of opportunity for outside players to undermine the goodwill, dedication and commitment of funders to the program. For example, it is not uncommon for other competing health programs who feel they have been poorly funded by comparison to try to divert funding away from the tobacco control program for their own purposes. Perhaps the best example of under-implementation has occurred in the enforcement of youth access legislation and it is clear from research conducted to date, that enforcement does need to be high before effects on tobacco use can be expected (Chaloupka & Pacula, 1998).

Finally, it is plain that the tobacco industry employs specific strategies to counter the likelihood that comprehensive tobacco control programs will have their intended effects. Apart from lobbying to divert funding away from tobacco control activities per se, they also seek to encourage allocation of funds into strategies for which there is least evidence of benefit, or least likelihood of making a population-wide impact on tobacco use (eg. Bialous & Glantz, 1997; Balbach & Glantz, 1998). In addition, the tobacco industry uses counter-strategies to recruit youth to smoke and to make continuation of smoking easier for smokers (such as price discounting; emergence of promotions and brand items; advocating for smoke-free areas rather than complete elimination of smoking indoors). All of these strategies have the aim of protecting their market -- decreasing the likelihood that smokers will quit, and maintaining a climate favorable for teenagers -- their future customers -- to start.

So, given that these factors can obscure assessment of the impact of comprehensive tobacco control programs, how should the effectiveness of such programs in reducing teenage tobacco use be judged? What should the markers of progress be?

### ***Markers of Progress in Comprehensive Tobacco Control Programs***

In evaluating comprehensive programs, 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 programs - as well as the amount and type of promotional and other strategies used to encourage and promote smoking on the part of tobacco companies (Wakefield & Chaloupka, 1998). Consideration should then be given to measures of progress (so-called intermediate measures) and measures of outcome.

To begin with, assessments should be made of the level of program implementation. As an overall assessment, it should be determined whether the amount of program expenditure was as intended or was compromised by some process and whether this might have varied over time. This helps to establish whether one might reasonably expect change at the population level for the actually implemented level of program input and policy change, as well as an explanation for any variation over time in markers of progress towards reduced teenage tobacco use. To assess implementation of individual program components, it is important to determine whether they were noticed, recalled or recognized by adolescents, and/or whether programs reached adolescents.

Obtaining intermediate measures requires an understanding of the influences on teenage tobacco uptake. A range of markers of progress might be consistent with or signal a likely eventual change in prevalence, given what we already know about influences on teenage smoking behavior. These indicators of progress could furnish helpful information about whether and to what extent, comprehensive tobacco control programs may be affecting, or expected to affect, teenage smoking behavior.

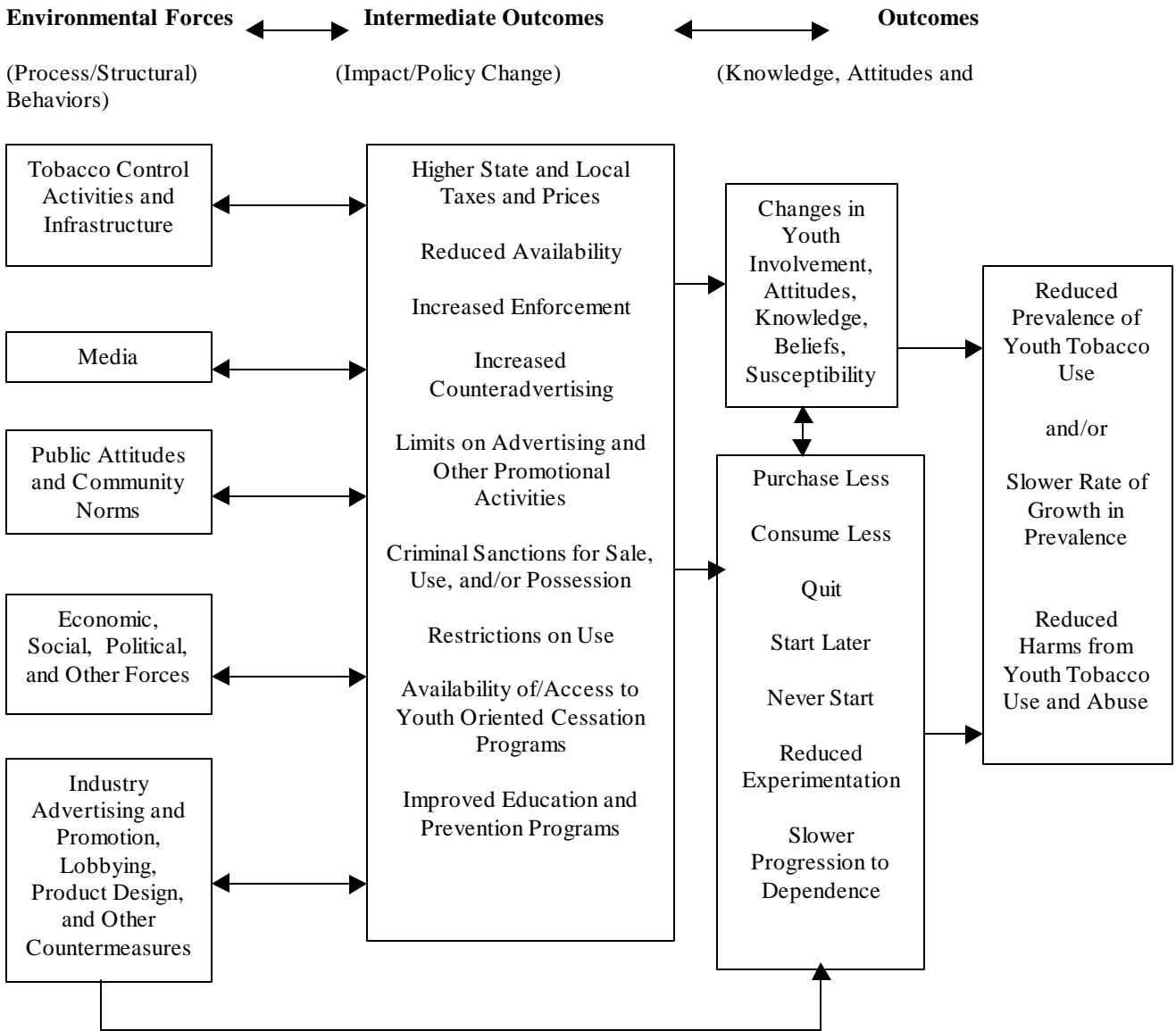
It is known that the uptake of smoking usually involves identifiable stages. Exploration and initiation of smoking is largely confined to adolescence, with transition from regular use to dependence occurring in late adolescence and early adulthood. The process of becoming a smoker generally includes a period of susceptibility prior to any experimentation; early and advanced periods of experimentation; the development of addiction; and the building up of tolerance until cigarette consumption level is stabilized (Conrad, Flay & Hill, 1992; Flay & Petraitis, 1994; Pierce et al., 1996). The progression from experimentation towards regular use involves multiple social, psychological and biological factors, and it seems likely that different factors may play different functions at different points in this progression (Conrad et al., 1992; Flay, 1993).

Figure 1 provides an overview of the types of factors that influence uptake of smoking by teenagers, based upon the influential theory of triadic influence (Flay & Petraitis, 1994). While other researchers may have differences of opinion as to the relative importance of different factors or the pathways by which certain factors influence behavior change or its precursors, most would agree that this provides at least a fair approximation of the complex interplay of factors that determine behaviors such as tobacco smoking. It is clear that the path to influencing reduction in tobacco use is determined in multiple ways -- consistent with the results of research studies that have mostly found relatively short-



term effects on adolescent tobacco smoking by using one strategy in isolation. The diagram below demonstrates why rapid change in prevalence is unusual, intervention may take years to produce effects on teenage tobacco use at the population level, and rapidly achieved gains can be eroded over time. This model offers a framework for identifying changes in factors that foreshadow changes in teenage tobacco use.

**Figure One: Influences on Teenage Smoking**



If the uptake of tobacco smoking is understood as a process, it is clear that interventions might be expected to yield lower smoking prevalence rates in due course if they act to reduce susceptibility, the likelihood of experimentation, progression toward addiction, and to decrease the stabilization of smoking patterns in children and adolescents. But, even before such changes become evident, more proximal indicators of progress, amenable to measurement, can serve as early markers of positive change. If we accept the evidence that particular policies and programs have been demonstrated to influence teenage tobacco use, then measures of actual policy enactment and implementation, as well as measures of program delivery and receipt should be viewed as markers of progress towards the longer term aim of achieving reduction in adolescent smoking. It is worth pointing out, however, that some policy measures may reduce smoking more rapidly than others. For example, price increases exert their effects relatively quickly. Other influences may work through multiple channels. For example, reductions in adult smoking may directly change the normative environment, so that there is less explicit modeling of smoking as an ‘adult’ behavior (Flay et al, 1994; Distefan et al., 1998). Reductions in adult smoking may impact indirectly by increasing the social undesirability of smoking with increased smoking bans, especially at home, and making access to parent’s cigarettes less likely, as parental smoking declines (Hill & Borland, 1991).

In reviewing evidence for the effectiveness of comprehensive tobacco control programs in reducing teenage tobacco use, we focus upon: measures of program implementation and strength; intermediate markers of progress (including awareness of campaign messages by youth); changes in factors that promote or normalize smoking (such as decreasing youth access to tobacco, creating more restrictions on smoking, permitting tobacco advertising); beliefs about smoking and health and smoking and addiction; support for tobacco control strategies; consumption; adult smoking; adolescent intentions and uptake continuum measures; and finally, teen smoking prevalence.

### ***California: 1989 – Present***

Proposition 99, the California Tobacco Tax and Health Promotion Act, was enacted by voters in November 1988 and became law on January 1<sup>st</sup>, 1989. The initiative increased the tax on cigarettes and other tobacco products by 25 cents per pack (from 10 to 35 cents per pack), and earmarked 20 percent of the additional revenue for programs aimed at the prevention and reduction of tobacco use. From the outset, the California legislature has not implemented this funding mandate for tobacco control programs, and with the exception of the year 1990-1991, under-funded tobacco control programs efforts by between 14 percent and 51 percent of what was promised (and by an average of 32 percent between 1989 to 1996 (Pierce et al., 1998). Over the first seven years of the program, this decline in funding translated into an average of \$3.35 per person per year, aged 12 years or more, from 1989 to 1992/93 to \$2.08 per person per year in the period 1993 to 1995/96 (Pierce et al., 1988). However, over this same period, tobacco industry expenditure increased in California. In the first four year period, the tobacco industry spent five times more than the California Tobacco Control Program (CTCP). In the next

three year period, it spent ten times more than the CTCP (Pierce et al., 1998). Thus, the 'strength' of tobacco control efforts was not only reduced by lower funding, but more aggressively counteracted by tobacco industry promotional activities.

The CTCP allocated funding for tobacco control efforts in a number of ways. Local lead agencies (county health departments and city health departments) received an average of 15 percent of total funds to coordinate tobacco control activities and provide technical assistance on program planning and delivery at the local level; especially in relation to increasing dissemination of information on the health effects of smoking and passive smoking, and in measures to protect people from ETS. Mass media counter-advertising on television, radio and in outdoor and print media has been a visible component of the CTCP, receiving an average of 12 percent of expenditure from fiscal year 1989/90 to 1996/97. A competitive grants program was also established to fund tobacco prevention projects that built on existing community services and resources; especially those targeting ethnic minority communities, receiving an average of 15 percent of funds. On average, an additional 22 percent was allocated each year to local school districts and county offices of education for implementing school-based tobacco prevention, education and cessation programs for adolescents. On average, the remaining 21 percent were used to fund medical care programs that were not part of a comprehensive tobacco control strategy.

The evaluation of the CTCP has involved statewide surveillance of tobacco-related attitudes and behaviors of adults and adolescents, tracking of population by the University of California at San Diego (Pierce et al., 1994; 1998), tracking of program implementation by San Diego State University (Elder et al., 1996); and more recently an 'independent evaluation' linking program implementation to outcome measures, awarded to a consortium of groups including the Gallup Organization, Stanford University and the University of Southern California (Independent Evaluation Consortium, 1998). However, at the time this review was written, only the baseline survey from the independent evaluation was available.

Evaluation of message reach and comprehension has generally shown high levels of campaign awareness (Popham et al., 1994; Pierce et al., 1998; Independent Evaluation Consortium, 1999). In an evaluation of the first mass-reach counter-advertising campaign conducted by the Californian Department of Health Services in 1990-91, a series of four cross-sectional samples of school students before and following the commencement of the media campaign showed that teens were aware of the campaign, using measures of aided and unaided recall (Popham et al., 1994). This study also demonstrated an increase in student attitudes against smoking and changes in student smokers thinking about quitting or nonsmokers thinking about starting, as well as smoking prevalence, consistent with a positive effect of this early campaign (Popham et al., 1994). From July 1995 through December 1996, 20 percent of the total of \$10.2 million spent on general audience media was tagged as 'youth-specific', and 25 percent of the groups to whom local program activities were directed were youth (Howard-Pitney et al., 1998). During this period, a total of 19 general audience advertisements disseminated messages about youth access (31 percent), countering pro-tobacco

influences (30 percent), ETS (27 percent) and cessation/prevention (12 percent). Television advertising had moderate to high recall among both adults (38-67 percent) and 10<sup>th</sup> graders (51-67 percent) and between one-quarter and one-third of 10<sup>th</sup> graders recalled ads on radio and on outdoor signs (Howard-Pitney et al., 1998). The 1996 media campaign run by the CTCP was aimed at young adults, rather than teens. Despite this, in the 1996 California Tobacco Survey, 82 percent of adolescents said they saw an anti-smoking message on television in the past month, 50 percent said they heard such a message on radio and 58 percent saw an anti-smoking billboard (Pierce et al., 1998). Recall of television anti-smoking messages was higher for adolescents than adults. Thus, available evidence does indicate that Californian teenagers are aware of counteradvertising messages, despite the fact that few have been aimed specifically at teenagers.

Details of the dissemination of other program strategies through 1995 are sketchy, although from 1992 through 1994, it was noted that local health departments implemented more than 10,000 multi-session prevention, cessation and environmental tobacco smoke programs, with 61 percent focusing on prevention, 32 percent on cessation and 2 percent on ETS (Elder et al., 1996). The baseline surveys undertaken for the independent evaluation for 1995/96 provide a much richer source of information on program activities (Independent Evaluation Consortium, 1998), suggesting that nearly 40 percent of community program activities focused on countering pro-tobacco influences, 19 percent on reducing exposure to ETS, 19 percent on reducing youth access, 15 percent on cessation or prevention and 8 percent had another focus. During these calendar years, 116 local community agencies were funded, and nearly half of the activities undertaken were aimed at elected officials, tobacco retailers, law enforcement officials and other such groups. Based on teacher survey data, school averages for implementation of at least one tobacco prevention lesson were 54 percent for 5<sup>th</sup> grade and 52 percent for 8<sup>th</sup> grade teachers, with peer education programs being implemented in 15 percent and 29 percent respectively (Rohrbach et al., 1998).

In California, the proportion of tobacco retailers who failed compliance checks for selling tobacco products to minors decreased from 52 percent in 1994 to 22 percent in 1997 (California Department of Health Services, 1998). However, perceptions of adolescents' ease of access to cigarettes did not change in surveys conducted in 1990, 1993 and 1996, with around 58-60 percent of teenage respondents indicating they thought it would be easy for them to get cigarettes if they wanted some at each time point (Pierce et al., 1998). These findings are largely confirmed by the independent evaluation which also pointed out that social sources are important for obtaining cigarettes and may become more so, if and when purchase from retail outlets becomes more difficult (Independent Evaluation Consortium, 1998).

Population surveys show there has been an increase in the percentage of indoor workers who work in smoke-free workplaces (Pierce et al., 1998). Importantly, there has also been an increase in the percentage of homes which are smoke-free, including homes with smokers. In 1992, 29 percent of Californians under the age of 18 years were exposed to ETS at home. By 1996, this figure had decreased to 13 percent (Pierce et al., 1998).

These trends create an environment more conducive to not smoking; both by reinforcing the social unacceptability of smoking, and by making smoking more inconvenient. In schools, however, progress in maintaining a smoke-free environment has been mixed. Surveys show that the perceived prevalence of teachers' smoking changed favorably, with 17-18 percent of school students indicating in 1990 and 1993 that none of their teachers smoked, compared with 29 percent in 1996 (Pierce et al., 1998). This is important, since research has established a link between teachers' smoking at school and adolescent smoking uptake (Allen et al., 1991; 1992). However, surveillance data also indicate that despite a long-standing ban on smoking in junior high and middle schools, and a more recent ban on smoking in all schools, fewer adolescents thought that students obeyed the rules not to smoke in 1996 (40.7 percent) than in 1990 (46.3 percent) (Pierce et al., 1998). These more recent data were largely confirmed by an independent survey of smoking in schools (Independent Evaluation Consortium, 1998).

During the period 1990 through 1996, Californian teenagers were highly exposed to tobacco advertising and promotional activities, with 90 percent reporting exposure to pro-smoking messages and a majority understanding and agreeing with the messages in cigarette advertisements. From 1993 to 1996, the percentage of teens that owned a promotional item with a cigarette company logo increased from 8.9 percent to 13.6 percent (Pierce et al., 1998). During 1996, around 1 in 12 newspaper issues in California contained pro-tobacco advertising and for the first time, full-page advertisements promoting tobacco-sponsored nights at local clubs and bars were observed. Expenditure by tobacco companies on billboard advertising was noted to be higher per capita in California than in most comparable states in the US, although it is unclear whether this may be because California is more heavily targeted or because there are more billboards to lease (Boley Cruz et al., 1998). In any case, it was noted that 49 percent of tobacco billboards in 18 surveyed counties appeared to be within 1,000 feet of public playgrounds and schools. During the 18-month period reviewed, 1 in 8 public events were sponsored by tobacco companies, although this did not differ from sponsorship trends in 10 comparison states (Boley Cruz et al., 1998).

Several econometric studies have demonstrated that Proposition 99 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 United States (Glantz, 1993; Hu, Sung & Keeler, 1995a; 1995b; Pierce, 1994). Hu et al. (1995b) found that, of the 1,051 million packs of cigarettes not sold during the period 1990-1992, 819 million (78 percent) were estimated to be attributable to the price increase and 232 million (22 percent) were attributed to the impact of the media campaign. Subsequent work by Pierce et al. (1998) has tracked the change in the real price of cigarettes up to 1996, and demonstrated, based on underlying accepted assumptions about the relationship between price and consumption, that declines in consumption in California have been greater than that expected based upon price alone and are coincident with changing levels of program expenditure. These findings provide good evidence that investment in the tobacco control program exerts independent effects upon cigarette consumption in California.

The introduction of the California TCP was associated with a decline in adult smoking prevalence in that state. Analyses of change in adult smoking prevalence in California and the rest of the United States, indicate that although smoking prevalence in California is always lower than the rest of the US and prior to 1989 was declining at the same rate, the rate of decline from 1989 to 1993 in California (-1.09 percent per year) exceeded that for the rest of the US (-0.66 percent per year). However, in the period 1993 to 1996, the rate of decline in California (-0.16 percent per year) was less than observed for the rest of the US (-0.27 percent) (Pierce et al., 1998). This has been attributed to change in the level of program expenditure and specifically, change in the ratio of program expenditure to tobacco industry promotional expenditure.

Measures from the California Tobacco Surveys for 1993 and 1996 show that there was an increase in the percentage of 12 to 14 year olds who were susceptible to becoming smokers (from 34.5 percent to 42.0 percent), and an increase in the percentage of addicted smokers (defined as having smoked 100 cigarettes) (from 9.9 percent to 12.1 percent). California Tobacco Surveys assessed smoking behavior in large representative household samples of California adolescents in 1990, 1993 and 1996, and data from outside California collected in this fashion are not available for comparison. Using the criterion of smoking within the past 30 days, standardized smoking prevalence did not change among 12 to 17 year olds from 1990 to 1993 (9.2 percent), but from 1993 to 1996, increased significantly from 9.2 percent to 12.0 percent, coincident with the reduced amount of tobacco control funding and the increased ratio of tobacco industry to tobacco control funding (Pierce et al., 1998). During the 1990s, there have been significant increases in smoking prevalence among teenagers across the United States. Comparison of data from the school-based Monitoring the Future Surveys show that although smoking increased in California between 1993 and 1996 in both 8<sup>th</sup> (relative increase of 16 percent) and 10<sup>th</sup> graders (relative increase of 6 percent), this was less than was observed for 8<sup>th</sup> (increase of 29 percent) and 10<sup>th</sup> graders (increase of 23 percent) in the rest of the United States (Unger et al., 1998).

In summary, there is mixed evidence that the CTCP has been associated with reductions in teenage tobacco use. In the early period of the program, when program expenditure was highest and the ratio of tobacco control expenditure to tobacco industry expenditure was most favorable, 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 stabilized 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. These findings are largely supported by concomitant change or lack of it in these time periods, with regard to teenage tobacco-related beliefs and attitudes, perceptions of access to tobacco, compliance with school smoking restrictions, and an increase in tobacco advertising and promotion, as evidenced by tobacco industry expenditures and adolescent reports of exposure. 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 program will be of considerable interest and ongoing surveillance and evaluation will document whether it be associated with more positive changes in teen smoking in the future.

### ***Massachusetts: 1993 - Present***

In 1992, as the result of a ballot referendum known as “Question 1”, Massachusetts increased the excise tax on tobacco products to take effect in 1993, from 26 to 51 cents per pack. The Massachusetts Tobacco Control Program (MTCP) began in October 1993, with a major media campaign designed to provide public information and influence public attitudes toward smoking. Other statewide initiatives began in late 1993 and early 1994, and for the program’s first three full fiscal years, the MTCP budget was funded at \$43.1 million in 1995, \$41.8million in 1996 and \$36.8million in 1997 (Abt Associates, 1998). This pattern of decreasing expenditure is similar to what has been observed in California (Begay & Glantz, 1997) and although the tobacco industry has been active in Massachusetts, attempting to divert funding away from the program, their response has been less aggressive than was observed in California (Siegel & Biener, 1997). With a population of around six million, the average expenditure of \$40.6 million per year represents an approximate average annual per capita expenditure of \$6.64 (US Bureau of Census, 1999). The MTCP funded local agencies throughout the state (including local boards of health, school departments and youth services agencies) to provide direct cessation services, educate communities on tobacco issues, and work for local ordinances and policies limiting youth access to tobacco and exposure to ETS. In addition to the MTCP, the state enacted another 25-cent increase in the tobacco excise tax in October 1996. The tax on smokeless tobacco was also increased to 75 percent of the wholesale price and a new tax was placed on cigars at 15 percent of the wholesale price (Abt Associates, 1998).

To assess the effectiveness of the MTCP, an independent evaluation was commissioned (Abt Associates, 1998). Population-based surveillance of adult tobacco-related knowledge, attitudes and behaviors was undertaken by the Center for Survey Research at the University of Massachusetts (Biener & Roman, 1996) and surveys of public high school and secondary school students were undertaken by Health and Addictions Research Inc (Briton et al., 1997). In addition, the YRBS undertaken in schools every two years was available for the years 1993, 1995 and 1997 (Massachusetts Department of Education, 1998).

In Massachusetts, the broadcast media effort in 1997 included eight television spots and six radio spots specifically aimed at youth, with additional exposure in theaters, aiming to ‘de-glamorize’ smoking. Tracking surveys show that the vast majority of adolescents recalled having heard the anti-smoking message and 80 percent recognized the theme “it’s time we made smoking history”. Tracking surveys additionally found that adolescents who recalled particular advertisements tended to express attitudes consistent with the intent of the campaign (Abt Associates, 1999). From 1993 to 1996, the

percentage of students aware of anti-tobacco advertising on television increased from 77 percent to 88 percent, on radio from 46 percent to 58 percent, and on billboards from 38 percent to 46 percent (Briton et al., 1997). One index of public attention to tobacco control issues is the frequency with which tobacco-related stories appear in daily newspapers. In Massachusetts, newspapers ran an average of 2.8 tobacco-related stories per month from July to December 1996; about four times the national rate during the same period (0.7 stories per month). These studies suggest the population, including adolescents, experienced high levels of exposure to the MTCP media messages.

Survey results indicate that nearly all Massachusetts adults understand smoking is unhealthy, see few positive benefits of smoking and view the tobacco industry with skepticism (Abt Associates, 1999). The 1996 Massachusetts school survey showed that 62.1 percent of 7<sup>th</sup> through 12<sup>th</sup> graders thought that people greatly risk harming themselves by smoking cigarettes (Briton et al., 1997), but trend data are not reported.

In the three and a half years from January 1994 through June 1997, 141 cities and towns with a combined population of over 3.9 million, adopted provisions requiring permits for tobacco retailers and restricted placement of vending machines. In addition, Boards of Health and other Massachusetts TCP-funded programs worked to enforce youth access provisions through compliance checks on signage and under-age sales. From early 1994 to mid 1997, the success rate of youth purchase attempts gradually declined from 48 percent to 8 percent, and areas with MTCP-funded Boards of Health improved more than areas without such funding (Abt Associates, 1999). Despite this, in 1996, 67.1 percent of 7<sup>th</sup> and 8<sup>th</sup> graders reported it was fairly easy or very easy to obtain cigarettes and 76.6 percent of those who had tried to buy cigarettes were not asked to show proof of age (Briton et al., 1997). Subsequent survey data from the YRBS show that between 1995 and 1997, students reported they were significantly more likely to be asked for proof of age if they attempted to buy cigarettes from stores (an increase from 49 percent to 61 percent). Consistent with this finding, fewer school students reported buying cigarettes from stores (a decrease from 48.1 percent to 33.4 percent), whereas more students reported that someone else bought cigarettes for them (an increase from 11.2 percent to 23.5 percent) (Massachusetts Department of Education, 1998).

Smoking bans in Massachusetts municipal buildings have become more common since 1993, so that nearly five times the population was protected from exposure to ETS in these types of buildings in 1997, compared with 1992 (Abt Associates, 1999). The percentage of indoor workers subject to a worksite smoking ban increased from 53 percent in 1993 to 65 percent in 1997, so that that average hours of exposure to ETS at work declined from 4.5 hours to 2.2 hours per week (Abt Associates, 1999). In addition, since the implementation of Question 1, the population protected by complete bans on smoking in restaurants grew from less than 60,000 to nearly 1 million. Furthermore, there has been a decline in the percentage of adults who said they allowed visitors to smoke in their homes – from 57 percent in 1993 to 44 percent in 1997 (Abt Associates, 1999). However, in the 1996 school survey, 89.5 percent of students in 9<sup>th</sup> through 12<sup>th</sup> grade thought students who smoked did not obey school non-smoking rules in their school (Briton et al., 1997). Data from the YRBS surveys also suggest that between 1993



and 1997, there was little change in the percentage of students who smoked on school premises (Massachusetts Department of Education, 1998). These data suggest some positive changes in restrictions on smoking in public places and in the home -- both important for reducing the acceptability of smoking -- but little progress in reducing smoking on school premises.

Tobacco advertising continued to be prevalent in Massachusetts following the commencement of the MTCP. Between 1993 and 1996, the percentage of Massachusetts school students in grades 7 through 12 who said that they had seen cigarette advertising in the month before the survey remained stable and was most common for billboards (80 percent), newspapers and magazines (78 percent) and on clothing (74 percent). In contrast the percentage who reported awareness of tobacco advertising on posters and pamphlets, in newspapers and in other places declined from 1993 to 1996 (Briton et al., 1997). In 1996, 31.4 percent of 7<sup>th</sup> to 12<sup>th</sup> graders said that they owned clothing or other items with a tobacco brand name on it.

Immediately after Massachusetts Question 1 became effective on January 1, 1993, the real price of cigarettes increased sharply but was rapidly eroded by a significant industry-initiated price cut that more than offset the tax increase (Harris et al., 1996). Despite this, data show that in Massachusetts, the excise tax increase combined with the tobacco control program activities was associated with a decline in per capita cigarette consumption (CDC, 1996; Abt Associates, 1998). From 1990 to 1992, the period prior to the commencement of the MCTP, the taxable per capita cigarette consumption of cigarettes by adults declined 6.4 percent in Massachusetts, 11.0 percent in California, and 5.8 percent in the remaining 48 states and District of Columbia combined (Harris et al., 1996). From 1992 to 1996, taxable per capita consumption declined by 19.7 percent, while in California and remaining states, it declined by 15.8 and 6.1 percent respectively.

In addition to actual consumption data for the whole population, a survey of adults and teenagers undertaken in late 1993 through early 1994 indicated that 35 percent of adults and 21 percent of teenagers had considered quitting in response to the price increase generated by the 25-cent tax on cigarettes in early 1993 (Biener et al., 1998). A further 26.0 percent of teenagers cut costs by reducing the number of cigarettes smoked or changing to a cheaper brand. In addition, since the 1996 school survey was undertaken in the several months following the October 1996 tax increase, students were asked whether price increases had affected their buying cigarettes and if so, how. Overall, the data suggested that students were affected by the price increase, with: 6.3 percent saying they tried to quit in response; 10.4 percent saying that they did quit for some period of time; 4.0 percent saying they bought fewer packs; and 1.8 percent saying they switched to a cheaper brand (Briton et al., 1997). These data provide important supplementary information, adding to the evidence that price increases do influence teenage tobacco use.

In Massachusetts, data on adult smoking prevalence from both the Behavioral Risk Factor Surveillance System (BRFSS) and the Massachusetts Tobacco Surveys (MTS) suggest a slow but steady decline, coincident with the start of the MTCP. The BRFSS data suggest a relative decline in adult smoking prevalence of 8.9 percent over the first

three years of the program (from 23.5 to 21.3 percent), compared with a relative decline of 3.3 percent in the rest of the BRFSS-participating states (excluding California) (from 24.1 percent to 23.4 percent) (Harris et al., 1996). The MTS estimate that adult smoking prevalence declined from 22.6 percent in 1993 to 20.6 percent in 1995 – a relative decline of 8.8 percent, consistent with the BRFSS trends obtained for Massachusetts. While these changes do not reach statistical significance, the trends obtained in these two independent databases increase confidence that this change is real.

From school surveys undertaken in Massachusetts from 1993 to 1996, there was an increase in the percentage of adolescent smokers who considered quitting in the six months before the survey, with a relative increase of 6.8 percent (from 69.5 to 74.2 percent) among 7<sup>th</sup> through 12<sup>th</sup> graders. In 1996, an average of 37.9 percent of those who considered quitting attributed this to anti-smoking messages they had seen or heard in the past year. Overall, including nonsmokers, there was no change between 1993 and 1996 in the percentage of adolescents who intended to use cigarettes in the next year (Briton et al., 1997).

In looking at current smoking prevalence, school-based surveys undertaken in the state by Health and Addictions Research Inc. were compared with figures from the MTF surveys for the rest of the US, which used similar methodology in collecting the data (Briton et al., 1997). These comparisons show that Massachusetts adolescents had a higher smoking prevalence than adolescents in the rest of the United States prior to the start of the MTCP, but that in the three-year period following program commencement, the gap between Massachusetts and the rest of the US narrowed. Thus, while adolescent smoking prevalence in Massachusetts rose in the early part of the 1990s consistent with national trends, from 1993 through 1996, youth smoking rates remained relatively steady (Briton et al., 1997). During this post-program period, the relative change in Massachusetts teens compared with their counterparts in the rest of the US has been in the opposite direction for 8<sup>th</sup> graders (1.9 percent decrease in Massachusetts compared with a 25.7 percent increase for rest of US), and has been minimized for 10<sup>th</sup> graders (16.3 percent increase for Massachusetts compared with 23.1 percent increase for the rest of the US) and 12<sup>th</sup> graders (7.4 percent increase for Massachusetts compared with 13.7 percent increase for US). More recent data from the YRBS surveys undertaken in Massachusetts confirm that trends in this state are against those being observed nationally: From 1995 through 1997, smoking prevalence among all Massachusetts students changed from 35.7 to 34.4 percent (a relative *decrease* of 3.6 percent), compared to a change from 34.8 to 36.4 percent nationally (a relative *increase* of 4.5 percent) (Massachusetts Department of Education, 1998).

For the youngest school students, exposure to anti-smoking messages is likely to have begun earlier and been more consistent so that prevention of experimentation with smoking would be most likely to be detected in this subgroup of students. Survey data show that lifetime cigarette use declined among 9<sup>th</sup> graders from 69 percent in 1995 to 62 percent in 1997 (Massachusetts Department of Education, 1998). For 7<sup>th</sup> and 8<sup>th</sup> graders, lifetime use of cigarettes declined significantly between 1993 and 1996, from 45.4 to 41.8 percent, after increasing from 36.6 percent in 1990. Of most interest, comparisons with

national data from the MTF surveys show a relative decline of 4.6 percent in lifetime cigarette use for 8<sup>th</sup> graders in Massachusetts (from 52.2 to 49.8 percent), against a national relative *increase* of 9.5 percent (from 45.3 to 49.3 percent) (Briton et al., 1997).

Overall, the evidence for the MTCP being associated with achieving progress in influencing youth tobacco use is positive and consistent -- especially given that trends in prevalence are contrary to those observed nationally since the program's commencement, though this was not evident in the pre-program period. Evidence of decline in per capita consumption associated with the program is particularly strong and consistent with data from California suggesting that a tax increase combined with a comprehensive tobacco control program can be more effective in reducing per capita consumption than a tax increase alone. The data from Massachusetts are augmented by survey data suggesting that some of this decline applied to adolescent smokers. Importantly, the intermediate markers of progress are consistent with high levels of recall of media messages, acceptance of the health risks of smoking among teenagers, and increased restrictions on smoking in public places. Like California, however, compliance with bans on smoking in school premises has not changed. Access to tobacco from retail outlets appears more difficult, but most teenagers reported that cigarettes were still easy to obtain, and the evidence suggests that social contacts are increasingly more likely to be sources for cigarettes.

### ***Arizona: 1994 - Present***

In November 1994, Arizona voters passed Proposition 200, which increased the cigarette excise tax by 40 cents per pack (from 18 to 58 cents); proportionally increased the tax on other tobacco products; and earmarked 23 percent of the new revenue to tobacco education programs (Bialous & Glantz, 1997). In its first year, the state established the Arizona Tobacco Education and Prevention Program (ATEPP), which targeted pre-adolescents, adolescents, pregnant and post-partum women and their partners. In the most recent year, 54% of funding was directed to media and sports sponsorships; 25 percent to local projects focusing on school-based tobacco education, reducing youth access, providing cessation services, creating smoke-free environments and providing programs for native Americans, and 5 percent to an information clearinghouse (including the establishment of a telephone helpline). The remainder went to other contracts, statewide projects and administration (including evaluation). The total amount expended was \$9.7 million in fiscal year 1996; \$18.2 million in 1997; and \$24.2 million in 1998, which translates to an investment ranging from approximately \$2.13 to \$5.32 per capita (US Bureau of Census, 1999). There is good evidence that the tobacco industry was active in Arizona (Bialous & Glantz, 1997), as they have been in California and Massachusetts. Lobbying efforts of the industry were considered by some to be partly responsible for the one-year delay in spending of the tobacco program funding, so that in the first year after the tax increase, little program activity commenced in the field (Bialous & Glantz, 1997) and pre-program baseline measures were not made.

Evaluation of the program includes contracts to the University of Arizona to monitor recall and appraisal of the media elements of the campaign (Eisenberg et al., 1998; Eisenberg & Hogan, 1999) and the impact of the price increase on consumption (Hogan, 1996). In addition, the U.S. Bureau of Health Statistics (formerly the U.S. Bureau of Epidemiology and Disease Control Services) undertook surveys of adults and teenagers (Arizona Department of Health Services, 1996; 1997). Results from subsequent population surveys to judge change are not expected until late 1999.

As intended, the bulk of media messages developed from January 1996 were designed for pre-adolescents, adolescents and pregnant women with a total of 14 television advertisements aimed at teenagers, and two at pregnant women. Additional advertisements were produced for radio, billboards and posters. In January 1998, three advertisements aimed at adults were launched with a relatively low level of exposure, although from September 1998, a larger scale adult cessation effort was launched. Overall, over 75 percent of the television budget went to advertisements aimed at adolescents (Eisenberg & Hogan, 1999). Of the funding expended on the media campaign, 77 percent went to television advertising, 11 percent to radio, 10 percent to sports sponsorships and the remainder to other media vehicles. Another activity developed in conjunction with the media campaign was a large mobile interactive exhibit, called the "Ashkicker", which mimics a horror show, demonstrating to youth the dangers of using tobacco. It is used in schools, county and state fairs, rodeos and other public events across the state. A telephone survey of teenagers, pregnant women and adults in mid 1998 found that approximately two-thirds of each target group reported seeing television advertising in the past 30 days (Eisenberg et al., 1998). Aided recall of the advertising directed at youth showed that the television advertisements varied in recall, with five specific advertisements being recalled by more than three-quarters of adolescents. Radio spots were recalled by 47 percent of adolescents, and billboards, posters and other promotional products by 64 percent. Eighty percent of teenagers agreed the media messages made them think about the negative effects of tobacco use. In addition, 27 percent of adolescents had visited the Ashkicker, and 90 percent said it made them feel more strongly about not using tobacco. Finally, 27 percent of teenagers who were smokers said that the advertising had made them decide to quit (Eisenberg et al., 1998).

Change in taxable sales of cigarettes was observed in the period following the price increase induced by the tax change (Hogan, 1996). Based upon data from the Metropolitan Phoenix Consumer Price Index, it appeared that the full 40-cent tax increase was incorporated into the retail price of cigarettes. Following the implementation of Proposition 200, there was an 8.4 percent reduction in per capita cigarette consumption. After adjustment for stockpiling of lower-priced cigarettes in anticipation of the tax increase, taxable non-reservation cigarette sales declined 5.4 percent after the imposition of the additional 40 cent excise tax, consistent with estimates of the price elasticity of demand for cigarettes (Hogan, 1996). Since anti-tobacco advertising and other aspects of the ATEPP were not implemented during the time period covered by the report (December 1994 through December 1995), this change is attributed to the effects of the price increase only. The report also found no evidence of increased sales in neighboring

states or in Indian reservations with lower taxes, and no evidence of any substantial increase in smuggling of cigarettes, thereby eliminating these alternative explanations for a reduction in consumption. These data are highly consistent with the findings from California and Massachusetts, with the change in consumption being more in line with that expected for the effects of price alone, but lower than that observed in these other states, which also had the added benefit of program activity. As an adjunct to these data, the 1997 youth tobacco survey found 20 percent of youth aged 10 through 17 years who were current smokers reported that they bought fewer cigarettes as a result of the price increase in November 1994, and 15 percent had switched to a cheaper brand (Arizona Department of Health, 1997). These findings are consistent with those reported for Massachusetts youth (Biener et al., 1998).

There has been limited documentation, to date, of change in the tobacco control policy environment in Arizona. However, a telephone survey of 6,000 Arizona adults, which found that 23.8 percent were smokers, provides some information on smoking restrictions in the state (Arizona Department of Health, 1996). Overall, 69 percent of those who worked indoors reported that smoking was banned at their workplace, and restricted to designated areas, in a further 23 percent. Furthermore, 50 percent of nonsmokers and 16 percent of smokers reported that smoking was banned in their home. A survey in the field this year will provide data for comparison purposes.

A telephone survey of 5,579 respondents, ages 10 through 17, was conducted from October 1996 to August 1997. This survey was undertaken after the program was in the field for almost a year, so its utility as a baseline measure was diminished. Smoking prevalence, defined as having smoked in the past 30 days, was reported as 2.5 percent for 5<sup>th</sup> to 8<sup>th</sup> graders and 15 percent among 9<sup>th</sup> to 12<sup>th</sup> graders (Arizona Department of Health, 1996). These figures are substantially lower than those obtained using school surveys (Arizona Criminal Justice Commission, 1995), but a follow-up survey is planned in 1999, which should yield data for comparison over time. The survey indicated that over 80 percent of respondents reported there was a rule prohibiting smoking in their school, and around 20 percent said teachers smoked at school. Of the youth surveyed, 39 percent reported that they obtained their cigarettes through others buying for them, 36 percent bought for themselves, 7 percent took them secretly and 14 percent were given cigarettes by others – with 49 percent indicating that it was easy to get cigarettes.

Information available to date from Arizona suggest that after a slow start in the development of the program, the predominantly youth-directed media campaign has been very intensive and well-recalled by adolescents. Effects on aggregate cigarette consumption were observed in line with expectations based on the extent of the 1994 price increase. Markers of progress with respect to youth attitudes, exposure to smoking restrictions, reduced youth access and smoking behavior will need to await completion of follow-up surveys later in the year. In addition, the adult-focused campaign which commenced in 1998 remains to be evaluated and a population survey of adults will provide important information about its impact.

### ***Oregon: 1996 - Present***

In Oregon, Ballot Measure 44 was passed in November 1996, increasing the tax on cigarettes and earmarking 10 percent of that increase to tobacco prevention and education. The increase raised the cigarette tax by 30 cents per pack (from 38 cents to 68 cents). Of the projected two-year \$170 million in revenue generated by the tax increase, \$17 million was allocated over two years for the Oregon Tobacco Prevention and Education Program – equaling about \$2.66 per capita per year (US Bureau of Census, 1999). Of this funding, \$3.25 million (38 percent) was distributed to local coalitions to decrease youth access, create tobacco-free environments, decrease tobacco advertising, and promote linkages to cessation resources. Public awareness and education received \$2.3 million (27 percent) (of which \$2 million was spent on anti-tobacco advertising and public relations) and most emphasis was placed upon using counteradvertising messages developed by other states that seemed effective and tested well; thereby directing funding to message delivery rather than creation. Statewide and regional projects received \$1.4 million (16 percent) and included the establishment of a telephone quitline, tribal tobacco programs, multi-cultural programs and other demonstration projects. Schools received \$1 million (12 percent) for development of school smokefree policies, curriculum development, training for school staff, parent involvement, linkage with local coalitions and communities and teen cessation support. Finally, \$0.6 million (7 percent) was allocated to statewide coordination and evaluation.

A Technical Evaluation Advisory Committee comprised of independent research specialists in tobacco control and program evaluation oversees the evaluation of the program. Process evaluation measures include standardized reports on program implementation from all local coalitions, schools and Indian tribes in receipt of funding, records of placement and recall of counteradvertising, and calls to the smokers' quitline. Other studies are conducting surveys to assess change in in-store tobacco advertising and promotions, worksite and restaurant smoking policies, retailer compliance with youth access laws, per capita consumption of cigarettes, and adult and adolescent tobacco-related knowledge, attitudes and behavior (Oregon Health Division, 1999).

In Oregon, counteradvertising has been broadcast on Oregon media and has included graphic portrayals of the health consequences of smoking and passive smoking. Early tracking surveys show that 74 percent of adults and 84 percent of adolescents can recall one or more of the advertisements (Oregon Health Division, 1999).

Change in per capita cigarette consumption in Oregon, coincident with the increased excise duty and commencement of the program, demonstrates findings highly consistent with those observed in other states with comprehensive tobacco control programs. From 1993 to 1996, taxable per capita consumption of cigarettes decreased 2.2 percent in Oregon and 0.6 percent in other US States (excluding Arizona, California and Massachusetts where other comprehensive tobacco control programs are in progress) (Pizacani et al., 1999). From 1996 to 1998, taxable per capita consumption declined by 11.3 percent in Oregon, compared with 1.0 percent in the comparison US states (Oregon Health Division, 1999). The decline in consumption was greater than expected on the

basis of price increase alone. While 6.3 percent could be attributed to the price increase alone, based on predictions using price elasticity of demand, the additional 5 percent decline was probably attributable to the added effects of the tobacco program.

In Oregon, adult smoking prevalence is assessed using the annual telephone based-BRFSS and in 1997, a supplement was added to obtain a larger sample to furnish data on country smoking rates and minority populations. The BRFSS shows that in 1996, 23.4 percent of adult Oregonians were smokers, compared with 21.9 percent in 1998, a relative decline of 6.4 percent in only two years. However, national data are not yet available for comparison.

Tobacco use among adolescents is measured using data from the YRBS administered through schools every other year since 1991 for grades 9 through 12, and each alternate year, data is obtained from a similarly conducted survey administered by the Oregon Office of Alcohol and Drug Abuse Programs of 6<sup>th</sup>, 8<sup>th</sup> and 11<sup>th</sup> graders. These surveys show that trends in tobacco use by adolescents in Oregon mirrored national increases for the first two years following commencement of the program. Most recent figures from 1998 indicate that 21 percent of Oregon 8<sup>th</sup> graders and 32 percent of 11<sup>th</sup> graders reported smoking cigarettes in the past 30 days (Oregon Health Division, 1999).

Since the program has been in the field for only two full years, relatively limited data are available to assess progress. However, early reports suggest that recall of media messages have reached both adults and teenagers. To date, there are no published measures of change in tobacco-related knowledge or attitudes, restrictions on smoking in public places, youth access, or tobacco industry promotional activity, although these data are being collected. However, the extent of decline in per capita consumption following the introduction of the program is highly consistent with what has been observed in both California and Massachusetts. Similarly, the observed reduction in adult smoking prevalence mirrors that found in Massachusetts and the early program period in California, although final judgement will need to await release of comparable national data.

### ***Florida: 1997 - Present***

From the settlement between tobacco companies and the state of Florida, \$23 million was allocated in fiscal year 1997, and \$70 million in fiscal year 1998 to fund the Florida Tobacco Pilot Program (FTPP) -- the equivalent of \$1.56 and \$4.69 respectively per capita. Unlike the other comprehensive programs, the state of Florida did not begin its program with a tax increase, since funding was provided through the provisions of the settlement. For fiscal year 1998, the allocation of funding was \$26 million to counteradvertising, \$16 million to education and training, \$15 million to youth and community programs, \$8.5 million to enforcement and \$4.5 million to evaluation.

A strategic plan was released in June 1998 (Florida Department of Health, 1998) which explained that the program was specifically aimed at reducing tobacco use among

teenagers aged 12 to 17 years, and a major component has been a youth-oriented counter-marketing media campaign developed to reduce the allure of smoking. The so-called "Truth" campaign - began in April 1998. The campaign placed particular emphasis on engendering unfavorable attitudes towards the tobacco industry. The program also fostered community partnerships with all 67 Florida counties, school-based initiatives, an education and training initiative, and enhanced enforcement of youth tobacco access laws.

The University of Miami, which serves as the Coordinating Center for Evaluation, has been contracted to evaluate the program, though most universities within the state are involved. The evaluation includes a management information system to track the number and type of tobacco control activities undertaken, such as the number of compliance checks and local programs delivered. In addition, Florida State University is monitoring the media campaign (Sly et al., 1999). The Florida Youth Tobacco Survey is considered a prime instrument for measuring program progress and outcome, to be supplemented by data from the BRFSS for adult tobacco use and the Pregnancy Risk Assessment Monitoring System to determine tobacco use trends in teenage mothers. In addition, data from Florida's Department of Business and Professional Regulation are being monitored to establish baseline trends in aggregate cigarette consumption and per capita consumption for counties as one measure for determining change as a result of local policy and program initiatives (Florida Department of Health, 1998).

Evaluation updates are posted to the FTPP website by the Florida Department of Health. From mid to late 1998, updates mostly focused on providing descriptive information on results from the February 1998 Youth Tobacco Survey on teenagers; tobacco-related attitudes and health beliefs, predictors of tobacco use, and more detailed data on use patterns among minority groups (Florida Department of Health, 1998). Since early 1999, some information has been posted on program implementation and tobacco industry advertising and promotional activity. Since the February 1998 youth tobacco survey was conducted (which showed that 56 percent of middle school and 67 percent of high school students were not taught about tobacco use), implementation of CDC-approved prevention curricula in schools began in earnest, and as of January 1999, had been confirmed in over 100 schools throughout the state. Peer education efforts, where youth participate in extra-curricular activities to educate their peers about tobacco companies' attempts to promote tobacco to youth, expanded from 400 youth in 1998 to over 8,000 in February 1999. Around 20 percent of stores selling tobacco visited by youth and community partnership members were within 1,000 feet of a school and more than half had tobacco advertising located three feet or less from the ground (Kershaw, 1999). In 1998, over 12,000 citations for possession of tobacco by under-aged youth were processed.

To evaluate the media campaign, a media tracking survey was conducted, with successive cohorts of adolescents sampled by telephone, recruited in April (prior to the campaign), June and September 1998, and to be followed-up this year (Sly et al., 1999; Center for the Study of Population, 1998a; 1998b). In addition, a national survey was undertaken in April, demonstrating that prior to the campaign Florida youth did not differ from their



interstate counterparts in terms of attitudes and behaviors. An additional national survey will be undertaken in 1999 to provide further comparisons. Comparison of the cross-sectional samples within Florida, however, suggests that recall of the counter-advertising was much increased from the pre-campaign period. Survey data indicate that there has been an increase in reported recall of anti-tobacco advertising by youth, such that by September 1998, 28 percent reported seeing or hearing at least one anti-tobacco advertisement each day and an additional 66 percent reported doing so at least weekly (Center for the Study of Population, 1998a; 1998b). Nearly 83 percent are able to describe the events or themes of one or more specific anti-tobacco advertisement. Within the first six weeks after the campaign launch, change was evident in youth attitudes about the behavior of the tobacco industry, in a direction consistent with a positive impact of the campaign (Center for the Study of Population, 1998a) and this persisted in a follow-up survey in September (Center for the Study of Population, 1998b). For example, between April and September 1998, the percentage of teens who strongly agreed with the statement that "tobacco companies try to get young people to smoke because older people quit smoking or die" increased from 29 percent to 42 percent. Information on appraisal of the campaign by adults was gained from a telephone survey of 434 Florida adults, weighted to reflect population aged 18 years and older. This survey found that 47.6 percent of adults were aware of the 'Truth' campaign. Of those who were aware, 9 out of 10 liked or strongly liked the campaign message (Kershaw, 1999). These findings suggest high levels of exposure and favorable early impact on the target group of adolescents, and upon adults in general.

Surveys of tobacco use among Florida middle and high school students were undertaken by the Florida Department of Health in February 1998 and February 1999. The sampling frame for the 1998 survey consisted of all public schools with any grades 6 through 12, with 266 schools being selected. In 1999, the survey returned to these same schools. Response rates for each year were similar and weighted to account for non-response (Florida Department of Health, 1999). From 1998 to 1999, the prevalence of current cigarette use (use in the past 30 days) among middle school students declined from 18.5 percent to 15.0 percent and among high school students from 27.4 percent to 25.2 percent -- both significant declines (Bauer et al., 1999). Almost all of the decline was among non-Hispanic white students, who have among the highest rates of cigarette use. National data for comparison with the Florida data from 1998 to 1999 are unavailable, although the trends observed in Florida are larger than any decline observed nationally among youth since 1980 (University of Michigan News and Information Service, 1998).

Despite being in the field for a year, the Florida tobacco control program has been extremely proactive in its use of media counteradvertising, choosing to focus upon further discrediting the tobacco industry as the prime strategy to discourage adolescents from smoking. In addition, the program has been active in developing local programs at the community level. Clearly, the media campaign is being seen and remembered by teens, and there is evidence that it has increased negative attitudes towards the industry. The indication from the school-based surveys in Florida that teen prevalence significantly declined between 1998 and 1999 is notable, although no national comparison data are available yet. Although no tax increase was associated with the start of the campaign, the

industry announced a price increase prior to the start of the campaign and another supposed price increase of 45 cents per pack after the state settlement was announced. Due to 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 cut back funding to \$39 million per year (near to approximately \$2.61 per capita) (Givel & Glantz, 1999).

### ***Other Tobacco Control Programs***

In 1997, Maine increased tobacco excise duty and established a comprehensive tobacco control program. The excise duty on cigarettes was raised from 37 to 74 cents in November 1997, and funding of \$3.5 million for a new statewide initiative to establish the Partnership for a Tobacco-Free Maine within the state Department of Human Services was authorized. The program includes a mass media campaign, school and community grants to support local tobacco prevention and control programs, increased enforcement of youth access laws, and a research and evaluation component. Surveys to establish benchmarks for adolescent and adult smoking are planned for this year. Earlier this year, the state of Maryland also increased excise duty on cigarettes and provided funds for programs. In addition, Mississippi and Minnesota, states that independently settled with the tobacco industry, have now begun comprehensive programs. However, Texas, which also settled independently with the industry, will be unlikely to run a program. At the time of writing, a number of states that settled in November 1998 including Maryland, Vermont, Hawaii and Washington had committed funding for comprehensive programs. Some other states committed smaller amounts of funding and still others have yet to decide. Developments in these states will add further to the experience and research base, but indicate that such programs are becoming more accepted as part of best practice in tobacco control.

### ***Common Findings From Markers of Progress in Comprehensive Programs***

It is obvious that each of the programs differ by virtue of their length of time in the field, their per capita expenditure on tobacco control, the background circumstances under which they were initiated, the background trends in teenage smoking prevalence against which they will be judged, the relative allocation of funding to general tobacco control strategies as opposed to youth-specific approaches, the selection of messages and strategies within each program component, the extent of actual compared with intended implementation, and the measures used to assess progress. When appraised individually, it is difficult to draw firm conclusions about the effectiveness of particular mixes of program inputs in reducing teenage tobacco use, but when taken together, there are a number of consistent findings that emerge.

First, with respect to program implementation, one of the consistent findings that has been observed is an erosion of expenditure as the program progresses. This has been most obvious in California, but also observed in Massachusetts and most recently, Florida (Bialous & Glantz, 1997; Balbach & Glantz, 1998; Givel & Glantz, 1999). This reduction in per capita expenditure is likely to compromise the ability of such programs to maintain changes observed early in the program's life -- a factor strongly emphasized in the most recent surveillance report from California (Pierce et al., 1998). That report also makes much of the change in the ratio of tobacco control to tobacco industry expenditure and this is a factor poorly studied elsewhere.

In reviewing the effects of media counteradvertising on teenage tobacco use, Pechmann (1997) and others (Lewit et al., 1981) suggest that a ratio of one anti-smoking ad for every four cigarette ads may be required before teenage smoking will decline. However, in 1993, ratios of cigarette advertising (including ads on billboards, buses, kiosks, magazines, newspapers, in-store signs and promotions) to counteradvertising suggested that only in Massachusetts was this ratio met, with a ratio of 1 anti-smoking ad to 1.4 cigarette ads -- in California the ratio was 1 to 9.4 and in Michigan, which was running a modest counteradvertising campaign at the time, the ratio was 1 to 20 (Pechmann, 1997). Information to determine ratios for Oregon, Arizona and Florida is not yet available. Taken together, there is considerable theoretical and experiential evidence that preventing the erosion of program funding will be critical to durability of effects.

To the extent that changes are being made in tobacco policy measures for which evidence suggests a reduction in teenage tobacco use, it is likely that the programs will achieve reductions in youth prevalence and/or consumption. To the extent that programs are able to fund community initiatives and implement school-based prevention programs demonstrated to reduce tobacco use, reductions in tobacco use are likely to flow. But the extent of implementation, and the extent to which this is undermined by the tobacco industry and other competitors for funding, seems likely to be one of the single most critical factors in program success.

Where programs are more fully implemented, there is good evidence that they lead to an increase in the passage of local ordinances that create smoke-free indoor environments and reduce youth access. As known from previous research, these changes in the policy environment are very likely to lead to reductions in youth smoking prevalence and consumption. However, it is doubtful at this stage that reductions in youth access are being achieved. While stronger enforcement may lead to retailers being less likely to sell directly to minors, there is some suggestion that under-age smokers use older peers to buy for them and thus obtain their cigarettes through social sources (Massachusetts Department of Education, 1998; Independent Evaluation Consortium, 1998). Similarly, while there has been great improvement in the extent of workplaces, restaurants, other public places and private homes where smoking is banned indoors, compliance with bans on smoking on school premises seems low (Briton et al., 1997; Pierce et al., 1998).

The second point of note is that, among these programs, evidence is strongest that they are immediately associated with a decline in per capita cigarette consumption. Variation in per capita cigarette consumption reflects changes in the numbers of cigarettes smoked by smokers, people who smoke, or a combination of both. Since these measures are available each month through data reported to the state by the Tobacco Institute on tax receipts from wholesale cigarette deliveries, they 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 per capita consumption. Therefore, aggregation of data over several years, as has been done in most state evaluations, will be likely to minimize the influence of these practices, and reflect actual consumption more accurately. A second potential limitation is that the data reflect only packs sold within the state, so that if smokers increasingly travel out of state to obtain cigarettes where they may be cheaper, 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 cigarette 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 (e.g. Oregon), have not evidenced increases in consumption (e.g. Arizona), are not easily accessible for cigarette purchase for most of the population (e.g. California), or would make a negligible difference to per capita consumption, even if all increases in consumption in a neighboring state with lower tax were explained by cross-border purchases (eg Massachusetts). Taken together, there is strong evidence from these comprehensive programs, coupled with other research, that price increases influence adolescent tobacco use -- and that the addition of program activity reduces consumption more than that expected for price alone.

Third, there is consistent evidence that the programs are associated with a decline in adult smoking prevalence, with these effects observed to date in California, Massachusetts and Oregon. Arizona and Florida -- conducting more youth focused campaigns -- have yet to examine change in adult prevalence associated with program exposure. While reductions in adult prevalence obviously have their own value -- after all, adults are the ones most likely to soon develop tobacco-related illnesses -- these changes in the normative environment for smoking, coupled with reduced opportunities to smoke and the message of social undesirability offered by increased bans on smoking, are likely to be important influences on youth smoking.

Finally, despite the different strengths and mix of program messages and strategies used in these comprehensive programs, the evidence that they lead to markers of change in factors that influence teenage smoking, and to reductions in teenage smoking prevalence and uptake, is compelling. Plainly, for programs 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. Notwithstanding

these cautions, we find that the weight of evidence falls in favor of comprehensive tobacco control programs being able to reduce teenage tobacco use.

As states decide what levels of funding from their tobacco settlement money should be allocated to programs to reduce teenage tobacco use, legislators should not use ‘lack of evidence for benefit’ as an argument to avoid making allocations. Given the evidence to date of progress made by programs in the field, the research findings which link public education through counteradvertising, community-based programs, school-based tobacco education programs, cessation services for smokers, advances in enforcing tobacco policy to reduced youth smoking, and our theoretical understanding of factors that shape teenage tobacco use, comprehensive tobacco control programs are in fact the ‘best buy’ for reducing teenage smoking.

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