

## REVIEW

# Curbing Adolescent Smoking: A Review of the Effectiveness of Various Policies

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Tobacco-related mortality is one of the biggest killers in American medicine. Evidence suggests that if adolescents can be kept tobacco-free, most will never start using tobacco. Therefore, tobacco control policies directed at the youth population could provide an effective method for sustaining long-term reductions in smoking in all segments of the population. Many forms of tobacco control policies have been implemented including restrictive laws, public campaigns, and taxation duties; there has been disagreement over which is most effective. We investigate the efficacy of various methods of tobacco control in youth and present a review of the published evidence.

Econometric data for both youth access restrictions and environmental tobacco smoke restrictions afford ambiguous results. Results vary in a continuum from a moderate negative effect toward, ironically, a marginal positive effect on smoking. While information dissemination policies may be somewhat effective on the onset, they are limited in their effect and eventually diminish over time. We conclude that increases in price affect teen smoking to a great degree. Most estimates show that for a 10 percent increase in prices, which could be implemented by a tax per pack, a 15 percent decrease in cigarettes consumed could be accomplished. Taxation policies are an effective means of preventative medicine.

## INTRODUCTION

According to the Surgeon General's Report on Smoking "[s]moking remains the largest single preventable cause of premature death and disability in the United States" [1]. Statistics from the Center for Disease Control cite that "[s]moking begins primarily during childhood and adolescence" [2] and that, "[n]early all first use of tobacco occurs before high school graduation; this finding suggests that if adolescents can be kept tobacco-

free, most will never start using tobacco" [2]. Therefore, tobacco control policies directed at the youth population could provide an effective method for accomplishing and sustaining long-term reductions in smoking in all segments of the population. Policy makers seeking to decrease youth smoking have attempted various types of restrictive laws, public campaigns, and taxation duties; and there has been disagreement over which is most effective. We seek to investigate the efficacy of var-

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†Abbreviations: MSA, Master Settlement Agreement.

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## RESTRICTIVE POLICIES

Restrictive policies serve a paternalistic government function, outlaw undesirable social behavior, and punish those who disobey. Such laws pose costs to those who choose to continue such criminal actions in the order of fines or loss of freedom (prison) and presumably make the desirability of such behavior unworthy of its costs. This set of policies can be further categorized as access controls and environmental controls.

The evidence for the effectiveness of access controls to obtaining tobacco products has been lukewarm at best. Access controls describe policies intended to keep cigarettes out of the hands of adolescents and aim to make it more difficult to possess. These policies include restrictions in purchasing, requiring signs on vendors' windows advertising such restrictions, mandates of identification inspection, and the explicit licensing of tobacco sales much in the same way as alcohol sales. Other such policies include certain prohibitions on cigarette vending machines and bans on providing free samples.

The literature provides little evidence that these policies are effective; what has been published is a mixed bag of results. Gruber [3] discovers that among high school seniors, access control policies show minimal effects on the participation and frequency rate of smoking. For the younger students in the same study, access controls seem to provide a marginally more significant negative impact on smoking quantity but not on participation rate. Emery et al. [4] find that tobacco access controls are more effective for adolescents experimenting with smoking and that such policies become nearly insignificant as smoking becomes more habitual. Lewitt et al. [5] show that among ninth-graders, age

restrictions have neither an effect on a reduction in quantity or frequency smoked nor an effect on those considering smoking. Yet, these restrictions do, however, have a negative effect on participation rates to the extent of 4 percent to 5 percent. The results that Chaloupka and Grossman [6] report appear counterintuitive. Contrary to the intent of access control policies, the duo find that a minimum age restriction provides a statistically significant value supporting the notion that these laws lead to increased smoking. This could perhaps be attributed to a "forbidden fruit" effect, whereby outlawing a good makes it more desirable. However, the authors attribute this statistic to the lackadaisical manner in which compliance is enforced. They speculate that such laws would at the very least impact youth smoking somewhat negatively if properly enforced.

In investigating the effects of the other access restriction policies, studies show more consistent evidence of ineffectiveness. Chaloupka and Grossman [6] find that since most youth do not obtain their cigarettes from vending machines, there is little evidence of vending restrictions decreasing smoking; Lewitt et al. [5] find the same result. With regard to laws prohibiting free samples, the same two studies again show insignificant proof of such a policy deterring youth smoking.

Most are now familiar with the deleterious effects of secondhand smoke; as such, ordinances have been enacted to limit citizens' environmental tobacco smoke exposure. These types of bans on smoking in many places, including schools, hospitals, retail areas, public institutions, workplaces, and restaurants, make it more difficult for the smoker to smoke at will. It can be speculated that by preventing most smoking in socially interactive settings, the social value of smoking decreases. This consideration to the youth population might suggest that peer pressure to smoking could potentially be miti-

gated. As restrictions to use of tobacco in certain locations are sanctioned, such as in the school or in nearby vicinities, the probability of groups of students gathering to smoke diminishes. Students will be less exposed to the act of smoking and the pressures to follow in the actions of their friends.

The evidence for these policies show a moderate to no effect of such restrictions. Several major studies have shown that smoking restrictions do have a small negative effect on smoking levels. Sung et al. [7] suggest that from studies of the Western United States, which tend to have the greatest restrictions on smoking, the negative effect of such policies is significant, though only marginal. They estimate the effect of policy as a 5.8 percent decrease in consumption in the short run.

With regard to the youth population, Chaloupka and Grossman [8] find that for stringent restrictions, such as those that include prohibition of smoking in private workplaces and restaurants, there is a moderately negative effect of these policies on probability of smoking. However, they show little or no effect on cutting down on quantity. Less stringent restrictions, such as restricting use in only publicly owned places, seem to provide little or no evidence of an effect of these policies on both decreasing the probability of smoking or a decrease in the quantity of cigarettes smoked. Considering just the most relevant restriction to youth, i.e., prohibition of smoking at school or school events, there appears to be a significant statistic evincing a moderate decrease in cigarette consumption as a result of these restrictions.

Gruber [3] states that there is evidence of a slight effectiveness of these policies, such as from bans on smoking on public transportation and restaurants. However, one substantial finding from his study is that the younger youth seem to respond more to restrictive policies by cutting back more of their cigarette consumption. Lewitt et al. [5] and Emery et al., [4]

on the other hand, both detect no effect on smoking as a result of bans on locale smoking.

Econometric data for both youth access restrictions and environmental tobacco smoke restrictions afford ambiguous results. Results vary on a continuum from a moderate negative effect toward, ironically, a marginal positive effect on smoking. It is unclear whether restrictive policies are an effective means to helping youth stay away from cigarettes.

## **INFORMATION DISSEMINATION POLICIES**

Information dissemination involves the promotion and prohibition of promotion of tobacco products. Institutions and organizations opposed to the consumption of cigarettes run anti-smoking campaigns, but the tobacco industry and its cigarette companies advertise and promote their products. Anti-smoking campaigns most often attempt to educate the public on various health issues that accompany smoking. This, in effect, makes the consumer more aware of all of the costs associated with smoking. Cigarette advertising, on the other hand, can create the image that smoking is glamorous and fun or sophisticated and sexy. This commonly used commercial tactic strives to increase the perceived benefits of smoking. Tobacco is one of the most heavily advertised and promoted consumer products in the nation, second only to the automobile industry in the size of its expenditures for advertising [5]. Limiting tobacco advertising and promotion halts the latter's attempts at such. As part of the tobacco settlement and the Master Settlement Agreement (MSA), the tobacco companies voluntarily subjected themselves to withdrawing all tobacco billboard ads and the use of cartoon characters in promotion to limit tobacco advertising exposure to the youth population [9].

There is little consensus as to whether tobacco advertising even works [10].

Evidence as to whether or not bans on pro-tobacco campaigns work also provide little agreement. Very little is published about the effectiveness of such bans, especially since the MSA is relatively new, negotiated in late 1998. There does, however, seem to be a slight skew in the available literature that such bans are effective in discouraging teenage smoking. A study from Lewit et al. [11] in the 1980s showed some evidence that the ban on broadcast advertising had a modest effect on teenage smoking. A more recent publication from Lewit et al. [5] also found that exposure to pro-tobacco media created some positive correlation with smoking in ninth graders. We can infer from this discovery that with a ban on pro-tobacco media, a slightly negative correlation could be speculated with regard to teenage smoking.

On the other end of the spectrum of information dissemination policies are anti-tobacco campaigns. Many anti-tobacco campaigns utilize the mass media in the form of public service announcements and commercials. Others rely on grassroots types of activities to enlighten consumers of the dangers of smoking such as through education campaigns in schools.

Several decades ago, Lewit et al. [11] found that a combination of both radio and television messages of anti-smoking decreased smoking rates; it seemed to be most effective in its first year of existence though. More recently, Lewit et al. [5] impart paradoxically that anti-tobacco media actually somewhat increases the likelihood of smoking in youth. From such results we can speculate that as the media touts the same message repeatedly, its effects decrease because people tend to start ignoring them. It can even lead to the creation of a "forbidden fruit" effect, causing the opposite of the intended effect of such policies.

The evidence of more direct types of anti-smoking information dissemination efforts do provide more positive news of these policies' efficacy. Such devices stray

from the use of mass media toward a more personal message. These include programs in schools that teach students in-depth about the bad effects of smoking, warning labels on the packs of cigarettes themselves, and community gathering events such as the Great American Smoke Out. Lewit et al. [5] cite that among the various media focused policy interventions the most effective in reducing smoking among ninth-graders seems to be education in the classroom. While statistically significant in reducing smoking, the effect tends to be unfortunately small. Meier and Licari [12] investigated the effects of the 1966 imposed Surgeon's General Warning labels directly on packs of cigarettes. In its first year, the label decreased tobacco consumption by 1.65 packs per capita. In the years subsequent to the warning label's initiation, the impact to reduce smoking remained and does so still today. Unfortunately, the impact becomes smaller with time. Much in the same way that media messages get ignored over time so do warning messages on cigarette packs.

Overall, Chaloupka and Grossman [6] looked at the effect of cigarette taxes especially earmarked for anti-tobacco uses. Several states, such as California and Massachusetts, have made this a mandatory requisite of their tobacco taxation laws. The majority of these monies go to anti-smoking campaigns of either type mentioned above in addition to research on the topic. Research intends to provide the information that is included in educational campaigns and indirectly serves to provide anti-smoking information. They discover that the use of such monies do provide a negative, statistically significant, effect on both the participation rate and quantity smoked in youth. Because these funds are indistinguishable from any of the above mentioned programs, the results of this study can be used as in indication of the overall effectiveness of anti-tobacco campaigns.

Evidence paints a more hopeful picture of the effectiveness of information

dissemination policies vs. restrictive measures. However, such evidence is not highly voluminous and is limited in its suggestion of great effectiveness. While information dispersion policies may be somewhat effective on initiation, but they are limited in their effect and eventually diminish over time.

### **ECONOMIC INCENTIVE POLICIES**

When examined in juxtaposition to the other two aforementioned types of policies, certain advantages can be immediately noticed. With regard to information dissemination campaigns, price changes make costs explicit, rather than relying on the individual to incorporate the information intended to influence a consumer's perception of discount rate or externalities. The method of media campaigns and education relies on three steps to discourage smoking: the acceptance of information, internally adjusting costs and benefits, and then ultimately making the decision not to smoke. Changing prices eliminates the first two steps and immediately aids the consumer in whether or not such increased price is worth his or her consumption.

Despite the seemingly apparent advantage that price alterations have in eliciting a response in consumption, price responsiveness ultimately determines whether such policies are effective. Price elasticity of demand tells us whether or not a change in price on a pack of cigarettes will actually cause individuals to cut back on their consumption and by how much. The term "price elasticity of demand" represents the responsiveness of demand to changes in price. This is described mathematically as a percent change in quantity demanded over the percent change in price.

When seeking to change the price of cigarette packs, there are two options: supply-side and demand-side. A less traditional method to affecting prices is via the supply side. Currently, the government creates price supports for tobacco farmers and in so

doing sets a floor that the price of tobacco leaves cannot fall below. This effectively raises the price of tobacco. Only a handful of studies have been done on the supply-side effects of price supports in affecting price. Sumner and Alston [13] published the first influential report on this topic. They stated that the removal of such price controls would decrease price by 3 percent and increase sales by 1 percent in the United States. A follow up study was conducted by Zhang et al. [14], which concluded that price support programs only minimally affect the price of a pack of cigarettes on the whole. At the time of its publication, the tobacco price support program increased the price of tobacco leaves by 36 cents per pound, which ultimately translated to a 1 cent increase in the price of a pack of cigarettes.

Taxation is a demand-side technique to increase the price of cigarettes. This is by far the most often used method to affect changes in price. From empirical data, taxation also appears to be the most effective policy in the cessation or prevention of teenage smoking. In fact, virtually every study cites taxation and price changes as an effective means of smoking deterrence in the youth population. Relative to other policies, the metric results on the efficacy of taxation prove to be the most robust regression estimates.

By understanding the incidence of tax on the consumer and the elasticity of demand, we can control the degree by which we increase prices and decrease the amount of smoking. With regard to incidence of tax, Barnett et al. [15] found that the tobacco industry is a six-firm oligopoly with a high degree of price coordination. Their results show that for a \$1 increase in taxes, 50 cents to 75 cents is passed onto the consumer, depending on the type of tax. Others have shown that prices can actually rise by more than the amount of the tax because of a lack of a perfectly competitive market [7, 16]. If we can accurately estimate such incidence, we can

effectively levy taxes such that the price increase takes incidence of tax into account.

It is important to note that decreased rates of smoking can take on two forms: either a decrease in participation rates (i.e., you smoke or you do not) or a decreased quantity of cigarettes smoked (i.e., a decreased frequency of smoking). Most public health officials aim to only decrease prevalence rates and dismiss the worth of the latter. However, the benefit of a decreased quantity smoked has just as important of an effect. Fewer cigarettes smoked still produce the same effects of full cessation. For example, smoking less still decreases the environmental damage of smoke and reduces some health costs. Thus, we consider either effect in response to a price increase to be a successful policy.

Within the youth population, empirical data provide strong evidence of significant price sensitivity. While most studies describe the decrease in teen smoking as very significant, there are debates about where the reductions stem from, whether they are from fewer kids smoking or kids who are smoking less. Nevertheless, evidence pointing to the effectiveness of prices is very significant and real. Lewit et al. [11] estimate youth elasticity as nearly three times that of the adult population using data from the 1960s and 1970s. Their estimates declared that teen price sensitivity was  $-1.44$ , i.e., for a 10 percent increase in prices, 14.4 percent of teens reduce smoking, with results affecting a youth's decision to smoke rather than the conditional demand of how many cigarettes to smoke. With more recent data, Chaloupka and Grossman [8] estimate that the average overall youth elasticity of demand is  $-1.313$ . This figure is statistically significant and again shows a sharp reduction in smoking for increases in price. In this study, however, the reductions in smoking come about equally from a decline in participation and a cut back on the quantity smoked per smoker. This

study concludes that because virtually no smokers begin their habit after 20 years of age, that large sustained increases in taxes should be very effective in achieving long-run improvements in health. Certainly, this speculation seems valid, but only under the assumption of constant elasticities.

There is some evidence that price elasticities of demand change over time. Speculations state that as taxes increase they become less effective because the only smokers left are the hard-core, die-hard smokers who will not quit. Certainly the shift in cultural and social climates with regard to smoking may create decreasing numbers of smokers to the point where only the hard-core individuals remain as well. Sheu et al. [17] realized that in a study in California, in the context of post-Proposition 10 and the tobacco settlement, prices became less effective in a state where smokers have been bombarded with more and more costs to tobacco use. While prices become less effective in getting individuals to stop smoking, there remains evidence of effectiveness on decreasing the quantity smoked. Looking over the youth data over time, however, there seems to be no clear-cut evidence showing changes in youth elasticity over time. We associate time increases with increasingly stringent smoking policies and increased taxes in the case of the United States. This lack of lessened effectiveness of youth taxation can be simply explained as growing pains. As the smoking youth population becomes the older, high-quantity chronic smoker, they no longer belong to the cohort of youth; that is, as individuals get hooked onto smoking they grow beyond the age of what is classified as youth. Therefore, it remains that the youth population can be likened to the starting generation of smokers, and smoking can continue to be stopped at its source through continued taxation.

While taxation works to stop those youth who actually purchase the cigarettes, price changes might not have as big an

effect on those who are experimenting with smoking. The economic incentives are not as solid without actual purchases or very small volumes thereof. Gruber [3] shows that in a sample mean of various surveys for high school seniors, the price elasticity of the most robust data shows  $-0.67$ , only  $-0.06$  of that in quantity demanded. The price elasticities of demand for high school seniors from another survey show a remarkable  $-3.0$ ,  $-1.5$  in participation and  $-1.5$  in quantity demanded of price elasticity. But when surveying younger youth the effectiveness of taxation seem inept. The more robust of the data show a price elasticity of only  $-0.31$ , with conditional demand of  $-0.03$ . For the rest of the survey data sets, a statistically insignificant estimate was obtained. This suggests that the younger youth, which are more likely just starting to smoke, smoke cigarettes on an experimental basis or to such a small extent that purchasing cigarettes is not necessarily a part of smoking. Perhaps these children obtain cigarettes off older friends or only smoke when offered cigarettes for free. Emery et al. [4] conducted research on differences between these sub-cohorts of youth smokers. They were classified as experimenters, who had tried cigarettes or experimented to the extent of a few puffs, current smokers, who had smoked a cigarette in the last month, and established smokers, who had smoked a cigarette in the last month and smoked at least 100 cigarettes in their lifetime. Their results show that for current smokers the price elasticity stands at  $-1.70$ ,  $-0.83$  in participation and  $-0.87$  in quantity demanded; for established smokers the price elasticity was  $-2.24$ ,  $-1.56$  in participation and  $-0.68$  in quantity demanded. However, price was not a factor for experimenters in any age group. Therefore, we can set up these figures on a spectrum of those who do not purchase cigarettes but smoke, those who smoke regularly and purchase a medium amount of cigarettes, and those who smoke habitually and spend a large amount of

their budget on cigarettes. It is clear to see that as intensity of smoking increases and as a greater percentage of their allowances and spending money is allocated toward tobacco, the more effective taxation is on creating incentives to cease such behavior.

One very interesting article authored by Lewit et al. [5] provides some insight into differences between boys and girls when it comes to price sensitivity. Boys show a much greater decrease in smoking participation in response to an increase in price than girls. Elasticities for boys range from  $-1.51$  to  $-1.02$ , whereas girls' are  $-0.32$  to  $-0.06$ , for a combined  $-0.87$  to  $-0.49$ . On the other hand, girls show a much greater response to an increase in price for intent to smoke. Boys' intent to smoke were  $-0.92$  to  $-0.84$ , and girls  $-1.26$  to  $-0.99$ , for a combined  $-1.07$  to  $-0.95$ . This concludes that while increases in price are effective in reducing the youth smoking rate, for boys, increased taxes are more likely to cause them to stop smoking, whereas in girls the effect seems to deter them from starting in the first place. It is interesting just to note how a policy intended on performing a single function can do it via multiple paths in different segments of the population.

From the large quantity of literature on price elasticities of cigarette demand, it is quite reasonable to conclude that increases in price affect teen smoking to a great degree. Most estimates show that for a 10 percent increase in prices, which could be implemented by a tax of a third of a dollar to each pack, a 15 percent decrease in cigarettes consumed could be very plausible. One unclear area that needs further evaluation, however, is the experimentation phase. At this early stage of smoking, teens are not aware of the risks of addiction and cannot be effectively prevented from doing so with simple taxation. Nevertheless, the benefits of using a simple, virtually costless tool such as taxation proves to be quite large; the returns are unmatched.

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