The Impact of Implementing Tobacco Control Policies: The 2017 Tobacco Control Policy Scorecard

David T. Levy, PhD; Jamie Tam, MPH; Charlene Kuo, MPH; Geoffrey T. Fong, PhD; Frank Chaloupka, PhD

ABSTRACT

The Tobacco Control Scorecard, published in 2004, presented estimates of the effectiveness of different policies on smoking rates. Since its publication, new evidence has emerged. We update the Scorecard to include recent studies of demand-reducing tobacco policies for high-income countries. We include cigarette taxes, smoke-free air laws, media campaigns, comprehensive tobacco control programs, marketing bans, health warnings, and cessation treatment policies. To update the 2004 Scorecard, a narrative review was conducted on reviews and studies published after 2000, with additional focus on 3 policies in which previous evidence was limited: tobacco control programs, graphic health warnings, and marketing bans. We consider evaluation studies that measured the effects of policies on smoking behaviors. Based on these findings, we derive estimates of short-term and long-term policy effect sizes. Cigarette taxes, smoke-free air laws, marketing restrictions, and comprehensive tobacco control programs are each found to play important roles in reducing smoking prevalence. Cessation treatment policies and graphic health warnings also reduce smoking and, when combined with policies that increase quit attempts, can improve quit success. The effect sizes are broadly consistent with those previously reported for the 2004 Scorecard but now reflect the larger evidence base evaluating the impact of health warnings and advertising restrictions.

KEY WORDS: effectiveness, review, tobacco control policy

In 2001, the USPHS Community Preventive Services Task Force's *Guide to Community Preventive Services: Reducing Tobacco Use and Secondhand Smoke Exposure*[1] (the "Task Force") reviewed the empirical literature on the effectiveness of tobacco control interventions. A Task Force panel of public health and prevention experts, appointed by and independent of the Centers for Disease Control and Prevention, assessed the evidence base and provided a range of effect sizes for price, mass media, smoke-free air, and health care provider interventions. Shortly thereafter, the Tobacco Control "Scorecard," published in 2004,[2] provided estimates of policy effect sizes on smoking initiation, cessation, and prevalence for a broader set of policies that included health warnings and advertising bans. Both of these reviews concluded that there was moderate to strong evidence on the effectiveness of cigarette price increases, smoke-free air laws (SFALs), and mass media campaigns (MMCs), and limited evidence on the effectiveness of cessation treatment policies. The 2004 Scorecard[2] also found limited evidence regarding the effectiveness of graphic health warnings and tobacco marketing restrictions.

The Scorecard[2] provides essential inputs to tobacco control policy simulation models, cost-effectiveness analyses, and other methodologies used to evaluate individual or combined tobacco control policies and their past or future impact on population health.[3–9] These analyses can help guide decision making about

Author Affiliations: *Lombardi Comprehensive Cancer Center, Georgetown University, Washington, District of Columbia (Dr Levy and Ms Kou); Department of Health Management and Policy, University of Michigan, Ann Arbor, Michigan (Ms Tam); Department of Psychology and School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada (Dr Fong); Ontario Institute for Cancer Research, Toronto, Ontario, Canada (Dr Fong); and Health Policy Center, Institute for Health Research and Policy, The University of Illinois at Chicago, Chicago, Illinois (Dr Chaloupka).*

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Correspondence: *David T. Levy, PhD, Lombardi Comprehensive Cancer Center, Georgetown University, 3300 Whitehaven St, NW, Suite 4100, Washington, DC, 20007 (DL777@georgetown.edu).*

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which tobacco policies to prioritize and implement. Furthermore, because the reported effect sizes represent changes in smoking rates relative to initial levels, they can be applied to different countries using their respective smoking prevalence. In the last 13 years, however, the evidence base has grown substantially. Since the 2001 review, the Task Force has updated its review[10] and other reviews have been conducted.[11,12]

We update the 2004 Tobacco Control Scorecard to (1) reflect newer evidence of effect sizes, with particular attention to policies in which previous evidence was limited and (2) provide credible ranges of effect sizes for each tobacco control policy. In updating the reviews conducted for the 2004 Scorecard, we include reviews and studies published after 2000 and focus on 3 policies in which previous evidence was limited: tobacco control campaigns, graphic health warnings, and marketing bans. As in the original Scorecard paper, we focus on high-income countries (HICs), where numerous reviews and studies were available.

Methods

We confine the review to analyses of interventions traditionally used to reduce cigarette demand, including cigarette taxes, SFALs, marketing restrictions, comprehensive tobacco control programs, media campaigns, graphic health warnings, and cessation treatment policies. These policies have received the most attention in the tobacco control literature and are explicitly recognized in the World Health Organization MPOWER Reports.[13,14]

We conducted a search of the PubMed database for reviews and articles published from January 1, 2000, to June 30, 2016. We also included articles from Task Force reviews and other reviews obtained from our search.[12] We used the following key word search terms: ("cigarette," *or* "smoking," *or* "tobacco control") *and* ("effectiveness," *or* "evaluation," *or* "impact") *and* descriptors for a particular policy (eg, "price," "tax," "smoke-free air," "clean air," etc). Eligible studies included experimental, quasi-experimental, and population-based evaluations (including case control, cohort and cross-sectional studies). To determine average policy effect sizes, strongest weight was given to population-level evaluations with at least 1 smoking outcome: initiation, cessation, prevalence, or quantity smoked. Because standardizing to prepolicy levels is useful in translating results to populations with different smoking rates, we estimate average effect sizes in terms of relative changes from the initial smoking prevalence. Since Task Force estimates are generally provided in terms of (absolute) percentage point (PP) estimates, we convert their estimates to relative terms, that is, the absolute change relative to the initial smoking prevalence, using a smoking prevalence of 25% as a representative level. Although US smoking prevalence rates are currently below 25%,[15] we adopt the 25% initial smoking prevalence as a conservative estimate of the initial rates during the time period when most evaluation studies were conducted.

Policy effect sizes are reported as the estimated percentage change in smoking prevalence over a 5-year (short-term) or 40-year (long-term) time horizon. The short-term effects rely most heavily on studies that examine changes in smoking prevalence following policy implementation, while the long-term effects reflect the reduced initiation and increased cessation if newly implemented policies are maintained over time. We suggest credible ranges for effect sizes based on the number of studies conducted, variation in results, and strength of evidence.

Results

The short-term and long-term effect sizes for each policy type are summarized in the Table, where we provide upper and lower bounds on these effects and policy implementation and enforcement issues.

Price policies

Increasing cigarette excise taxes raises the purchase price, thereby reducing cigarette consumption. Consumer responsiveness is generally estimated by the price elasticity, which measures the percentage change in quantity demanded corresponding to a 1% price increase.

The Task Force[1] (103 studies from 2 systematic reviews[16,17] combined with 13 more recent studies from January 2009 to July 2012) obtained a price elasticity for overall cigarette consumption of −0.37 (a 3.7% decrease in quantity demanded resulting from a 10% price increase), with −0.18 attributed to reduced prevalence and −0.19 to the reduced quantity of cigarettes consumed. The Task Force also obtained a price elasticity of +0.38 for adult cessation and −0.42 for initiation. Higher prevalence elasticities were found for youth, young adults, and low-income individuals.

Based on the Task Force findings, the short-term price prevalence elasticity is −0.18, with a credible range of 25% above and below the effect size (−0.135 to −0.225) to reflect the large number of studies and their variability across countries, for example, consumption elasticities average −0.4 ranging between −0.3 and −0.5.[1,16] Based on the Task Force estimates that initiation and cessation elasticities are approximately double those of prevalence elasticities,[1,16,17] the

TABLE

Effect Sizes[a] and Implementation Issues for High-Income Countries

Intervention	Short Run[b]			Long Run[c]			Comments
	Best	Lower	Upper	Best	Lower	Upper	
Tax increase by 50% of current price with no value-added tax	− 9.0%	− 6.75%	− 11.25%	− 18.0%	− 13.5%	− 22.5%	Tax may be implemented as specific or ad valorem tax. Price per pack of cigarettes is expected to increase on average by the amount of the specific tax and less with an ad valorem tax. Ad valorem taxes tend to increase price dispersion, which may be reduced by laws that set a minimum price. The effects may be eroded by smuggling or price inflation.
Comprehensive smoke-free air laws, including all indoor worksites, restaurants, and bars	− 10.0%	− 5.0%	− 15.0%	− 12.5%	− 7.0%	− 19.0%	Effectiveness may be reduced if private worksites have already implemented smoke-free restrictions, if partial restrictions are already in place, or if compliance with law is weak (eg, due to lack of antitobacco norms or lack of enforcement).
Media campaigns implemented at a high level	− 8.0%	− 4.0%	− 12.0%	− 10.0%	− 6.0%	− 14.0%	Effectiveness depends on whether the mass media campaign is well-tested, implemented on multiple media platforms, of sufficient scale, and sustained over time. The effectiveness of a media campaign may be enhanced if implemented alongside other interventions that increase the visibility and reach of the campaign.
Comprehensive programs, including media, other educational and cessation programs	− 8.0%	− 4.0%	− 12.0%	− 12.0%	− 6.0%	− 18.0%	Effectiveness may depend on how funds are implemented (eg, between media campaigns, cessation treatment, and local campaigns), and may be less if campaigns have been previously implemented, are not of sufficient scale, or if campaigns are not sustained over time.
Health warnings: large, bold, rotating, and graphic	− 5.0%	− 2.0%	− 8.0%	− 10.0%	− 5.0%	− 15.0%	Effectiveness depends on previous text warnings. Plain packaging and media campaigns may further enhance the effectiveness of health warnings.
Marketing restrictions with direct bans on all advertising	− 4.0%	− 2.0%	− 6.0%	− 6.0%	− 3.0%	− 9.0%	Effect sizes are based on empirical studies of TV, radio, print, and point-of-sale tobacco advertising. Online advertising and indirect marketing efforts may offset these effects.
Complete cessation policies include financial coverage of treatments, quit lines, and health care provider interventions	− 5.5%	− 2.75%	− 8.25%	− 11.0%	− 5.5%	− 18.75%	Cessation treatment policies primarily increase quit success and may act synergistically with other policies that act primarily to increase quit attempts. Media campaigns may be needed to publicize cessation programs.
Financial coverage of treatments alone, especially pharmacotherapies	− 2.0%	− 0.8%	− 3.25%	− 4.0%	− 2.0%	− 6.0%	Effective unless the intervention is well publicized and enforced.
Active quit lines alone	− 0.8%	− 0.25%	− 1.25%	− 1.5%	− 0.75%	− 2.25%	Effectiveness depends on the quit line being publicized and may be increased substantially with the provision of no-cost pharmacotherapy.
Health care provider interventions alone	− 1.6%	− 0.8%	− 2.4%	− 3.2%	− 1.6%	− 4.8%	Effectiveness depends on the percentage of smokers visiting health care providers each year and the percentage of providers who provide comprehensive interventions (eg, through enforcement or effective monitoring).

[a] *Effects sizes are in terms of the percentage reduction in smoking prevalence.*
[b] *Short term is a 5-year horizon.*
[c] *Long term is a 40-year horizon.*

long-term prevalence elasticity is estimated to double to −0.36 (−0.27 to −0.45). These elasticity estimates can be multiplied by the projected relative change in cigarette prices to obtain prevalence effect sizes.

In addition to the price elasticity, the public health impact of raising cigarette taxes depends on the magnitude of the tax increase and the extent to which that tax is passed on to consumers as an increase in the price of cigarettes.[18] For specific (per unit) taxes, studies generally indicate that cigarette prices increase by at least the amount of the tax,[16] while ad valorem taxes create more price dispersion, thereby creating more opportunities for more price-sensitive smokers to trade down to cheaper brands.[19,20] The impact of tax policies may be reduced through substitution to roll-your-own,[21,22] cigars, smokeless tobacco,[23,24] e-cigarettes, or water pipe if taxes on these noncigarette tobacco products are relatively low,[25,26] or through tax avoidance (eg, through cross-border and duty-free shopping by smokers) and tax evasion (eg, smuggling), especially if neighboring jurisdictions have lower tax rates.[16] In addition, since price effects depend on cigarette affordability (price relative to income),[25–27] the effectiveness of tobacco tax policies may diminish if taxes do not increase commensurately with income.

Smoke-free air laws

Comprehensive SFALs are public sector regulations that prohibit smoking in worksites and designated public areas such as restaurants, bars, shopping areas, and transit.

Based on a 2010 Task Force review[28] (50 studies) and 82 more recent studies, the Task Force obtained strong evidence for a 2.7 PP (−4.7 to −1.5 PP; 11 studies) reduction in smoking prevalence from comprehensive SFALs. With 25% initial smoking prevalence, the 2.7 PP drop translates into a 10% relative reduction. Smoking bans also showed a median absolute increase in smoking cessation of 3.8 PP, a 1.2 drop in cigarettes per day, and odds of smoking lowered by 15% among youth and young adults. Similar results have been obtained in other reviews.[11,28,29]

Based on the Task Force estimates of prevalence effects, comprehensive SFALs that cover worksites, restaurants, and bars are associated with a short-term relative reduction in smoking prevalence of 10% (5%-15%) compared with no SFALs. Based on the Task Force estimates of initiation and cessation effects, these effects increase to a long-term reduction of 12.5% (7%-19%) through continued increases in smoking cessation (including from reduced quantity smoked) and lower initiation rates. However, SFALs may have smaller effects if smoke-free policies are already prominent in private worksites or if there is low compliance with SFALs due to weak enforcement or a lack of antitobacco social norms.[30]

Comprehensive tobacco control programs

Comprehensive tobacco control programs are coordinated efforts that implement multiple population-level interventions to denormalize smoking, reduce secondhand smoke exposure, increase cessation, and prevent initiation. A recent study[31] found that a large percentage of the expenditures of US campaigns in 2011 are dedicated to community-based interventions (40%), MMCs (20%), providing cessation services (quit lines and low-cost pharmacotherapies; 20%), and surveillance and administration (20%).

The Task Force recently reviewed 61 studies (through August 2014) of comprehensive programs, with 56 evaluating programs directed at cigarette use. Comprehensive campaigns implemented over a median of 9 years were associated with an overall median decrease of 3.9 PP (−5.6 to −2.6 PP; 16 studies) in adult smoking prevalence, with US studies showing a median decrease of 2.8 PP (−3.5 to −2.4 PP; 12 studies). For US studies, this implies a 10% to 15% relative reduction in smoking prevalence assuming an initial 25% prevalence. Comprehensive campaigns implemented for a median of 8 years resulted in an overall median decrease of 4.6 PP (−8.4 to −1.1 PP; 10 studies) in prevalence of tobacco use among young people (<25 years of age, 14 studies). Several recent studies examine the impact of state tobacco control expenditures across states and over time. One study[32] over the time period of 1991 to 2006 found a 5% to 10% reduction in smoking rates for those states that shifted from unfunded tobacco control programs to funding at Centers for Disease Control and Prevention–recommended expenditure levels; another study[33] found 3% to 4% lower current and established smoking prevalence (ages 18-25 years), with a doubling of cumulative state tobacco control funding (from 14% to 28% of the Centers for Disease Control and Prevention–recommended level) between 2002 and 2009; and another study[34] found a 6% reduction in youth initiation with a doubling of program funding between 2002 and 2008.

Based on the recent Task Force review and recent studies, comprehensive tobacco control programs lead to an 8% (4%-12%) short-term relative reduction, increasing to a 12% (6%-18%) long-term relative reduction in smoking prevalence through the greater impact on youth smoking.

Mass-reach health communication interventions

Mass-reach health communication interventions target large audiences through television and radio broadcasts, print, digital media, and out-of-home placements (eg, billboards, point-of-sale). Messages are typically developed through formative testing and may aim to reduce smoking initiation among young people, increase cessation, or educate the public on the harms of tobacco use and secondhand smoke.[12]

The Task Force identified 70 studies (January 2000 to July 2012) evaluating MMCs, with 64 assessing television as the primary communication medium. Mass media campaigns reduced adult smoking prevalence by a median of 5.0 PP (−5.2 to −1.9 PP; 4 studies), implying a 20% drop with 25% initial prevalence. For young people through 24 years of age, they obtained a median decrease of 3.4 PP (−5.3 to −1.6 PP; 11 studies), a 14% relative drop (3.4/25). Mass media campaigns were associated with a 3.5 PP increase in cessation rates (2.0-5.0 PP; 12 studies), translating into a 14% relative increase (3.5 PP/25%). Studies also showed dose-responsiveness to MMC exposure.

Findings from the Task Force are broadly consistent with previous reviews,[11,12] although the quality of evidence has raised concerns.[35] Since these reviews were published, a New York MMC[36] was associated with a 13% relative reduction in smoking prevalence and 35% increase in quit attempts, and the Centers for Disease Control and Prevention's Tips campaign was associated with a 13% increase in quit attempts.[37–39] Other recent studies[40–43] also supported a dose-response relationship between MMC exposure and smoking prevalence.

Studies on MMC effectiveness indicate reductions in smoking prevalence of at least 10%, but research on comprehensive tobacco control programs, which often include such campaigns, suggests effect sizes of 10% or less. A high-intensity MMC is estimated to reduce smoking rates by 8% (4%-12%) in the short term, increasing to 10% (6%-14%) long term. The dose-response relationship suggests gains from increased exposure to media campaigns. The effects are also likely to depend on the focus of the campaign, premarket testing of messages, sustained exposure, and the use of multiple forms of media. With the rapid growth in the use of alternative media, campaigns through social media may be needed to reach youth.[44]

Health warnings

Health warnings on cigarette packages are designed to warn consumers about the risks of smoking. These warning labels vary in size (percentage of package covered), may rotate labels over time, and may be text only or pictorial (depicting health hazards with graphic photos).

Five reviews[12,45–48] consider pictorial warning labels (PWLs) and all but one[46] found consistent benefits in terms of smoking behaviors. Two long-term studies of the introduction of PWLs in Canada[49,50] attribute a 12% to 20% relative reduction in smoking over a 6- to 8-year period to PWLs. A meta-analysis of longitudinal studies[47] reported that PWLs were associated with a 13% relative reduction in adult smoking prevalence. Between one-fifth and two-thirds of youth in Canada, the United Kingdom, and Australia report that PWLs helped prevent them from initiating smoking.[45]

Based on the reviews and a recent analysis taking into account observed reductions in smoking prevalence relative to earlier changes in trends,[51] replacing small text warnings with large (at least 50% of pack) graphic warnings contribute to a 5% (2%-8%) short-term relative reduction in smoking prevalence and a 10% (5%-15%) long-term reduction through greater cessation and reduced initiation. Unless updated on a regular basis with new content, the effectiveness of graphic warning labels may wane over time as consumers become too accustomed to their appearance.[52–54] However, MMCs accompanying health warnings can have reinforcing effects.[55] Pictorial warning labels have been accompanied by plain packaging in some countries, although evidence of its effectiveness is more limited.[56–59]

Marketing bans

Tobacco marketing restrictions include bans on direct advertising, such as TV, radio, magazine, newspaper, billboard, and retail point-of-sale advertising, and bans on indirect marketing, such as free distribution of products, promotional discounts, the appearance of tobacco products in TV or films, sponsorship of sports and music occasions, and the distribution of nontobacco products identified with tobacco brand names. Evaluations have focused on direct advertising bans.

While marketing bans were not reviewed by the Task Force, 5 reviews[12,17,60–62] have considered advertising bans and all but one[60] found evidence for the effectiveness of comprehensive advertising bans. These reviews, however, note methodological limitations, including problems of causality, failure to control for other policies, and failure to indicate the extent of ban coverage. After controlling for price and other factors across a broad range of countries from 1990 to 2005, Blecher[63] found that comprehensive advertising bans reduced per capita consumption by 7% in relative terms, similar to an earlier study.[64] A recent update[12]

of this work obtained overall reductions of 12%, and, consistent with the original study, found much larger effects in low- to middle-income countries than in HICs. A study of 18 European countries[65] found that advertising bans were associated with higher quit ratios for highly educated groups. In addition, a comprehensive review[66] found that youth are particularly susceptible to advertising, suggesting that marketing restrictions have the potential to reduce smoking initiation over time. Two recent studies[67,68] found that awareness of tobacco advertising declines with increased restrictions.

Relying primarily on results from Blecher[12,63] regarding the effect of advertising bans on total consumption, and estimating that half of the reduction in per capita consumption is attributed to reduced prevalence,[16,17] a complete advertising ban (compared with no restrictions) reduces smoking prevalence by 4% (2%-6%) in the short term and 6% (3%-9%) in the long term. While evaluations of bans on indirect forms of marketing are limited, such bans may yield additional gains when coupled with direct advertising bans. Internet advertising, however, has become increasingly prevalent[69,70] and may offset some gains.

Cessation treatment policies

Cessation treatment policies aim to increase the use of evidence-based behavioral treatments and pharmacotherapies for smoking cessation. These policies may involve specific recommendations by a government agency or involve specific interventions fostered by a federal agency or a state or local health department or agency, and may include (1) requiring financial coverage of evidence-based cessation treatments, (2) providing state-run telephone-based quit lines, and (3) recommending health care provider interventions that encourage patients to quit. Their effect at a population level depends on treatment effectiveness, increases in treatment use, and changes in quit attempts and relapse.[71]

Governments may provide financial coverage of evidence-based smoking cessation treatments. The updated Task Force[1] (through July 2012; 13 studies) concluded that financial interventions that make evidence-based treatments (including medication, counseling, or both) more affordable increased quit rates among tobacco users at follow-up (>3.5 months) by 4.3 PP (0.2-6.0 PP; 12 studies) and quit attempt rates by 2.8 PP (−0.6 to 9.1 PP; 6 studies). A 2012 Cochrane Review[72] found that completely subsidized financial interventions directed at smokers increased abstinence with a relative risk (RR) of 2.45 (1.17-5.12 RR; 4 studies) and increased quit attempts (RR: 1.11) and treatment use (RR: nicotine replacement therapy 1.83; bupropion: 3.22; behavioral therapy: 1.77). With unassisted quit rates of 4% and quit attempt rates of 40%, the Cochrane Review results are roughly consistent with those of the Task Force. Applying the methodology in the study by Levy et al[73] with an initial 40% quit attempt rate, 60% relapse rate and that 50% of treatment use are new quit attempts, completely subsidized cessation treatment yields a 2.0% (0.75%-3.25%) short-term relative reduction in smoking prevalence increasing to 4% (2%-6%) long term.[73,74]

Telephone quit lines provide behavioral counseling and support to help smokers who want to quit. Based on a 2013 Cochrane review[75] (77 studies), the Task Force concluded that quit lines are effective. Using 49 studies comparing active with passive quit lines, they estimated that quit lines yield a median 3.1 PP (0.5-3.3 PP; 12 studies) increase in quitting and a 4.2 PP increase when promoted through mass-reach health communication interventions. Slightly higher estimates were suggested by West et al.[76] When quit lines offered free NRT or other pharmacotherapy, the Task Force found a 396% (134%-1132%; 9 studies) median increase in call volume and a 9.8 PP (7.4-15.7 PP; 11 studies) median absolute increase in cessation rates.

With an estimated 5% of smokers calling quit lines each year,[73] and 50% of calls as new quit attempts,[73] we estimate that active quit lines without NRT coverage yield a 0.75% (0.25%-1.25%) short-term relative reduction in smoking prevalence increasing to 1.5% (0.75%-2.25%) long term. For quit lines that provide NRT at no cost to the smoker, the impact is estimated as 3% (1%-5%) in the short term increasing to 6% (2%-10%) in the long term.

Government policies may recommend health care providers to ask patients about smoking, advise them to quit, and refer them to treatment alternatives. These interventions may range from brief one-time assessments to more extensive interventions involving patient follow-up with behavioral and/or prescribed pharmacotherapies.[77] West et al[76] estimated that brief interventions increase quit rates by 2 PP, mostly through increased quit attempts.[78] With 10% of smokers receiving extensive interventions each year, a 40% quit attempt rate and 60% relapse rate,[77] health care provider interventions reduce smoking prevalence by 1.6% (0.8%-2.4%) in the short term increasing to 3.2% (1.6%-4.8%) long term.

Applying the same analyses for each of the 3 types of cessation treatment interventions, comprehensive cessation treatment policies yield a 5.5% (2.75%-8.25%) short-term relative reduction in smoking prevalence, increasing to 11% (5.5%-18.75%) long term. A limitation of the studies, however, is that they

focus on the cessation intervention itself, rather than the impact of government policies on the intervention, for example, the ability to effectively recommend health care provider interventions. Nevertheless, the estimated impacts may fail to incorporate synergistic effects when implemented with other tobacco policies. Levy et al[79] provide evidence that comprehensive cessation treatment policies primarily affect quit success, while taxes and SFALs increase quit attempts, implying synergistic effects when cessation treatment interventions are combined with other policies.

Discussion

The policy effect sizes presented in the Table update the 2004 Tobacco Control Scorecard with findings from a rapidly accumulating evidence base over the past 15 years. The estimates of policy impact can be used to rank the relative effectiveness of different policies for HICs.

Raising cigarette taxes; implementing comprehensive SFALs; banning all tobacco advertising, promotions, and sponsorships; and funding comprehensive tobacco control programs, particularly those that include media campaigns, are highly effective strategies for reducing smoking prevalence. Cessation treatment policies and prominent graphic health warnings are likely to be especially effective in increasing quit success when combined with other policies that increase quit attempts. The Scorecard effect sizes are broadly consistent with recommendations previously issued by the Task Force[10] and those reported in the previous Scorecard analysis[2] but now reflect the larger evidence base evaluating the impact of health warnings and advertising bans.

While we have focused on the effects of implementing individual policies, the impact of a new intervention depends on the existing tobacco control environment and on whether any other policies are simultaneously implemented. Interventions implemented in settings with strong existing tobacco control legislation and strong antitobacco social norms may yield smaller gains than those implemented in settings that have limited or no existing tobacco policies. For this reason, simultaneously implemented policies may have overlapping effects. To estimate the combined effect of implementing more than 1 policy intervention, we recommend applying effect sizes as constant relative reductions, that is, for policy i and j with effect sizes PR_i and PR_j, $(1 - PR_i) \times (1 - PR_j)$ would be applied to the current smoking prevalence. This formulation confines the resulting smoking prevalence to positive levels and also implies slightly smaller absolute reductions for each policy when implemented in combination with other policies than if implemented alone. Because of limited evidence about the nature and extent of tobacco policy interactions, wider credible ranges should be applied to the effect sizes of combined policies.

Implications for Policy & Practice

- The literature on policy effect sizes for tobacco control policies has increased substantially in the last 15 years, providing a stronger base for justifying specific policies.
- Raising cigarette taxes, implementing smoke-free air laws, comprehensive marketing bans, media campaigns, cessation treatment policies, and graphic health warnings each have important roles in reducing smoking prevalence in HICs. Large increases in cigarette taxes relative to initial prices continue to be the most potent policy.
- Studies of supply-oriented policies, such as regulating the content of tobacco products, are needed.

Previous simulation modeling and empirical studies that evaluate the impact of combined tobacco control policies have obtained results consistent with the constant relative reduction formulation. The SimSmoke tobacco control policy simulation model has applied effect sizes similar to those suggested previously with a constant relative reduction assumption in several US states[80–82] and in HICs such as Ireland[83] and the United Kingdom.[84]

The Tobacco Control Scorecard reports policy effect sizes directed at cigarette-smoking prevalence. However, policies directed at noncigarette nicotine delivery products, such as smokeless tobacco, water pipe, and e-cigarettes, may influence the effectiveness of cigarette-oriented policies. Policies directed at reducing the use of alternative nicotine delivery products could discourage smoking by promoting stronger antitobacco norms, or they could dissuade smokers from substituting their cigarettes for other products and thereby encourage continued smoking.[85]

The effect sizes for demand reduction policies indicate the potential for substantial reductions in smoking prevalence, as much as 60%.[6,86] Nevertheless, there may be an upper limit to the combined impact of demand reduction policies, beyond which the reduction to smoking prevalence could be minimal. Efforts that restrict the supply of cigarettes, such as policies that address smuggling, raising and enforcing minimum purchase age laws, limiting the number and location of retailers (eg, through licensing), or regulating the content (eg, levels of nicotine, toxic constituents, or flavors) of tobacco products, may be needed to dramatically reduce population smoking.[12] Such supply-oriented approaches, when coupled with

comprehensive demand reduction policies, may ultimately be necessary for countries to reach "tobacco endgame" goals.[87,88]

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