Investing in youth tobacco control: a review of smoking prevention and control strategies

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Abstract

***Objective*—To provide a comprehensive review of interventions and policies aimed at reducing youth cigarette smoking in the United States, including strategies that have undergone evaluation and emerging innovations that have not yet been assessed for efficacy.**

***Data sources*—Medline literature searches, books, reports, electronic list servers, and interviews with tobacco control advocates.**

***Data synthesis*—Interventions and policy approaches that have been assessed or evaluated were categorised using a typology with seven categories (school based, community interventions, mass media/public education, advertising restrictions, youth access restrictions, tobacco excise taxes, and direct restrictions on smoking). Novel and largely untested interventions were described using nine categories.**

***Conclusions*—Youth smoking prevention and control efforts have had mixed results. However, this review suggests a number of prevention strategies that are promising, especially if conducted in a coordinated way to take advantage of potential synergies across interventions. Several types of strategies warrant additional attention and evaluation, including aggressive media campaigns, teen smoking cessation programmes, social environment changes, community interventions, and increasing cigarette prices. A significant proportion of the resources obtained from the recent settlement between 46 US states and the tobacco industry should be devoted to expanding, improving and evaluating "youth centred" tobacco prevention and control activities.**

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Introduction

A large body of research shows that, at the present time, very few people initiate smoking or become habitual smokers after their teen years. In the United States, nearly nine out of 10 current adult smokers (89%) started their habit before the age of 19 years.[1] By this age, most youth who are going to smoke have already become or are in the process of becoming habitual smokers. Although many tobacco prevention activities have focused on youth, smoking among adolescents in the United States rose throughout most of the 1990s, until declining somewhat in the past two years.[2–4]

Given the epidemiology of smoking initiation, a great deal of policy and programmatic attention has been directed at youth smoking in the United States.[5] In this article, we synthesise and comment on the burgeoning literature regarding efforts to discourage youth from smoking. This article describes a number of youth smoking prevention and control strategies, and summarises the state of the science regarding the impact or effectiveness of each strategy. Two previous reports—the US surgeon general's 1994 report on youth smoking and the Institute of Medicine's (IOM) 1994 report *Growing up tobacco free*—are valuable resources.[1 4] We summarise material from these earlier reports, but also review studies and strategies that have emerged since. Our emphasis here is on the youth smoking situation and the state of youth tobacco control science in the United States, although we believe that much of what we present in this review is relevant and salient to other countries as well.

We limit our review to youth oriented prevention and control strategies and to smoking, recognising that adult interventions and smokeless tobacco also deserve similar attention. Note, too, that since very few tobacco intervention studies include cost analyses, we cannot offer specific advice regarding the costs of various interventions and the likely returns to these investments. Nonetheless, our goal is to provide a cogent summary of the main foci of youth tobacco prevention and control in the United States, an assessment of the current state of the science, a description of recent programmatic or policy innovations, and a lengthy reference list to which people can turn for additional information. As such, this review article should be quite useful to tobacco control advocates and policy makers. Although we do not emphasise study design and methodological issues in our comments of individual studies, we believe that this review will be useful to researchers as well.

We conducted an extensive literature review and synthesis of published research addressing interventions to reduce youth smoking. Through Medline, we identified articles reporting evaluations of smoking prevention and control initiatives involving youth. We mostly review studies employing experimental or rigorous quasi-experimental designs. While

we reviewed some pre-1994 literature, our focus was on what has been learned since 1994 when both the IOM and surgeon general reports were published.

In addition, we collected and reviewed information on emerging initiatives and interventions that have not yet been evaluated or received much attention in the peer reviewed literature. We monitored reports of recent strategies distributed through several different electronic mailing lists. We also conducted a series of informal interviews with tobacco control advocates in the United States to learn of new approaches currently being tried to discourage youth smoking. The purpose of these activities was to identify emerging trends and promising innovations. Our discussion of recent innovations is neither comprehensive nor systematic in a scientific sense. Rather, it is an attempt to identify emerging trends and to provide information about some of the new and creative interventions that are currently being implemented and evaluated.

To organise the wealth of information on the topic of tobacco prevention and control efforts among youth, we categorised efforts into the following areas: (1) school based educational interventions; (2) community interventions; (3) mass media/public education; (4) tobacco advertising restrictions; (5) youth access restrictions; (6) tobacco excise taxes; and (7) direct restrictions on smoking. The published research regarding interventions in these areas is summarised and reviewed. We also describe a number of novel and largely untested interventions. These include: (1) youth oriented smoking cessation programmes; (2) computer based systems; (3) peer based interventions; (4) recent anti-tobacco advertising campaigns; (5) penalties for possession and use; (6) school policies; (7) vendor penalties; (8) restrictions on the sale and marketing of tobacco products; and (9) interventions to identify youth with a propensity to use tobacco. We conclude with a discussion of prevention strategies (both proven and new) that are promising and warrant further implementation and rigorous evaluation.

Prevention activities

SCHOOL BASED EDUCATIONAL INTERVENTIONS

Elementary and secondary levels

A large number of school based programmes have been implemented during the past three decades. Most of these efforts target elementary school and/or middle school students. As described in the IOM report on youth smoking, the majority of these programmes have tended to be based on one of three main approaches.[4] The first approach is an "information deficit or rational model" in which the programme provides information about the health risks and negative consequences of tobacco, most often in a manner intended to arouse concern or fear. Many of the early education interventions in youth tobacco control (before the mid 1970s) were based on this model. The primary premise of this approach is that youth are generally misinformed about the risks of smoking and that educating them on the health and social detriments of smoking will provide a deterrent. Programmes based on the information deficit or rational model have generally been found to be ineffective in deterring initiation or reducing volume among current smokers, although many programmes were not evaluated or only short term impact was assessed.

The second major approach to youth tobacco prevention programmes is an "affective education model" in which the programme attempts to influence beliefs, attitudes, intentions, and norms related to tobacco use with a focus on enhancing self esteem and values clarification. This type of prevention programme emphasises initiation influences within an individual, recognising that knowledge deficits are not the only factors associated with smoking initiation.[4] Content themes across many of these programmes include self esteem and self image enhancement, stress management techniques, values clarification, decision making skills, and goal setting. Evaluation findings for this type of intervention generally have suggested a weak or insignificant impact.

The third approach to tobacco prevention is based on a "social influence resistance model". In this model, the programme recognises and emphasises the social environment as a critical factor in tobacco use. In addition to individual factors, influences outside of an individual, such as peer behaviour or attitudes (both positive and negative), and certain aspects of the environmental, familial, and cultural contexts, are of great importance. As such, this type of intervention focuses on building skills needed to recognise and resist negative influences, including recognition of advertising tactics and peer influences, communication and decision-making skills, and assertiveness.[4]

The results of many individual evaluations and meta-analyses of tobacco and other drug prevention programmes strongly suggest that programmes based on the social influence resistance model are the most effective of the three approaches. The IOM report concluded that evaluations of school based prevention programmes have "consistently demonstrated that a brief school intervention that focuses on social influences and teaches refusal skills can have a modest but significant effect in reducing the onset and level of tobacco use".[4] In a meta-analysis of smoking prevention programme evaluations published between 1974 and 1991, Rooney and Murray found that social influence programmes could account for reductions in smoking between 5–30% (with the upper range given as the highest estimate of programme performance under "optimal" conditions only).[6] In meta-analyses of controlled studies of drug use prevention programmes for youth, Tobler reported that interactive programmes and those led by peers that addressed the social influences of substance use were most effective.[7 8] These findings were echoed by Black and colleagues, whose meta-analysis suggested that interactive peer interventions for middle schoolers are superior to

non-interactive, didactic programmes led by researchers or teachers.[9]

Similarly, in a different meta-analysis of smoking prevention programmes for adolescents, Bruvold found that the effects of interventions with a "traditional" or "rational" orientation were small and often insignificant.[10] In contrast, Bruvold found that those interventions with a social reinforcement orientation (that is, those focusing on the development of skills to recognise and resist social pressures) had the largest effects in terms of attitude and behavioural change. Although not all social influence interventions have been successful, a wide body of literature suggests that this approach has the best track record overall.[11]

One particular intervention that has received a great amount of attention is the "Drug Abuse Resistance Education" or DARE programme. Taught by uniformed police officers, DARE combines the building of self esteem, the development of resistance skills, and information about the negative effects of drug use and violence.[12] Despite DARE's popularity and proliferation, few positive results regarding tobacco and other drug use have been revealed in numerous individual or combined programme evaluations.[12–14]

The long term impact of school based educational interventions is of concern. It appears that the effects tend to dissipate with time, with effects generally persisting in the range of 1–4 years.[1] The IOM report stated that "while the results of more than 20 research studies have shown that school based prevention programmes alone have consistently delayed onset of smoking, lasting effects have only been demonstrated at 2 year follow up".[4] Programme "boosters" or subsequent interventions appear to enhance the staying power of the intervention effects, although the most appropriate content of and timing for these booster sessions is not known.[15 16]

College level

Recent evidence indicates a disturbing increase in smoking behaviour among college students, suggesting the limits of elementary and secondary school based prevention efforts. As Wechsler and colleagues showed, the prevalence of smoking on college campuses has increased nationwide.[17] Based on longitudinal data from 130 college campuses, these researchers estimated that the prevalence of self reported smoking in the past 30 days increased from 22.3% in 1993 to 28.5% in 1997. Recent results from the "Monitoring the Future" project reveal a trend toward increased cigarette use among young adults in general.[18] This increase in smoking is believed to reflect the rise in smoking that occurred among adolescents earlier in the 1990s.[17] It is also possible that an increase in smoking initiation among older teenagers and young adults is also playing a role. In a study of four universities, Naquin and Gilbert found that 10% of smokers had their first cigarette and 11% started smoking on a regular basis after high school.[19] Besides the risks posed by smoking, young adults who smoke cigarettes are also at a higher risk for binge drinking and the use of marijuana, cocaine, and LSD.[20] A number of interventions aimed at preventing tobacco, alcohol, and other drug abuse have been implemented in both urban and rural colleges and universities, although few have undergone rigorous evaluation and few are perceived as being effective by those implementing them.[21]

Summary

A large number of individual evaluations and review articles regarding controlled educational interventions to reduce youth tobacco use have been published.[22–26] A wide range of evaluation results from experimental and quasi-experimental studies suggest that some of these educational programmes resulted in a significant short term reduction in smoking, a delay in initiation, or a desirable change in attitudes toward tobacco use.[1 4] Programmes that embrace a "social influences" model tend to be the most effective, especially when enhanced by an extensive community based health education programme. The recent literature confirms, but does not greatly expand on, the 1994 reports. Perhaps more surprisingly, there is not a welter of new evaluations of school based programmes, suggesting either that such programmes have not changed very much or that scholars have been discouraged by previous findings from exploring these programmes any further.

Many of the guidelines for developing and implementing school based tobacco prevention programmes previously issued by the National Cancer Institute and the Centers for Disease Control and Prevention (CDC) are still relevant.[4 22] The CDC's recommendations include: (1) that the instruction should provide information on the social influences of and peer norms regarding tobacco use in addition to information on the short and long term physiologic consequences of smoking; (2) programme specific training for teachers should be provided; and (3) that schools should develop and enforce tobacco free policies, to make sure prevention programmes are implemented in a setting with broad policy support.[22] Additional information on CDC guidelines and specific programmes or curricula that the CDC endorses through its "Research to Classroom" programme is available.[27] Recently, Manske and colleagues recommended testing intervention models that involve youth developing their own solutions, and that examine the interaction between school based interventions and other community-based activities.[23] They also recommended that research be conducted to better understand why many youth do not smoke.

COMMUNITY INTERVENTIONS

The increased understanding of the combined effects of environmental, social, and cultural conditions on tobacco and other substance use has resulted in an emphasis on interventions that include comprehensive, community based approaches.[28] Such an approach targets multiple systems, institutions, or channels

simultaneously, and employs multiple strategies. In general, community interventions have multiple components, and involve the use of community resources to influence both individual behaviour and community norms or practices related to adolescent tobacco use. This includes the involvement of families, schools, community organisations, churches, businesses, the media, social service and health agencies, government, and law enforcement, with intervention strategies generally focused on making changes in both the environment and individual behaviour. Although community interventions take a variety of shapes, common elements among them include a shared emphasis on altering the social environment or social context in which tobacco products are obtained or consumed, and a shared goal of creating a social environment that is supportive of non-smoking or cessation.[4] Some of the components of community interventions, such as mass media campaigns and youth access restrictions, are also implemented as stand alone interventions, as described below.

While an increasing number of communities are attempting to influence youth tobacco use with multiple component interventions, there are few published reports of evaluations with rigorous designs. The available research results are encouraging in many cases.[1 28–32] For example, based on the results of a longitudinal trial, Pentz and colleagues reported that a community intervention involving mass media, school based education, parent education, community organising, and health policy components in some of the 15 communities in the Kansas City metropolitan area was effective in reducing tobacco, alcohol, and illicit drug use.[33] Regarding tobacco use, a significantly lower rate of smoking was observed in the intervention group at six months and at two years (when the rates for smoking in the last month were 19% in the programme group versus 29% in the control group).[34] In addition, the results of a randomised trial conducted by Biglan and colleagues in rural Oregon communities demonstrated a reduction in the prevalence of weekly cigarette use in communities exposed to the intervention (which focused on key social influences of smoking and included media advocacy, anti-tobacco activities for youth, and family communication activities).[35]

School based programmes and community interventions involving parents, mass media, and community organisations appear to have a stronger impact over time when they work in tandem rather than as separate, stand alone interventions.[4 25 28 36–38] Mobilising parents and community elements outside of the school (including the media) is seen as enhancing school based interventions and increasing the potential for a lasting behavioural impact.[1] For example, Lewit and colleagues examined the impact of tobacco taxes, public smoking ordinances, law regulating youth access, and exposure to tobacco messages (both pro and anti) in 21 of the 22 community intervention trial for smoking cessation (COMMIT) communities.[39] These researchers found that tax increases (discussed in greater detail below), exposure to tobacco education in schools, and policies restricting youth access to tobacco were associated with decreased smoking and intention to use cigarettes among ninth graders (ages 14-15 years). The authors also observed that the frequency of exposure to anti-tobacco advertisements was correlated with an increased likelihood of smoking. This counterintuitive finding was not significant in some of the subanalyses conducted by the authors, and is contradicted by other findings from the same study, including that the cumulative number of tobacco education classes (which include anti-tobacco messages) are associated with reductions in smoking behaviour and intentions.[39] Some might argue that the paradoxical finding lends credence to the perspective that the strong focus of tobacco control interventions on youth may unintentionally be glamourising tobacco use as an adult behaviour and thus have counterproductive effects.[40] At the present time, however, there is little empirical evidence to substantiate this concern.

Another comprehensive community intervention is the American stop smoking intervention study for cancer prevention (ASSIST), an eight year programme (1991 to 1999) funded by the National Cancer Institute in collaboration with the American Cancer Society and state and local health departments.[41] The overall goal of ASSIST is to reduce smoking prevalence to 15% by the year 2000 by encouraging smokers to quit and by discouraging young people from initiating the habit. Many local ASSIST coalitions emphasise the use of public health information and advocacy to denormalise tobacco use in the community. Some strategies used by ASSIST communities to prevent and reduce youth tobacco use include: youth education; encouraging enforcement of laws restricting youth access; banning tobacco advertising that is youth oriented; environmental tobacco smoke restrictions; and increasing physicians' role in youth tobacco prevention efforts. Currently, there are few published articles evaluating the effectiveness of ASSIST in general, or relative to youth in particular. Manley and colleagues reported that interim results regarding the impact of ASSIST suggest that this programme has led to reduced tobacco consumption in ASSIST states, and that this effect reflects more than increased prices from tobacco taxation.[42] Kegler and colleagues studied the factors related to coalition effectiveness in 10 ASSIST communities in North Carolina, but did not evaluate individual programmes for effectiveness in reducing smoking rates.[43] They found that community groups possessing an articulated plan, including specific goals and strategies for implementation, had stronger coalitions than community groups lacking these characteristics.

The efforts of several community interventions have involved a particular focus on youth access to tobacco products (as described below). Numerous other examples of community intervention efforts related to youth access

were reviewed by Forster and Wolfson, including the development and implementation of restrictions regarding cigarette vending machines, restrictions regarding the sale of "loose" or single cigarettes, restrictions regarding the age of people who can sell cigarettes, and requirements regarding the training of salespersons.[44] All of these are examples of attempts to alter the social environment or policy context in which tobacco products are obtained, distributed or consumed. As noted below, there is little evidence as to the effectiveness of these initiatives in reducing youth tobacco consumption.

Summary

The results of a small number of controlled trials of community interventions attest to their ability to have an effect on youth smoking behaviour. An important finding is that the effectiveness of school based programmes appears to be enhanced when they are included in broad based community efforts in which parents, mass media, and community organisations are involved, and in which the social policy or social environment as well as individual knowledge, attitudes, and behaviours are targeted for change.[45] However, it is our opinion that broad based community interventions alone are not sufficient to bring about a substantial and sustained decline in youth smoking. Community efforts, as symbolised by COMMIT, ASSIST, and other interventions, likely need to be combined with stronger advocacy, taxation, media interventions, and policy formation and implementation.[41 45 46] It is also important to recognise that the limited number of evaluations with experimental or strong quasi-experimental designs seriously limits our understanding of whether community interventions are effective and, of equal importance, which of their components are most useful in reducing youth tobacco use.

MASS MEDIA/PUBLIC EDUCATION

Mass media strategies have been used for broad based public education regarding a variety of public health issues, including tobacco use prevention and control. Mass media efforts are viewed as particularly appropriate for reaching youth, who are often heavily exposed to and greatly interested in media messages.[1 47] Further, as Jason[48] and Macaskill and colleagues[49] suggested, media based health promotion efforts have the potential to reach large segments of the population, especially those who are less educated, and to lower barriers to participation in health related programmes.

It is clear that the tobacco industry is successful in advertising and marketing pro-tobacco messages for youth. Some have proposed that the "very tools used by the tobacco industry to make cigarettes into the single most profitable legal consumer product sold can also be used to combat the smoking pandemic unleashed by tobacco products".[50] Young people have been the primary target of some sophisticated anti-tobacco media campaigns in several states, including California, Michigan, Minnesota, and Massachusetts. However, the impact of media campaigns on tobacco use among youth in general or specific subgroups is unknown. The few existing studies of the impact of mass media campaigns on youth smoking have shown varying results.[1 28 36–38 51–53] Hu and colleagues found that both increased taxation and the anti-smoking media campaign had an independent and significant impact on overall cigarette consumption in California from 1990 to 1992.[51] In addition, Popham and colleagues' evaluation of the California media campaign suggested some positive results for youth in grades 4–12 (ages 9-18 years).[52] Almost 50% of students surveyed were able to describe an advertisement without prompting, and almost 90% were able to recall parts of the campaign with a brief description. Although smoking prevalence among students decreased slightly in California after the media campaign was implemented, this study could not sort out the effects of the campaign from the myriad of other tobacco control efforts underway at the same time. Subsequent data suggest increases in California youth smoking behaviour during the mid to late 1990s, although the smoking rate there is below the national average.[53]

Flynn and colleagues showed that combining traditional school based prevention efforts with a mass media campaign increases intervention effectiveness.[36 37] In a study of two communities, the one that received a mass media intervention along with the educational programme for four years had an almost 40% lower rate of smoking than the one receiving the educational programme alone. The researchers also found that the media intervention was particularly effective among high risk youth, defined as students who reported ever smoking at baseline (grades 4–6, ages 9-12 years) and had two or more smokers in their immediate social or family environment. Based on the evaluation results of Flynn and colleagues, and Worden and colleagues, Secker-Walker and colleagues performed a cost analysis of a mass media programme and found that (in 1996 US dollars) the cost per exposed student was $41, the cost per averted smoker was $754, and cost per life year gained was $696.[36–38 54] If the campaign were to be implemented nationwide, the authors argued that economies of scale would produce significant decreases in these costs. Thus, it is believed that mass media interventions can have a significant and cost effective impact on youth smoking behaviour.

Goldman and Glantz recently reviewed research on the effectiveness of various anti-smoking messages and of paid anti-smoking advertising, and also conducted a qualitative study of 180 focus groups involving more than 1500 adults and youth.[55] They concluded that "aggressive" public education campaigns that focus on "industry manipulation" (that is, the goal of the tobacco industry to recruit young smokers and the tactics used to achieve this goal) and the negative effects of second hand smoke are more likely to reduce

cigarette consumption and denormalise smoking. According to these researchers, incorporating messages of industry manipulation into campaigns resonates with youth in particular because such messages emphasise that people are not acting independently in their decision to smoke. Goldman and Glantz also concluded that advertising strategies that focus on youth access, the short and long term health effects of smoking, and romantic rejection have less potential for effectiveness.[55]

It is important to recognise that the majority of "marketing" that has been aimed at smoking and other substance use prevention should more accurately be called "social advertising".[56] There are important differences between mass media or advertising campaigns and social marketing as a structured approach to influencing ideas and behaviours related to public health (see reviews by Lefebvre and Flora, Maibach and Holtgrave, and Chapman Walsh and colleagues).[57–59] Social marketing employs marketing tools and techniques in a rigorous and disciplined approach that involves consumer testing and feedback, and product responsiveness to this feedback.[59] In addition, Logan and Longo argue that it is time to "rethink" the theoretical approaches to anti-smoking media campaigns, and to devise a "third generation" of campaigns that encompass more of what is known about the behavioural and social dynamics of smoking.[60]

Summary

Sophisticated mass media campaigns that involve essential elements of social marketing and are theoretically driven may well have an effect on the attitudes and behaviours of youth regarding tobacco use, although the impact of such campaigns is challenging to evaluate and has not yet been demonstrated. The literature suggests that mass media interventions increase their chance of having an impact if the following conditions are met: (1) the campaign strategies are based on sound social marketing principles; (2) the effort is large and intense enough; (3) target groups are carefully differentiated; (4) messages for specific target groups are based on empirical findings regarding the needs and interests of the group; and (5) the campaign is of sufficient duration.[1 28]

TOBACCO ADVERTISING RESTRICTIONS

Of all consumer products, cigarettes are the most heavily advertised and marketed. There is great concern that tobacco advertising and marketing—including the distribution of promotional products such as clothing, sporting equipment, and gear for outdoor activities—is positively associated with youth smoking.[61–67] A historical review of tobacco marketing foci and smoking rates among youth showed that smoking initiation among females (but not males) greatly increased at the same time large scale marketing campaigns aimed at women were implemented.[62] This work showed that "major marketing impact occurred in youth smoking initiation only in the sex group targeted", and adds indirect evidence to the proposition that youth smoking initiation is influenced by industry advertising and marketing.[62]

While and colleagues reported that cigarette advertising "appears to increase children's awareness of smoking at a generic level and encourages them to take up the behaviour, beginning with any cigarettes which are available and affordable".[68] Altman and colleagues found evidence that youth awareness of tobacco marketing campaigns, receipt of free tobacco samples, and receipt of direct mail promotional paraphernalia were found to be associated with susceptibility to tobacco use.[69] Consistent with these findings, Pierce and colleagues reported that adolescents who had a tobacco promotional item and/or had an interest in tobacco advertising (that is, had a favourite advertisement) were significantly more likely to initiate smoking in the following three years.[63] Pierce and colleagues concluded that a significant portion of youth experimentation with smoking can be attributed to tobacco promotional activities. However, because these promotional items are not randomly distributed, selection bias could explain this finding.

The econometric evidence on the effects of advertising on cigarette consumption has focused on the aggregate impact on adult smoking. With many studies finding no significant relationship, and many others finding a significant but generally small relationship, this literature is indeterminate on the issue.[70] In any event, technical limitations of the dominant econometric approach[71] combined with a lack of studies on adolescent smoking make this literature of little utility in trying to assess whether advertising affects smoking by children.

Similarly, the potential effect of restrictions or bans on cigarette advertising on adolescent smoking behaviour also is unclear. Some states and municipalities have implemented restrictions regarding tobacco advertising. For example, the state of Utah and several major cities such as San Francisco and Baltimore have banned tobacco advertising from all billboards and other objects of display. These types of bans are too new to have been evaluated yet, and the implementation of similar bans has been delayed because of legal challenges. Nevertheless, the evidence regarding the effects of cigarette advertising bans is mixed, as different statistical analyses have come to opposite conclusions about whether bans reduce cigarette consumption.[70] Saffer and Chaloupka explain the inconsistent findings by the fact that partial and complete bans have different effects, but are not clearly distinguished from each other in research studies.[72] Using both theory and the existing empirical evidence, these researchers conclude that partial bans have little effect because they afford cigarette companies the opportunity to switch advertising expenditures to other promotional media and methods. In contrast, they find that complete bans could reduce tobacco consumption by approximately 6%, an amount that may seem small but could still have an important public health impact.

YOUTH ACCESS RESTRICTIONS

In the past decade, the issue of youth access to tobacco products has received an explosion of attention. Before this time, most intervention activities in this area were focused on discouraging individual adolescents from smoking. Starting in the late 1980s, when the evidence that adolescents have easy access to tobacco products was mounting, concern and action proliferated regarding broader environmental factors affecting the ability of youths to purchase or otherwise obtain cigarettes. In a recent review article, Forster and Wolfson explained that many policies have been implemented at the local, state, and federal levels regarding the distribution and sale of tobacco products.[44] Policy action has been seen in a number of areas, including regulation of sellers, regulation of buyers, restrictions on the distribution of free products or samples (including coupons), and regulation of the means of tobacco sale (where and how it can be sold).[44] The latter includes state and local efforts to restrict or totally ban vending machine sales of tobacco.

At the present time, all states prohibit the sale and distribution of tobacco products to minors through a variety of "youth access laws" or policies that involve age restrictions for selling tobacco. All 50 states and the District of Columbia prohibit the sale of tobacco products to people under the age of 18.[1] In contrast, laws banning adolescent purchase or possession of cigarettes vary by jurisdiction. Some tobacco control advocates have argued that purchase and possession laws are more difficult to enforce than restrictions on the seller, and are part of an effort to shift responsibility for tobacco sales from retailers to minors.[44]

Youth access laws and tobacco sales

Federal Public Law 102-321, commonly referred to as the Synar amendment and enacted in 1991, stipulates that states must enforce laws restricting the sale and distribution of tobacco products to minors and must demonstrate success in reducing youth tobacco access or risk not receiving the full complement of block grant funding for the treatment and prevention of substance abuse.[1] Jacobson and Wasserman suggested that the Synar amendment has led to a number of developments in youth tobacco control, including passage of age-of-sale legislation, increased enforcement efforts, and the increased use of undercover or "sting operations" or undercover studies.[73 74] They also suggested, however, that Synar may be fuelling the growth in the penalising of the purchasing or possession of tobacco among minors. Even with the leverage from the Synar amendment, it is believed that few jurisdictions seriously enforce laws regarding the sale of tobacco to minors.[1 44 73 74] An objective in the Public Health Services' draft "Healthy People 2010 Objectives" is to increase to 100% the proportion of states with retail licensure systems that include licence suspension or revocation for violations of state minor access laws.[75]

Some studies suggest that merchant education regarding youth tobacco access laws has failed to produce sustained refusal to sell cigarettes to minors.[76] Numerous sting operation studies show that illegal tobacco sales to minors are common, with older minors more able to purchase cigarettes than younger minors.[44] While laws regarding sales to minors appear to be rather benign in and of themselves, what seems to make a difference regarding illegal tobacco sales to minors is whether or not the laws are enforced. Upon completion of an extensive study of the enforcement and implementation of tobacco control laws, Jacobson and Wasserman concluded that ongoing enforcement is the key to reducing illegal sales to minors.[73] These researchers stated that "to be effective, local ordinances must have a graduated penalty structure that starts with a moderate fine for the first offense and escalates in severity with each subsequent effect". They also concluded that local licensure and license removal for vendors who sell tobacco products to minors would further restrict vendors' willingness to sell cigarettes to minors.

An experimental study of the effectiveness of an intervention regarding tobacco sales to minors was conducted by Rigotti and colleagues.[77] In this study, three communities in an intervention group enforced tobacco sales laws, while three matched communities in the control group did not. The findings suggested that increased enforcement enhanced vendors' compliance with Massachusetts' tobacco sales laws, thus reducing illegal sales to minors. Similarly, Altman and colleagues, after conducting a randomised trial of an intervention to reduce tobacco sales to minors in some California communities, concluded that "tobacco sales to minors can be reduced through a broad based intervention".[78]

Cummings and colleagues evaluated the impact of an intervention to increase compliance with tobacco purchasing laws by monitoring 319 outlets in six community pairs, where one of the communities in the pair was randomly assigned to an active enforcement programme.[79] Their results showed a dramatic increase in compliance with the law in both the intervention and control communities. The authors believe that their finding of no intervention effect, which is contradictory to several other studies, may be explained by "contamination" from publicity about the enforcement intervention and hence almost universal awareness of the project sting operations among retailers in both the intervention and control communities.

Some researchers have evaluated the impact of youth access strategies when combined with other interventions. For example, Feighery and colleagues investigated the effects of a community education and law enforcement intervention in a two year controlled trial.[80] Their primary conclusion was that an educational intervention (directed at merchants, law

enforcement agencies, and the community at large) alone had a limited effect on reducing illegal sales to minors, but that education plus enforcement significantly reduced illegal over-the-counter sales. Biglan and colleagues[81] used a multiple time series design to assess the impact of an intervention involving community mobilisation, merchant education, changing consequences for clerks, publicity about clerks refusing to sell, and feedback to store owners and managers about sales to youth in rural Oregon. Their analyses suggested that the intervention led to a significant (62%) reduction in sales in the intervention communities.

In response to public pressure, the tobacco industry has embarked on a highly publicised campaign to reduce youth smoking behaviour. The effects of the Tobacco Institute's "It's the Law" campaign—which is a public relations effort purportedly designed to eliminate the sale of tobacco products to minors—appear to be minimal. A survey of tobacco retailers revealed that less than 5% of retail respondents were participating in the programme, and that there was no difference between participating and non-participating retailers in terms of their willingness to sell cigarettes to minors (86% *v* 88%).[82] In another study, DiFranza and colleagues found that vendors participating in the "It's the Law" programme were just as likely to make sales to minors as non-participating vendors.[83]

Youth access laws and smoking behaviour

While several studies suggest that the enforcement of youth access laws can lead to reductions in illegal sales to minors, the evidence that this actually translates into reduced tobacco consumption is limited. Several studies failed to look at the impact of enforcement interventions on smoking behaviour. In studies that looked at both sales and behaviour, the two did not always go hand in hand. For example, the study by Rigotti and colleagues cited above found that reduced sales to minors were not accompanied by changes in adolescents' perceptions of their access to cigarettes or in their smoking behaviour.[77] Similarly, Altman and colleagues concluded that, while interventions to reduce tobacco sales to minors can be effective, multiple supply and demand focused strategies are needed to actually reduce tobacco use.[78]

In contrast, in an observational study of the impact of anti-smoking legislation in one suburban community, Jason and colleagues found that both merchant sales and adolescent smoking behaviour were reduced after the passage of the law.[84] Data from their student surveys suggested that both experimentation and habitual use of cigarettes decreased by over 50% between the pre- and post-test observations; subsequent inquiry suggested that a reduction in use was still apparent after seven years.[84 85]

Forster and colleagues conducted a randomised community trial in 14 Minnesota communities.[86] The goal of the intervention was to make youth access a community wide issue. Intervention communities organised to enact local ordinances, change retail merchants' behaviour, and promote enforcement of illegal sales to minors. Although youth smoking rose in both intervention and control communities, the rate of increase was much smaller in intervention communities. The authors concluded that "this study provides evidence that a community mobilisation intervention resulting in policy adoption and enforcement to reduce youth access to tobacco can affect adolescent smoking rates"; they were careful to note that the results reflect only short term effects.[86]

If the only or primary way in which youth gained access to cigarettes was through illegal sales, then we might expect the enforcement of youth access laws to have a powerful effect on smoking behaviour. However, youth cite a number of "social sources" (such as family, friends, or even strangers) for their cigarettes as well as illegal purchase.[87 88] Forster and colleagues found that, in the 14 communities in their intervention trial, youth who reported ever smoking were very likely to cite social sources for cigarettes, although older youth and those reporting weekly smoking also reported purchasing their own tobacco.[89] The literature to date appears to suggest that youth obtain tobacco products from a wide variety of sources, including social sources.

Summary

It is undeniable that the current state of regulatory, judicial, and legislative pressure on the tobacco industry and tobacco retailers represents an unprecedented and concentrated assault on youth access to tobacco products. Forster and Wolfson have stated that although "it seems reasonable to assume that reducing the number of retailers that sell tobacco to minors illegally will reduce minors' access to tobacco, which will in turn reduce youth smoking rates, it is surprising how little evidence is available to support those assumptions".[44] More evidence, in the form of controlled trials of interventions, is needed to support the intense growth of activity in the area of youth access restrictions. Furthermore, it is clear that in the face of increased enforcement of youth access laws, tobacco remains an alluring and addictive substance of great appeal to youth. What can be said with the evidence at hand is that youth access interventions can lead to a general reduction in illegal sales of cigarettes to minors.[90] Whether this will translate into reduced and sustained reductions in youth tobacco use remains to be seen.

In 1997, the Food and Drug Administration (FDA) implemented a number of regulations regarding youth access to tobacco. These regulations make it a violation of federal law to sell tobacco products to anyone under the age of 18 years and to fail to request an identification card for anyone appearing to be under 27 years. In addition, the regulations establish a minimum cigarette pack size of 20 cigarettes, ban free samples of cigarettes and smokeless tobacco, prohibit cigarette sales through

vending machines (with some exceptions), and ban self service displays of tobacco products. At the present time, it is not clear if the FDA will have the resources necessary to enforce these regulations.[44] More significantly, the tobacco industry challenged these regulations as being beyond the FDA's scope of authority. In the case of Brown & Williamson Tobacco Corp *v* FDA, the Fourth Circuit Court of Appeals agreed with the industry and ruled that the FDA could not promulgate most of the regulations. That case is now on appeal to the US Supreme Court, with a decision expected by mid 2000.

TOBACCO EXCISE TAXES

In this section, we review the evidence regarding the impact of tobacco excise taxes on youth smoking. Much of what we report here was taken, with permission, from previous work of Chaloupka and Warner.[70] Tobacco products are taxed by the federal government, states, and a few local governments. While generating revenue, tobacco taxation is also a policy that creates an economic disincentive to use tobacco. Theoretically, increasing the price of cigarettes through taxation could reduce adolescent cigarette consumption through three mechanisms: some adolescents would quit smoking; some would reduce the amount that they smoke; and some would not start smoking in the first place.[1] The extent to which higher cigarette taxes will achieve these objectives depends upon how responsive smokers, and prospective smokers, are to price increases.

The addictive nature of cigarettes suggests that teenagers could indeed be more responsive than adults to changes in cigarette prices, as it is easier to start smoking than to quit. Thus, any factor that can deter or reduce consumption, especially in older adults (who are established smokers), is likely to have a larger effect on teenagers who are initiating the habit. Studies of the elasticity of demand for cigarettes have followed a long tradition, dating back more than half a century.[91] Most of these studies have focused on the adult, or overall, demand for cigarettes, with comparatively few focused on teenage cigarette demand. After reviewing the relevant literature, a 1993 National Cancer Institute expert panel concluded that most estimates of the adult elasticity of demand have clustered around −0.40.[92] This implies that a 10% increase in the price of cigarettes will reduce the number of cigarettes demanded by 4%. The panel further found that prices influence teenage cigarette consumption "at least as much as adult consumption". Yet the dearth of studies devoted to calculating teenage cigarette price elasticities prevented the panel from arriving at a more precise estimate.

In one of the early studies in this area, Lewit and colleagues estimated elasticities for teens' likelihood to smoke and the quantity of cigarettes smoked by continuing smokers to −1.19 and −1.44, respectively.[93] These researchers suggested that youths should be more price sensitive than adults because, in light of the addictive nature of smoking, long term adult smokers are likely to adjust less quickly to changes in price than teenagers who have been smoking for a relatively short time, if at all. In addition, peer behaviour is likely to be much more influential for youths, multiplying the effects of price on youth smoking. That is, an increase in cigarette price directly reduces youth smoking and then again indirectly reduces it through its impact on peer smoking. Grossman and Chaloupka offered two additional reasons.[94] First, the fraction of disposable income a young smoker spends on cigarettes is likely to exceed that spent by an adult smoker. Second, compared to adults, youths are more likely to be oriented toward the present than the future.

The conclusion that youth cigarette demand is more price elastic than adult demand was widely accepted until 1991 when Wasserman and colleagues published a study indicating that prices did not have a significant impact on youth smoking.[95] They attributed this result to the inclusion in their models of an index of restrictions on smoking. These restrictions, which they note are positively correlated with price, had not been included in most previous studies of cigarette demand. Moreover, Chaloupka found that the price elasticity of demand for young adults (that is, individuals between 17–24 years of age) was also insignificant.[96]

However, a recent study of the impact of cigarette price increases on young adults (college age students) challenges these results. Chaloupka and Wechsler estimated price elasticities ranging from −0.906 to −1.309, with approximately half of the response caused by the impact of price on smoking prevalence and the remaining half caused by the impact of price on the number of cigarettes smoked by smokers.[97] Noting that their sample was not a random sample of all young adults, Chaloupka and Wechsler suggested that the price elasticity of cigarette demand by college students may be even higher, given the evidence that cigarette demand is relatively less elastic for more educated or higher income individuals.[96–99] Recent studies by Farrelly and colleagues,[100] Lewit and colleagues,[39] and Tauras and Chaloupka[101] provide additional support for the inverse relationship between price sensitivity and age.

In general, researchers examining the effects of price on smoking participation using individual level data from cross sectional surveys have assumed that much of the price effect estimated for youth reflects the impact of price on smoking initiation, while the estimate for adults is largely capturing the effects of price on smoking cessation. A few recent studies have attempted to examine directly the impact of cigarette prices on smoking initiation. Douglas and Hariharan found that a number of socioeconomic and demographic factors had a significant effect on smoking initiation, but their estimates for cigarette prices were insignificant.[102] These results were supported by DeCicca and colleagues, raising doubts about the hypothesis that higher

cigarette prices lead to significant reductions in youth smoking.[103]

Re-examining the longitudinal data used by DeCicca and colleagues, Dee and Evans found a negative and significant impact of cigarette taxes on smoking initiation.[104] They argued that DeCicca and colleagues' finding that price has no impact on smoking initiation was largely the result of the way in which their sample was constructed. Their estimated price elasticity of smoking onset is −0.63, consistent with several other recent studies of youth smoking employing cross sectional data. Clearly, the use of longitudinal data to examine the impact of cigarette tax and price changes on smoking initiation and cessation is an important advance. The findings from studies using relatively longer panels that control for unobserved state and/or individual factors affecting demand[100 101] are consistent with the findings that price sensitivity is inversely related to age.

Evans and Farrelly recently examined a phenomenon not previously studied by economists: the compensating behaviour by smokers in response to tax and price changes.[105] Specifically, they found consistent evidence that, although smokers reduced daily cigarette consumption in response to higher taxes, they also compensated in several ways. In particular, smokers in high tax states consumed longer cigarettes and those that are higher in tar and nicotine, with young adult smokers also most likely to engage in this compensating behaviour. As a result, they argued that the perceived health benefits associated with higher cigarette taxes are likely to be somewhat overstated. Given this compensating behaviour, Evans and Farrelly suggested that if cigarette taxes are to be used to reduce the health consequences of smoking, then taxes based on tar and nicotine content would be appropriate.[105] This is a controversial idea, however, that can be criticised on other grounds.[70] Concerns include: that such a policy conveys the impression that low tar and nicotine cigarettes are less hazardous, although this is not at all clear; that as people shift to low tar and nicotine brands their daily consumption may increase to compensate; and that if such a tax varied across states, it might increase cigarette smuggling.

Summary

The evidence on the degree to which teenagers are responsive to changes in cigarette prices is mixed, but the general consensus is that higher prices are an effective deterrent to youth smoking. Because cigarette price increases have been relatively small (under a dollar and, in many cases, just a few cents), it is difficult to predict with confidence the impact that a large price increase—such as a dollar or more per pack—would have on teenage cigarette consumption. The effects might be expected to be proportionately greater than those of a small tax increase.

Recent innovations in youth smoking prevention and control

The purpose of this section is to identify emerging trends and promising innovations in policy and programmatic responses to youth smoking. In considering programmes to investigate further and to implement, tobacco control advocates and policy makers might want to be familiar with emerging programmes that have received little to no evaluation attention to date. We stress that this section provides neither a comprehensive nor systematic review. Rather, this section represents an attempt to provide information about major themes that are referred to in published reports and in the media, that recur in reports on the internet of current tobacco control activities, and have emerged in our interviews and interactions with tobacco control advocates and professionals. In addition, it is important to emphasise that the majority of strategies described below have received no or only cursory evaluations. Thus, while some of these approaches may be compelling or appear to have promise, there is little to no empirical evidence to support claims about their worth or effectiveness at this point in time.

SMOKING CESSATION INTERVENTIONS

The results of a number of descriptive studies and focus group studies suggest that many teen smokers are motivated to quit smoking. It has been estimated that 74% of occasional teen smokers and 65% of daily users have a desire to quit, although some studies suggest that the success rate among those who do attempt to quit is low.[106 107] Sargent and colleagues found that smoking cessation rates among adolescents were comparable to adult rates, and varied according to smoking status (46.3% among occasional smokers, 12.3% among daily smokers of 1–9 cigarettes, and 6.8% among daily smokers of > 10 cigarettes).[108]

An important conclusion of several studies of adolescent smoking is that it is important to intervene to keep occasional smokers from becoming daily smokers. Yet, the results from a large focus group study of high school smokers suggest that adolescents are unfamiliar with the concept of a smoking cessation programme or with other tools or methods that support quit attempts.[109] Participants were not interested in seeking help or assistance from any professional person or service in attempting to quit, including physicians. Concerns about confidentiality and parental involvement were strongly voiced.

Unfortunately, as Sussman and colleagues documented in a recent review article, there have been very few controlled trials of efficacy regarding adolescent smoking cessation.[110] Brief office interventions delivered by health care professionals hold great promise as a cessation strategy among smokers, especially those who are not yet addicted to nicotine. There is a clear need for training regarding smoking cessation interventions among clinicians serving adolescent patients. Frank and colleagues reported that while over 50% of adult smokers who had seen a physician in the

past year were counselled to quit smoking, only 14% of smokers aged 12–17 had received cessation advice.[111] Similarly, data from the 1993 Teenage Attitudes and Practices survey showed that only 25% of 10–22 year olds report that a healthcare provider had discussed cigarette smoking with them.[112] Research has shown that most pediatricians feel confident and prepared to address issues regarding environmental tobacco smoke with their patients, yet fewer feel comfortable advising paediatric patients and their parents on how to stop smoking.[113–115] A number of materials (included guidelines and quick reference guide) in support of clinician based interventions regarding smoking cessation are available from the Agency for Health Care Research and Quality (formerly the Agency for Health Care Policy and Research) or the CDC.[116]

In summary, the impact of smoking cessation interventions among adolescents is not well understood.[110] Until recently, formal smoking cessation programmes were aimed exclusively at adults. An important recent trend, however, is an increase in the number of such smoking cessation programmes now available for youth. Given the cost effectiveness of smoking cessation interventions for adults, and the large number of addicted teenagers, research on cessation programmes tailored to youth is an important area and should be a high priority.[117 118]

Computer based systems

An important emerging trend is the use of computer based systems to communicate messages about tobacco to teens. Some of these innovations have been evaluated, but because most are in various stages of development and implementation we consider them under the category of new innovations. For instance, Innovative Training Systems is developing a computer game designed to educate children about the harms from tobacco products.[119] Former surgeon general C Everett Koop is developing a similar system.[120] The advantages of these efforts, if successful, are their low cost and adolescent receptivity to computer based information.

As an example of a recently evaluated programme, Pallonen and colleagues described two new computerised self help smoking cessation programmes for adolescents.[121] In the first intervention, the authors adapted a computer system based on a model of adult smoking behaviour change to adolescents. For the second intervention, they used a teen smoking cessation clinic programme developed by the American Lung Association. The results suggested reasonable cessation attempts and initial success (14–20%), but decreasing cessation rates (6%) after the six month follow up survey. The authors noted that the technology and approach are at an early stage of development, but that this study supports the feasibility of using computer based systems in adolescent smoking cessation interventions.

Peer based interventions

A major trend in school based interventions is the use of peer education programmes like Teens Against Tobacco Use (TATU), which has had programmes in many states. These programmes, sponsored by the American Lung Association, train older students to become positive role models for middle and elementary school students. TATU interventions include multiple, intensive sessions during the first phase, with "boosters" in subsequent years. Prevention programmes often include a media literacy component (for example, teens learn how the tobacco industry's advertising savvy has manipulated and distorted information about tobacco).

Recent anti-tobacco advertising campaigns

As a result of the perceived success of the hard hitting anti-tobacco advertisements in California, several states have begun a new generation of anti-tobacco advertising. These ads can be characterised as youth oriented—high energy, aggressive, fast paced, and in turn angry, sarcastic, and irreverent. They are also now being youth influenced, with teens being part of the production process under the assumption that teens best know how to appeal to other teens. For example, as a result of its 1997 settlement with the tobacco industry, Florida launched the "Truth" ads, which were meant to "demonise" the tobacco industry. The Truth/SWAT (Students Working Against Tobacco) messages were partially designed by teens and specifically aimed at teens. Initial evaluation reports indicate that the ads reached 92% of teens and significantly increased their negative attitudes toward tobacco companies.[122]

There is no agreement on the best approach to media counter advertising, and states are using a variety of models for their anti-tobacco advertisements.[123] The current anti-smoking ads in California continue previous anti-industry messages. In a slightly different approach, Florida ads focus on youths asking the industry to be truthful. Arizona ads offer the message that smoking is neither cool nor healthy, while ads in Massachusetts concentrate on adverse health effects. At this point, it is too soon to tell whether the heightened awareness of these ads will lead to lower youth smoking rates.

Penalties for possession and use.

A controversial initiative that has emerged recently is the increasing willingness of policy makers to fine underage youth for using tobacco products. Until recently, policy makers focused on penalising the vendor for an illegal sale to minors as opposed to the user.[90] Under pressure from retail merchants' associations, and perhaps out of frustration that "supply side" policies have not adequately discouraged youth tobacco consumption, policy makers have begun to enact laws that fine minors for smoking in public or possessing tobacco products. Tobacco control advocates have vociferously protested this approach as an attempt to shift attention away from vendors

who sell tobacco products to minors. Regardless, this shift appears to be gaining momentum. As with many of the more well established prevention strategies, we have no information on whether user fines will discourage youth from smoking.

Minors caught smoking or in possession of cigarettes can face a variety of penalties, ranging from a ticket or fine to an appearance in smoking courts, suspension from school, denial of a driver's license, or any combination of these. Fines differ widely in severity, some starting as low as $25, and increase with repeat violations. Fines can also be combined with tobacco education or cessation classes. Some areas allow for the removal or denial of the offender's driver's licence. For example, minors in Florida may lose their licence or be legally prohibited from attaining one if found in violation of the state's 1997 possession law. Driver's licence suspension or denial appears to be reserved for repeat offenders; licences are usually reinstated within a period of three to six months.

An important innovation to watch is the use of teen smoking courts. Florida, Indiana, Utah, and various counties in other states are experimenting with teen smoking courts, where teens must appear with their parents. The experience is more like a prevention programme than a traditional court. In Plantain, Florida, a trip to the teen smoking court includes a lecture by a throat cancer survivor, an anti-smoking video, and an appearance in front of the judge. The smoking court in Linn County, Oregon "tries" first time offenders using teen prosecutors and teen juries in an attempt to stop tobacco use before the transition to routine or addicted smoker.

School policies

Schools may have their own smoking policies, which can apply even to those students over 18 years old. Penalties for violations include fines, smoking education and cessation classes, informing the student's parents, and suspension and/or expulsion. In 1997, Jacobson and Wasserman reported that schools were not very aggressive in enforcing no smoking rules and considered it to be a low priority.[73] It appears, however, that schools are increasingly willing to develop, implement, and enforce no smoking policies. Recently developed school smoking policies seem to use a combination of punishments, rather than just fining or suspending students. Pentz and colleagues found, in a study of 23 schools in California, that schools with smoking policies with four components (that is, a smoking prevention education plan is in place and students ae restricted from smoking on school grounds, when leaving school grounds, and when near school grounds) had lower rates of self reported smoking among the students.[124] Although not a controlled study, these results suggest that strong school smoking policies are associated with decreased rates of youth smoking.

Vendor penalties

There do not appear to be any significant innovations regarding actions against retail vendors who sell tobacco products to minors, but there are some nascent trends to watch. For example, one trend may be local licensure of tobacco vendors and increasing penalties for illegal sales to minors. Fines in Utah start at $250 and go up to $10 000. Despite the potential financial penalty for non-compliance, the volume of violations was so great that a tobacco court was instituted in 1998. Local licensure is important because municipalities are more likely to monitor compliance and threaten licensure removal than state agencies.[90]

Restrictions on the sale and marketing of tobacco products

One way to restrict youth access to tobacco products is to remove the products from areas where youth can go. For example, recent restrictions on vending machines have been effective in removing them as a source of cigarettes for minors. An emerging trend is to restrict self service displays of cigarettes. Vendors oppose such restrictions because self service displays enhance sales. Another area of marketing restrictions involves billboard advertising. The issue of billboard tobacco advertising was addressed in the 46 state tobacco settlement, which stipulates the removal of billboard advertisements by April 23, 1999. Even before that, several communities had banned or restricted the use of billboard advertising. Most restrictions concern the area in which the ads are located.

Direct restrictions on smoking.

Policy efforts to restrict public smoking have proliferated since the 1980s.[125] Such efforts include state and local restrictions on smoking in public facilities and outdoor spaces, in worksites, in hospitals, in restaurants and bars, in hotels and motels, and on airline flights.[73 126 127] Brownson and colleagues concluded that public smoking bans appear to be effective in reducing non-smokers' exposure to environmental tobacco smoke, and that work site bans do influence the intensity of smoking among workers.[126] Such bans may also have a positive impact on quit rates.

Some econometric studies of teenage and young adult smoking behaviour found evidence that clean indoor air laws may reduce teenage cigarette consumption. Wasserman and colleagues found that imposing strict regulations on smoking in public places can significantly reduce the number of cigarettes consumed by teenagers.[95] Similarly, Chaloupka and Grossman, using data from the Monitoring the Future project, found that restricting smoking in public places significantly reduced the prevalence of youth smoking, and that restricting smoking in schools, in particular, reduced the average number of cigarettes smoked by young smokers.[128] Finally, Chaloupka and Wechsler found that laws restricting smoking in restaurants and schools significantly lowered college students' smoking participation rates.[97]

Although the reasons why such laws may be effective in reducing youth smoking are unknown, one could speculate that they simply reduce the opportunities available for smoking. Alternatively, or perhaps in conjunction with these reduced opportunities, clean indoor air laws may be a useful vehicle for creating a cultural norm that suggests smoking is socially unacceptable.

Interventions that focus on adolescent risk taking in general and/or on problem behaviours

Youth smoking occurs in a web of social relations that foster many types of adolescent experimentation and that also may foster problem behaviours. Because of this social context, youth smoking arises from some of the same family, peer, and community influences that are also important to sexual risk taking, crime and violence, and the initiation of harmful alcohol and illicit substance use.[129 130] Existing prevention research regarding other adolescent problem behaviours therefore has potentially important implications for the design and evaluation of programmes to curb youth smoking. Such interventions for older adolescents are often focused on improving academic skills. Many are also aimed at creating a sustained relationship with adult advisors or mentors who can provide social and emotional support while reinforcing appropriate social norms regarding substance abuse and other behaviours.[130 131] An additional approach involves "family focused" interventions. Biglan purported that there is a "great deal" of evidence supporting the efficacy of family focused interventions regarding substance abuse, including interventions that address the multiple factors affecting family functioning.[132]

A small, but potentially interesting literature for policy makers to consider examines the effectiveness of interventions designed to deal with behaviour that indicates a propensity to use tobacco products. For example, Kellam and Anthony conducted a randomised prevention trial to determine whether interventions targeting aggressive or disruptive classroom behaviour—an early antecedent to smoking—would reduce adolescent use of tobacco.[133] Using the "good behaviour game" or the "mastery learning curriculum" as the behavioural intervention, the authors found that tobacco initiation for disruptive boys who were assigned to the intervention was lower than the control group. There were no differences for girls. The authors conclude that these results suggest targeting early risk factors for tobacco use as a complement to subsequent prevention activities. This finding is consistent with Hu and colleagues, who found that higher academic performance is associated with a lower probability of smoking and that policies directed toward improving academic performance may also reduce adolescent tobacco use.[134]

Discussion

Our review suggests a number of prevention strategies that are promising, especially if conducted in a coordinated way to take advantage of potential synergies across interventions. Equally important, there is great potential for these interventions to be cost effective. Even modest gains from prevention and cessation efforts could lead to substantial reductions in the morbidity and mortality costs of smoking.[135] Our assessment and recommendations are similar to those of the CDC regarding "best practices" for comprehensive tobacco control programmes.[136] We recommend that significant attention be given to the following strategies.

MEDIA CAMPAIGNS

Evidence from hard hitting state sponsored anti-tobacco campaigns suggest that a sustained media campaign against smoking can be a successful strategy. At this point, we are not prepared to recommend a particular media strategy among those now being tried. According to the available evidence, one shot campaigns are not likely to change behaviour. Rather, a plan for a multi-year campaign that utilises a strong social marketing approach—and also incorporates a rigorous evaluation component—should be developed and implemented. In addition, more research is needed to examine whether and how tobacco advertising has been successful in reaching children and convincing them to use tobacco products. Once more information is learned, these marketing techniques can be used to the advantage of anti-tobacco groups and state organisations in developing effective media messages.

TEEN CESSATION PROGRAMMES

Almost all of the attention on smoking cessation has focused on adults.[110] Our review suggests that efforts to develop and implement adolescent smoking cessation programmes should be accelerated. It is particularly important to target adolescents who are just at the transition point before or after habitual smoking begins. The evidence at hand suggests that, although the processes by which nicotine dependence develops in adolescence are not well understand, teenagers certainly can and do become addicted to nicotine.[137–139] There is a need to reconsider the use of nicotine replacement therapy for adolescents. Currently, these therapies are unavailable legally to persons under 18, and very few studies have assessed efficacy and safety in adolescents.[139–141] As Patten concluded in a recent review article, much research is needed to evaluate the benefits of nicotine replacement therapies in adolescent smokers, and to assess adjuvant behavioural interventions tailored to adolescents' unique developmental and psychosocial characteristics.[141]

CHANGING THE ENVIRONMENT

Although the focus of this article and of the recommendations is on adolescents, it is important for tobacco control advocates to consider how to change the overall environment that induces adolescents to initiate tobacco use. One problem with targeted prevention strategies is that a single programme cannot always or perhaps even

often prevent smoking if the environment surrounding the child encourages tobacco use. Cigarette advertising, easy access to tobacco products, and tolerance toward smoking are only some of the issues that may contribute to high rates of youth smoking. We believe that an aggressive approach to changing the social context of smoking would include: (1) an emphasis on smoking cessation among adults in an attempt to reduce the amount of smoking among adult role models for children; (2) the expansion of state and local clean indoor air laws; and (3) rigorous enforcement of illegal tobacco sales to minors.

SCHOOL AND COMMUNITY BASED EFFORTS

Despite the mixed results of previous school based efforts, prevention programmes based on a social influence model have shown to have short term effects on middle school students, the time when students are most likely to initiate smoking. Unfortunately, little is known about the effect of these interventions when they are removed from a highly controlled research setting and implemented on a large scale in schools. We suggest that policy makers should focus on taking advantage of synergies between different strategies, especially school and community based programmes. One possibility for expanding school based interventions is to combine them with community based programmes that use a social influences model and also target the familial environment and the overall sociopolitical context of the community. We recognise that tobacco use is not the only risk taking behaviour in which many adolescents engage. Thus, it is important in the development of new interventions to view adolescent smoking in the context of broader developmental issues, and to recognise that, for some youth, smoking serves as a marker for other behavioural problems.

School and community based interventions should also explore the use of computers in their programmes. Adolescents represent a perfect audience for using emerging computer based anti-smoking strategies. The development and expansion of computer based systems presents a unique opportunity to take advantage of technology that most adolescents are comfortable with and to adapt anti-smoking messages to individual needs and circumstances.

Our review suggests that most school based prevention programmes target students in the elementary and junior high school, while high school students are often ignored. High school students may receive "booster" sessions, but these sessions are often unconnected to the interventions received in junior high. High school students are also excellent candidates for participating in sting operations, lobbying for anti-smoking legislation, and becoming peer educators for children in their community. Interventions using peer educators should be evaluated both for their impact on the children receiving the programme and for the effect of reinforcing non-smoking behaviour on the teens themselves.

INCREASING CIGARETTE PRICES

Raising excise taxes and increasing the price of cigarettes is likely to have an observable impact on youth smoking. Adolescents are price sensitive. Even if adolescents still have access to cigarettes through friends and family, higher prices are likely to result in fewer routine smokers and perhaps fewer cigarettes consumed by occasional smokers. Therefore, efforts to increase state and federal tobacco excise taxes should continue.

INVEST IN PROGRAMME EVALUATION

One possible explanation for the mixed results of smoking prevention and control programmes for youth is inadequate programme evaluation. One of the most significant barriers to implementing effective prevention programmes is translating a successful, but small scale and tightly controlled, intervention to the community.[46 142] Once the intervention has reached the community it is often assumed to be effective without any further evaluation. Our review suggests that the failure to evaluate youth prevention programmes is a serious deficiency in being able to defend additional investments in youth tobacco control efforts. Many new innovations appear promising. However, they all need rigorous programme evaluation in order for us to understand better the magnitude of the effects, whether or not different groups of youth respond differently to the intervention, the costs involved, and the barriers and facilitators to programme implementation.

Conclusions

The most obvious conclusion from this review is that adolescent smoking prevention efforts have had mixed results. It is also clear that no one approach is likely to reverse that finding. Despite a considerable amount of additional research and a wide range of new and innovative prevention strategies, we cannot say that there are any new revelations about the effectiveness of these programmes beyond the conclusions reached by the surgeon general and the IOM in 1994.[1 4] As a result, advocating for a focus on youth smoking prevention and control is somewhat controversial. Some policy analysts have suggested that the focus of public policy should be to reduce teenage smoking initiation rates.[1 4 73] Others have suggested that the focus on children will undermine the broader and likely more fruitful initiatives and programmes needed to attack smoking and to promote cessation among adult habitual smokers.[40]

From a practical perspective, these different policy views are not mutually exclusive. Both can be implemented simultaneously, and should be considered as complementary rather than competing strategies. From a public health perspective, we are appropriately concerned that the prevalence of youth smoking remains high despite the amount of resources already devoted to this problem and the wide array of interventions that have been tried. Yet, it is possible that without these interventions, rates of both experimental and habitual smoking among youth would be even higher.

On 19 November 1998, 46 state attorneys general in the United States agreed to a $206 billion settlement with the tobacco industry. The money from the settlement was given to states to reimburse them for past and future health care costs associated with smoking. There are no requirements, however, for how states must spend the settlement funds. Faced with a windfall of billions of unrestricted dollars, state legislators and health officials are being pressured to spend the money on a number of issues unrelated to smoking, from tax breaks to improving roads. Although these issues are important and may be politically popular, the settlement will not maximise public health objectives unless some of the money is used to reduce the morbidity and mortality burdens of tobacco use.

As part of the multistate settlement with the tobacco industry, an independent foundation—the American Legacy Foundation—was established to pursue a variety of tobacco control goals. These goals include reducing youth tobacco use, protecting non-smokers from environmental tobacco smoke, and helping adult smokers to quit. The foundation will receive approximately $1.2 billion to spend toward these goals in its first four years, with the majority of funds being targeted toward youth smoking prevention. The foundation will work through states, primarily through grant mechanisms, to develop novel and effective interventions. At the present time, the foundation intends to direct its support to states that provide matching funds for the effort. As such, this further emphasises the importance of states investing some of their settlement funds in tobacco control.

We believe that previous calls for tobacco control efforts that are "youth centred" remain relevant and critically important as we move into the 21st century.[4] This review suggests that there are a number of interventions and strategies that deserve further consideration, dissemination, and evaluation. The resources available through the settlement with the tobacco industry provide an unprecedented opportunity to invest in youth tobacco control. Thus, we strongly advocate that this opportunity be seized and that significant state resources—along with other resources—be devoted to expanding, improving, and evaluating tobacco prevention and control activities among youth.

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