Drug and Alcohol Review (November 2006), 25, 597 – 609

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Reducing the burden of smoking world-wide: effectiveness of interventions and their coverage

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Abstract

Cigarette smoking and other tobacco use imposes a huge and growing public health burden globally. Currently, approximately 5 million people are killed annually by tobacco use; by 2030, estimates based on current trends indicate that this number will increase to 10 million, with 70% of deaths occurring in low- and middle-income countries. Numerous studies from high-income countries, and a growing number from low- and middle-income countries, provide strong evidence that tobacco tax increases, dissemination of information about health risks from smoking, restrictions on smoking in public places and in work-places, comprehensive bans on advertising and promotion and increased access to cessation therapies are all effective in reducing tobacco use and its consequences. Despite this evidence, tobacco control policies have been unevenly applied—due partly to political constraints. This paper provides a summary of these issues, beginning with an overview of trends in global tobacco use and its consequences and followed by a review of the evidence on the effectiveness of tobacco control policies in reducing tobacco use. A description of the types and comprehensiveness of policies currently in place and a discussion of some of the factors correlated with the strength and comprehensive of these policies follows. [Jha P, Chaloupka FJ, Corrao M, Jacob B. Reducing the burden of smoking world-wide: effectiveness of interventions and their coverage. *Drug Alcohol Rev* 2006;25:597 – 609]

Key words: cigarette smoking, tobacco, tobacco policy.

Introduction

Cigarette smoking and other tobacco use is currently estimated to kill approximately 5 million people world-wide annually, accounting for one in every 10 adult deaths. By 2030, estimates indicate that this number will increase to 10 million, or one of every six adult deaths. Given current trends, about 500 million people alive today will die prematurely as a result of tobacco use, with 1 billion deaths from tobacco expected during this century [1].

Given the public health toll from tobacco use, governments have a strong incentive for intervening to reduce tobacco use. However, many governments have resisted taking strong action because of concerns that effective interventions would have harmful economic consequences. Recent efforts by the World Bank, in partnership with the World Health Organization (WHO), have addressed these concerns. A team of over 40 economists, epidemiologists and other tobacco control experts examined the state of the knowledge about tobacco use and tobacco control strategies. A summary of this work was published in 1999 [2], and the background papers contributing to this work were published in 2000 [3,4] and recently updated in 2006 [5].

This paper reviews and updates the findings from these efforts. The paper begins with an overview of trends in global tobacco use and its consequences, followed by a review of the evidence for the effectiveness of tobacco control policies. A description of the types and comprehensiveness of policies currently in place and a discussion of some of the factors correlated with the strength and comprehensive of these policies follows. Finally, the constraints against implementing

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Received 16 May 2006; accepted for publication 30 June 2006.

ISSN 0959-5236 print/ISSN 1465-3362 online/06/060597–13 © Australasian Professional Society on Alcohol and Other Drugs
DOI: 10.1080/09595230600944511

tobacco control policies and global efforts to overcome these constraints are discussed.

Tobacco use and its consequences

Estimates indicate that over 1.1 billion people smoked world-wide in 2000, with about 82% of the world's smokers residing in low- and middle-income countries (Table 1). Smoking prevalence is highest in the European/Central Asia region, where overall prevalence is 35%. Over one-third of all smokers reside in the East Asia/Pacific region, with the vast majority of these in China. As Table 1 indicates, smoking prevalence is significantly higher among men in low- and middle-income countries, with the difference between smoking prevalence among men and women being smaller in high-income countries [6].

As a result of early information linking smoking to health consequences, smoking prevalence has been declining for the past two decades in most high-income countries, most clearly in men. Smoking continues to increase, however, in many low- and middle-income countries. Increasing incomes have contributed to the increases in smoking, as has increased trade liberalisation [7].

The impact of smoking on health has been documented extensively elsewhere [8–10]. Estimates for 2001 indicate that about 5 million people died from tobacco-attributable diseases [9]. Data from numerous studies in high-income countries, where the consequences of tobacco use are well established, and several studies in low and middle-income countries suggest that about half of all long-term regular smokers are killed by their addiction. Half of these deaths occur during productive middle age (35–69 years old) [10]. Currently, about half of all tobacco-related deaths occur in high-income countries, while the others occur in low- and middle-income countries. Given the recent trends in smoking and the lags between smoking and disease onset, approximately 70% of the 10 million tobacco-attributable deaths expected in 2030 will take place in low- and middle-income countries.

Smoking is more common among poor men than among rich men in nearly all countries. In developed countries, smoking accounts for much of the mortality gap between the rich and poor. Estimates from Canada, England and Wales, Poland and the United States, for example, suggest that eliminating smoking-attributable differences in mortality would approximately halve the socio-economic disparity in mortality between men in these countries [11]. For women, who have generally been smoking in large numbers for a shorter period, the relationship between smoking, smoking-attributable mortality, and socio-economic status is more variable.

Interventions to reduce smoking

In addition to the public health burden caused by tobacco, there are several economic rationales for government interventions to reduce tobacco use. First, consumers have inadequate information about the health consequences of tobacco use and a poor understanding of the addictive nature of tobacco products [12–17]. General awareness of the health risks from smoking is relatively low in low- and middle-income countries. While general awareness of risks is higher in high-income countries, many still underestimate tobacco's danger relative to other health risks, and many smokers fail to fully internalise these risks. Similarly, the addictive nature of tobacco is under-appreciated. In the United States, for example, less than two of five teens who are smoking as high school seniors and who believe they will quit within 5 years actually succeed in doing so.

In addition to preventing children from adopting a tobacco habit, comprehensive approaches to promote smoking cessation are critical to near-term

Table 1. *Estimated smoking prevalence (by gender) and number of smokers, 15 years of age and over, by World Bank Region, 2000*

World Bank Region	Smoking prevalence			Total smokers	
	Males	Females	Overall	(millions)	(% of all smokers)
East Asia and Pacific	63%	5%	34%	429	38
Europe and Central Asia	56%	17%	35%	122	11
Latin America and Caribbean	40%	24%	32%	98	9
Middle East and North Africa	36%	5%	21%	37	3
South Asia	32%	6%	20%	178	15
Sub-Saharan Africa	29%	8%	18%	56	6
Low and middle income	49%	8%	29%	920	82
High income	37%	21%	29%	202	18

Note: Country economies are divided according to World Bank income regions [56].
Source: Reference 5.

improvements in public health. As illustrated by Fig. 1, a mix of tobacco control policies that is effective *only* in reducing smoking initiation would have little impact on smoking-attributable deaths during the first half of the 21st century. The vast majority of tobacco-attributed deaths over the next 50 years will occur among current smokers [1]. In contrast, a set of policies that was effective in significantly reducing tobacco use in all segments of the population (current and never-smokers) would generate substantial reductions in the public health toll caused by tobacco.

Demand side interventions

Numerous studies, mostly from high-income countries, have examined the impact of interventions aimed at reducing the demand for tobacco products on smoking and other tobacco use. The small but growing number of studies from low- and middle-income countries provides useful lessons about differences in the impact of these interventions between high-income countries and low- and middle-income countries.

Tobacco taxation. Nearly all governments tax tobacco products. Some of these taxes are specific, or per unit, taxes, while others are expressed as a percentage of wholesale or retail prices (*ad valorem* taxes). Historically, these taxes have been primarily used to generate revenues. In recent years, however, a growing number of governments have increased tobacco taxes to promote public health, earmarking some of the new revenues generated from the higher taxes for comprehensive programs to reduce tobacco use and/or implement other health-related programmes.

There are significant differences across countries in the level of tobacco taxes. As illustrated by Fig. 2, taxes tend to be absolutely higher and to account for a greater share of price (two-thirds or more) in high-income countries. In low- and middle-income countries, taxes are generally much lower, and they account for less than half of the price of cigarettes.

Well over 100 studies from high-income countries demonstrate clearly that increases in cigarette and other tobacco product taxes lead to significant reductions in cigarette smoking and other tobacco use. These studies confirm the most fundamental law of economics that states that as the price of a product increases, the demand for that product falls. The reductions in tobacco use that result from higher taxes and prices reflect the combination of increased smoking cessation, reduced relapse, lower smoking initiation and decreased consumption among continuing tobacco users. Economists use the term 'price elasticity' of demand to reflect the impact of price changes on consumption, where the elasticity is defined as the percentage change in the quantity consumed resulting from a 1% increase in price.

Studies from the United States, United Kingdom, Canada and many other high-income countries generally estimate that the price elasticity of cigarette demand ranges from -0.25 to -0.50, indicating that a 10% increase in cigarette prices will reduce overall cigarette smoking by 2.5 to 5.0% [18,19]. These studies apply a variety of econometric and other statistical

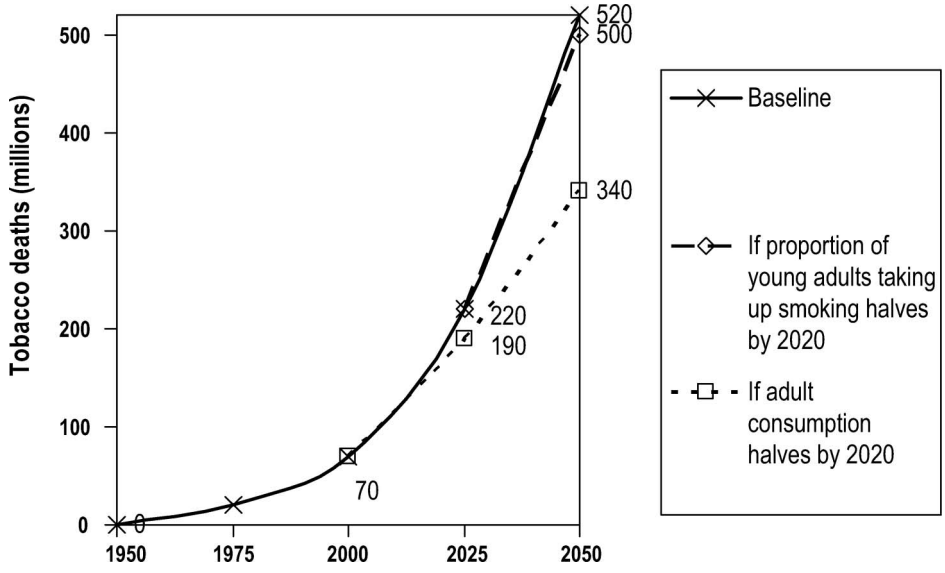

Figure 1. *Unless current smokers quit, tobacco deaths will rise dramatically in the next 50 years. Sources: References 1 and 4. Note: Peto and others estimate 60 million tobacco deaths between 1950 and 2000 in developed countries. We estimate an additional 10 million between 1990 and 2000 in developing countries. We assume no tobacco deaths before 1990 in developing countries and minimal tobacco deaths world-wide before 1950. Projections for deaths from 2000 to 2050 are based on Peto & Lopez, 2001.*

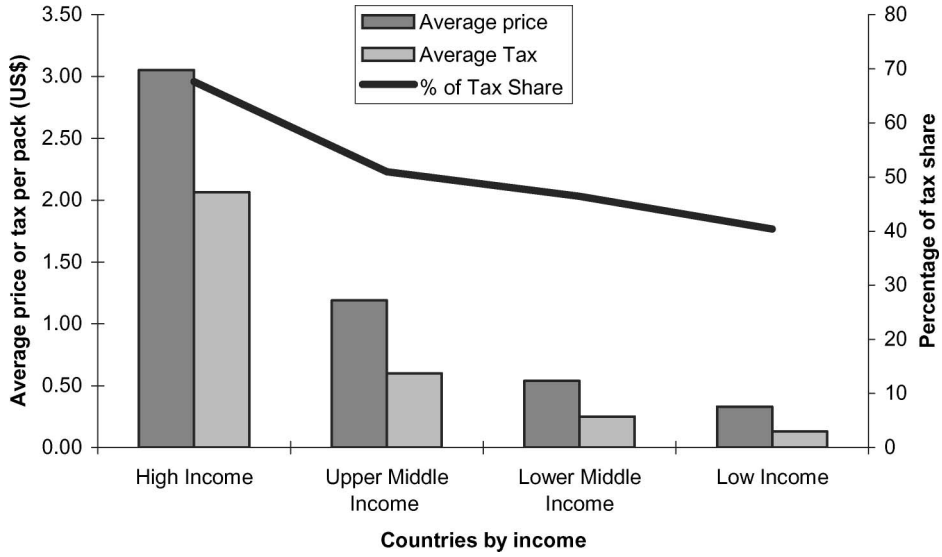

Figure 2. *Average cigarette price, tax, and percentage of tax share per pack, by income group, 1996. Source: World Bank; and authors' calculations.*

methods to aggregated time-series and pooled cross-sectional time–series data, as well as to individual-level survey data. Recent studies using survey data have concluded that half or more of the effect of price on overall cigarette demand results from reducing the number of smokers [20,21].

Several studies over the past decade have examined the relationship between addiction and cigarette demand [22,23]. Economic theories of addiction predict that the long-term impact of a permanent change in the price of an addictive substance will exceed the short-term impact, given that addicted consumers will change their behavior slowly, over time [24,25]. The empirical applications of these theories generally estimate long-term price elasticities that are approximately twice those estimated for the short term, with the long-term estimates centred on -0.8 (26).

Many recent studies from the United States have used individual-level data to explore differences in the price elasticity of cigarette demand by age, with a particular emphasis on youth and young adults [17–19]. Given that most smoking behaviour begins and becomes firmly established during teenage years and young adulthood, interventions that are effective in preventing smoking initiation and the transition to regular, addicted smoking will have significant long-term public health benefits. Estimates from these recent studies conclude that there is an inverse relationship between price elasticity and age, with estimates for youth price elasticity of demand up to three times those obtained for adults [26–28]. Several recent studies have begun to explore the differential impact of cigarette prices on youth smoking uptake, concluding that higher cigarette prices are particularly effective in preventing young smokers from moving beyond experimentation into regular, addicted smoking [29–32].

Similarly, several studies have explored differences in the price sensitivity of cigarette demand by income, education and/or socio-economic status [18–20]. Economic theory predicts that individuals with lower incomes and/or less education will be more responsive to price. The studies demonstrate how less educated people [23], lower-income individuals [21] and people in lower socio-economic classes [33] show greater reductions in smoking in response to price increases than people who are more educated, have higher income levels and are in higher socio-economic classes.

The finding that price responsiveness is higher among lower-income individuals is supported by new literature on the demand for tobacco products in low- and middle-income countries [18]. In general, estimates of price elasticity for low- and middle-income countries are about double those estimated for high-income countries, implying that significant increases in tobacco taxes in these countries would be very effective in reducing tobacco use.

In summary, the empirical evidence indicates that increases in tobacco taxes reduce tobacco use by preventing initiation (and subsequent addiction) among youth, increasing the likelihood of cessation among current users, reducing relapse among former users and reducing consumption among continuing users. The reductions in tobacco use that result from higher tobacco taxes will lead to substantial improvements in public health.

Restrictions on smoking. Over the past three decades, as information about the health consequences of exposure

to passive smoking has increased, many governments, especially in high-income countries, have enacted legislation restricting smoking in a variety of public places and private work-sites. In addition, increased awareness of the consequences of passive smoking exposure, particularly among children, has led many work-places and households to adopt voluntary restrictions on smoking. While the intent of these restrictions is to reduce non-smokers' exposure to environmental tobacco smoke, the policies also reduce smokers' opportunities to smoke. In turn, these smoke-free indoor air policies can also lead to reductions in cigarette smoking prevalence. Additional reductions in smoking, especially among youth, will result from the changes in social norms that are reflected by adopting these policies [17].

Comprehensive restrictions on cigarette smoking do lead to significant reductions in cigarette smoking [19,20,34,35]. As with higher taxes, these restrictions reduce both the prevalence of smoking and cigarette consumption among smokers. For instance, one recent study based on survey data found that work-place smoking bans reduced smoking prevalence among adults by 5%, while it reduced cigarette consumption among continuing smokers by 10% [36]. The no-smoking policies were most effective when strong social norms against smoking helped to make smoking restrictions self-enforcing [37].

Health information and counter advertising. The 1962 report by the British Royal College of Physicians and the 1964 Surgeon General's Report were landmark events in tobacco control in high-income countries. These publications represented the first widespread press coverage of the scientific links between smoking and lung cancer. The reports were followed, in many countries, by policies requiring health warning labels on tobacco product packaging that were later extended to tobacco advertising.

Research from high-income countries indicates that these initial reports and the publicity that followed about the health consequences of smoking led to significant reductions in cigarette smoking, with initial declines between 4 and 9%, and longer-term cumulative declines of 15–30% [14,38]. Efforts to disseminate information about the risks of smoking and other tobacco use in low- and middle-income countries have led to similar declines in tobacco use in these countries [15]. In addition, mass media anti-smoking campaigns, funded in many cases by earmarked tobacco taxes, have generated reductions in cigarette smoking and other tobacco use [15,39]. The continuing accumulation of evidence about the harmful effects of tobacco use and inadequate understanding of these risks among members of the public, particularly in the lowest-income countries, implies, however, that there is still much to be done in terms of health education.

Bans on advertising and promotion. Cigarettes are one of the most heavily advertised and promoted products in the world. In 2001, for example, cigarette companies spent $11.2 billion on advertising and promotion in the United States, the highest spending level reported to date [40]. Tobacco advertising efforts world-wide include traditional forms of advertising on television, radio and billboards, in magazines and newspapers, as well as favourable product placement, price-related promotions such as coupons and multi-pack discounts and sponsorship.

Numerous econometric studies, mostly from the United States and the United Kingdom, have explored the relationship between cigarette advertising and promotional expenditure and cigarette demand. In general, these studies have produced mixed findings, with most studies concluding that advertising has, at most, a small positive impact on demand [18,38]. However, critics of these studies note that econometric methods, which estimate the impact of a marginal change in advertising expenditures on smoking, are ill suited for studying the impact of advertising [18,38,40]. Approaches employed by other disciplines, including survey research and experiments that assess reactions to and recall of cigarette advertising, do support the hypothesis that increases in cigarette advertising and promotion directly and indirectly increase cigarette demand [17,42]. These studies conclude that cigarette advertising is effective in getting and retaining children's attention, with the strength of these associations strongly correlated with current smoking behaviour, smoking initiation and smoking intentions.

Several researchers have hypothesised that studying the impact of advertising and promotion bans on cigarette smoking would provide more direct evidence on the impact of advertising [19,39]. One recent study using data from 22 high-income countries, for the period from 1970 to 1992, provides strong evidence that comprehensive bans on cigarette advertising and promotion lead to significant reductions in cigarette smoking. The study predicted that a comprehensive set of tobacco advertising bans in high-income countries could reduce tobacco consumption by over 6% [41]. However, the study concludes that partial bans have little impact on smoking behaviour, given that tobacco industry can shift its resources from the banned media to those that are not banned.

Smoking cessation treatments. Near term reductions in smoking-related mortality depend heavily on smoking cessation. There are numerous behavioural smoking cessation treatments available, including self-help manuals, community-based programmes and minimal and intensive clinical interventions [20]. In addition, pharmacological treatments, including nicotine replacement therapies (NRT) and bupropion, have become much more widely available in recent years in high-income countries [20,41]. Current research provides mixed

evidence on the impact of behavioral therapies on successful smoking cessation. However, the evidence is strong and consistent that pharmacological treatments significantly improve the likelihood of quitting, with success rates two times those when pharmaceutical treatments are not employed [20,43,44].

While successful in treating nicotine addiction, the markets for NRT and other pharmacological therapies are highly regulated. In turn, pharmaceutical treatments are less affordable and less available than nicotine-containing tobacco products that are distributed in a relatively unrelated market. Recent evidence indicates that the demand for these products is related to economic factors, including their price [45]. Policies that decrease the cost of NRT and increase their availability, such as mandating private health insurance coverage of NRT, including NRT coverage in public health insurance programmes and subsidising NRT for uninsured or underinsured individuals, would probably lead to substantial increases in the use of these products.

Effectiveness of demand side interventions

As described above, demand side interventions, including tax and price increases, restrictions on smoking, bans on advertising and promotion, dissemination of information on the health consequences of tobacco use and improved access to cessation therapies, are highly effective in reducing the demand for tobacco products. Given the health risks from tobacco use, widespread adoption of these interventions would generate substantial reductions in the public health toll from tobacco.

Based on the existing evidence, Table 2 summarises findings from a recently updated simulation model that estimates the global impact of alternative policies aimed at reducing the demand for tobacco [5,46]. The policies considered are tax increases that would raise the price of cigarettes globally by 70%, a comprehensive set of non-price measures (including information campaigns, comprehensive advertising and promotion bans and strong restrictions on smoking in public places), and increased use of NRT (as a result of policies that lowered price and increased availability of these therapies). Nevertheless, the simulations indicate that substantial reductions in tobacco use and its consequences would result from the various policy changes. The 70% price increase, for example, would reduce expected smoking-attributable deaths among current smokers globally by an estimated 46–114 million. Similar large reductions in the numbers of smokers and smoking-attributable deaths would result from the other policy measures considered in the model (more details are in cited elsewhere [5]). Finally, this analysis concludes that these interventions are highly cost-effective, particularly for low- and middle-income countries, when compared to other public health interventions.

Supply side interventions

In contrast to the effectiveness of demand side interventions, there is much less evidence that interventions aimed at reducing the supply of tobacco products are effective in reducing cigarette smoking [2]. The US experience provides mixed evidence about the effectiveness of limiting youth access to tobacco

Table 2. *Potential impact of price increases of 10%, 70%, increased NRT use and a package of non-price measures*

		Change in number of deaths (millions)					
		70% price increase		NRT with effectiveness of:		Non-price interventions with effectiveness of	
Region	Smoking-attributable deaths (millions)	Low elasticity*	High elasticity*	1%	5%	2%	10%
Low-income and middle-income	362	−41.7 (−11.5)	−98.2 (−27.1)	2.9 (0.8)	14.3 (4.0)	5.7 (1.6)	28.6 (7.9)
High-income	81	−4.5 (−5.6)	−16.2 (−20.0)	0.6 (0.8)	3.1 (3.8)	1.2 (1.5)	6.1 (7.6)
World	443	−46.2 (−10.4)	−114.3 (−25.8)	3.5 (0.8)	17.4 (3.9)	6.9 (1.6)	34.7 (7.8)

*Low elasticity is −0.2 for high-income regions and −0.4 for low-income and middle-income regions. High elasticity is −0.8 for high-income regions and −1.2 for low-income and middle-income regions.
Source: Reference 5.

products in reducing youth tobacco use [20,34]. In addition, the effective implementation and enforcement of these policies may require infrastructure and resources that do not exist in many low- and middle-income countries. Crop substitution and diversification programmes are often proposed a as means to reduce the supply of tobacco. However, there is little evidence that these programmes reduce supply significantly, given that the incentives for tobacco-growing attract new farmers who replace those who do move out of tobacco farming [47]. Similarly, direct prohibition of tobacco is not likely to be politically feasible, effective or economically optimal [2]. Similarly, while trade liberalisation has contributed to increases in tobacco use, particularly in low- and middle-income countries, restrictions on trade in tobacco and tobacco products that violate international trade agreements and/or draw retaliatory measures may be more harmful. More effective means of deterring tobacco use and improving public health would be strong measures to reduce the demand for tobacco products, such as tax increases and advertising bans that are applied equally to both domestic and imported products [6].

The key intervention on the supply side is the control of smuggling. Recent estimates suggest that 6–8% of cigarettes consumed globally are smuggled [48]. While differences in taxes and prices across countries suggest a motive for smuggling, a recent analysis comparing the degree of corruption in individual countries with price and tax levels finds that corruption within countries is a stronger predictor of smuggling than price [48]. Several governments are adopting policies aimed at controlling smuggling. Effective measures include prominent tax stamps and warning labels in local languages, better methods for tracking cigarettes through the distribution chain, aggressive enforcement of anti-smuggling laws and stronger penalties for those caught violating these laws [49].

Comprehensive programmes to reduce tobacco use

In recent years, several governments, mostly in high-income countries, have adopted comprehensive programmes to reduce tobacco use, often funded by earmarked tobacco tax revenues. These programmes generally have consistent goals for reducing tobacco use, including: preventing initiation among youth and young adults; promoting cessation among all smokers; reducing exposure to environmental tobacco smoke; and identifying and eliminating disparities among population subgroups [20]. In general, these programmes have one or more of four key components: national and community interventions, counter-marketing campaigns, policy and regulation and surveillance and evaluation [20]. Programmes have placed differing emphasis on these four components, with substantial diversity among the types of activities supported within each component. Recent analyses from the United States and United Kingdom indicate clearly that these comprehensive efforts have been successful in reducing tobacco use and in improving public health [20,50–52].

Clearly, more significant decreases in the proportion of smokers among men *and* women could be achieved by implementing comprehensive tobacco control programmes that discourage young people from initiating smoking habits. The extent to which comprehensive programmes can prevent young people from becoming persistent smokers today will affect mortality rates in the middle or second half of the 21st century [4,11]. Mortality rates in the near future and throughout the first half of the century, however, could be reduced by aiding current smokers in quitting the habit. A recent study from the United Kingdom found that smoking cessation before middle age avoids more that 90% of the lung cancer mortality risk attributable to tobacco [53].

Coverage of effective tobacco control policies

While there is substantial evidence concerning the effectiveness of numerous policy interventions to reduce tobacco use, the use of these interventions globally is uneven and limited. This section reviews the use of tobacco control policies globally and provides some evidence on the factors related to the extensiveness (or lack thereof) of the policies that governments have adopted.

Methods

Legislative data were abstracted from the Tobacco Control Country Profiles database, which divides national tobacco provisions into six categories: prohibitions and restrictions on advertising and sponsorship, health promotion and education efforts against tobacco, sales and distribution requirements, tobacco product regulations, smoke-free indoor air restrictions and other provisions to include the formation of a national or territorial committee on tobacco control [54].

A coding scale was developed to evaluate empirically the content of the laws, regulations and their summaries, based loosely on the Assessment of the Comprehensiveness of Tobacco Laws Scale (ACT-L Scale) [55]. As it was intended originally to evaluate subnational and local laws, the ACT-L scale was modified to contend with variation among nationally legislated provisions. The scale consists of 34 items representing the content of a maximally comprehensive tobacco control policy, in addition to the progressive steps toward a model tobacco control policy. With the exception of nine summary items, each scale item is

scored 1 (present in the legislation or regulation) or 0 (absent in the legislation or regulation). Summary items are valued at one point greater than the sum of their sub-items. For instance, a complete ban on the use of registered brand names of tobacco products, trademarks or logos in all media is given a value of 6 points, one point greater than the sum of its component prohibitions on advertising via television, radio, billboards, cinema and print. There were two outliers in the general coding scheme. In the environmental tobacco smoke sub-scale, prohibition on tobacco use in all enclosed public places, except in designated areas, is given a score of 3 points. In the access sub-scale, banning the sale of tobacco products outside of a specialty shop is given a score of 4 points, the same value received if each of its four components are present (bans on tobacco sales within a specified distance of schools, in pharmacies, in government buildings and in hospitals).

The content of the scale items were as follows: 10 focus on interventions against passive smoking, 8 focus on advertising and promotion, 9 focus on reducing access to tobacco products (especially among minor children), 5 focus on tobacco packaging and product regulation and 2 focus on tobacco taxes. The total legislative score indicates the comprehensiveness of the national provisions. The legislative data set was coded on two independent occasions by the same rater; countries with variability in the two scores were examined and coded again to resolve the discrepancy.

Results

For each country, a total score and scores on each of the five sub-scales were computed. Countries for which no legislative information was available were excluded from the analysis. As shown in Table 3, the total score, across all countries, ranged from 1 to 36 (mean 12.3, standard deviation 7.7) of a possible 64 points when the tax sub-scale is included in the analysis. When the tax scale is excluded from the analysis, the total score, across all countries, ranged from 1 to 33 (mean 11.9, standard deviation 7.5) of a possible 57 points. The tax scale is excluded from some analysis because data on tax as a percentage of cigarette prices are available for only 30 of the 133 countries with legislative profiles.

Countries were divided according to the income group number assigned by the World Bank (56); lowest-income countries belong to income group 1, middle-income countries belong to group 2, and upper–middle-income countries belong to group 3. Tables 4 and 5 describe the mean scores of each income group in relation to one another, with and without the tax sub-scale. Table 6 presents comparable information for the subset of countries with data on tax as a percent of price.

Table 3. *Tobacco control legislation sub-scale scores*

Category	*n*	Highest possible score	Mean	Standard deviation	Score range
Passive smoking	133	20	5.2	3.1	0–12
Advertising	133	16	3.5	3.1	0–13
Reducing	133	13	0.9	1.4	0–6
Product regs	133	8	2.2	2.1	0–8
Tax	30	7	1.7	2.3	0–7

Source: Authors.

The upper–middle-income group had significantly higher total legislative scores than the low- and middle-income groups, suggesting a relationship between the comprehensiveness of tobacco control policies and income level. This difference persisted in analyses of total scores with and without the tax sub-scale. Furthermore, there is a positive correlation between GDP per capita, PPP (current international $) (PPP) and total legislative score (correlation 0.43). When the 30 countries with tax as a percentage of price data were examined alone; however, no significant difference was found in tax sub-scale scores between income groups.

Discussion

The existence of tobacco control provisions in national laws, regulations and ministerial orders are only one measure of a country's commitment to tobacco control at the policy level. Furthermore, the presence of a tobacco control provision in legislation, regulations or ministerial orders does not mean that the measure is enforced to the full extent of the law. Conversely, the absence of provisions from the sources reviewed by the Tobacco Control Country Profiles does not necessarily mean that tobacco control provisions do not exist in a particular country and are not enforced. The greatest limitation of this analysis lies in the completeness of legislative data available for most countries. As more full-text laws and regulations become available, more sensitive analysis will be possible and should be pursued.

The wide variation observed between total and sub-scale scores within and between income groups cannot explained by variance in income level alone. The variability in total scores (without the tax sub-scale) is shown in Figures 3–5. The legislative coding scheme does not account for tobacco industry (multinational) influence in each country, countries' reliance on tobacco agriculture or manufacturing, and related factors that could either impede or encourage the development of tobacco control policy at a national level.

In an analysis of the relationship between tobacco agriculture employment as a percentage of total labour

Table 4. *Mean legislative scores by income group designation without tax sub-scale*

Income group	*n*	Passive smoking	Advertising and promotion	Youth access	Product regulation	Total score
Low	51	3.9	3.18	0.29	1.33	8.71
Middle	52	5.96	3.73	1.15	2.58	13.42
Upper – middle	30	6.3	3.7	1.53	3.17	14.7

Source: Authors.

Table 5. *Mean legislative scores by world bank income group designation with tax sub-scale*

Income group	*n*	ETS	Advertising and promotion	Youth access	Product regulation	Tax as a percentage of price*	Total score
Low	51	3.9	3.18	0.29	2.0	1.33	9.1
Middle	52	5.96	3.73	1.15	1.33	2.58	13.65
Upper – middle	30	6.3	3.7	1.53	1.73	3.17	15.33

**Note*: Tax as a percentage of price available for 10 income group 1 countries, 9 income group 2 countries, and 11 income group 3 countries.
Source: Authors.

Table 6. *Mean legislative scores of only countries with tax data by World Bank income group designation*

Income group	*n*	ETS	Advertising and promotion	Youth access	Product regulation	Tax as a percentage of price	Total score
Low	10	5.4	4.4	1	2.5	2	15.3
Middle	9	5.89	3.67	1.67	3	1.33	15.56
Upper – middle	11	7.45	5.45	2.36	4.54	1.73	21.54

Source: Authors.

force and total legislative score, there was almost no correlation between the two variables (−0.025). Furthermore, there exist many different indicators of governance (such as rule of law, government effectiveness and graft) that could influence government priorities and policy decisions. Correlations between some of these indicators (voice and accountability, political stability, government effectiveness, regulatory framework, rule of law and control of corruption) yielded weak positive associations between governance indicators and total legislative score (ranging from 0.23 to 0.36). Clearly, there is need to examine each of these factors as they relate to tobacco control policy on a country-by-country basis.

Constraints against implementing effective tobacco control policies

Why is there so much variation in tobacco control policies? The political economy of tobacco control has been under-studied. We outline a few plausible areas of interest. First, it is plausible that governments and public health agencies simply do not know which tobacco control polices are the most effective. There is some evidence that improved national capacity and local needs assessment could increase the likelihood that tobacco control measures will be adopted. For example, academic analyses in South Africa geared to local policy needs increased substantially the willingness of South Africa to implement control policies [57].

Secondly, the cost of implementing control programmes appears not to be a major factor [5]. Current estimates of the costs of implementing a comprehensive tobacco control programme range from $2.50 to $10 per capita in the United States, while the Centers for Disease Control and Prevention recommends spending $6 – 16 per capita in high-income countries for a comprehensive tobacco control programme in the United States [58]. Canadian spending on tobacco control programmes was approximately $1.65 per capita in 1996 [59]. At the highest recommending

Table 7. *Estimated impact of a 10% increase in cigarette taxes on cigarette consumption and cigarette tax revenues, selected countries*

Country	% Change in cigarette consumption	% Change in cigarette tax revenues
Lower middle		
Belize	−2.24	7.54
Bolivia	−4.88	4.63
Bulgaria	03.33	6.33
Colombia	−3.60	6.04
Costa Rica	−6.00	3.40
Dominican Rep.	−1.07	8.82
Egypt	−4.56	4.98
El Salvador	−3.40	6.26
Estonia	−5.60	3.84
Jamaica	−3.36	6.30
Moldova	−1.49	8.36
Panama	−4.80	4.72
Paraguay	−0.80	9.12
Philippines	−5.06	4.44
Slovak Rep.	−2.76	6.97
Thailand	−4.96	4.54
Turkey	−3.36	6.30
Low income		
Albania	−5.60	3.84
Armenia	−4.00	5.60
Bangladesh	−2.40	7.36
Cambodia	−1.60	8.24
China	−3.23	6.45
Honduras	−0.80	9.12
India	−6.00	3.40
Indonesia	−2.40	7.36
Nepal	−5.86	3.56
Pakistan	−5.84	3.58
Sri Lanka	−1.91	7.90
Vietnam	−2.88	6.83
Zambia	−2.40	7.36
Zimbabwe	−6.40	2.96
High income		
Australia	−2.60	7.14
Austria	2.92	6.79
Belgium	−3.00	6.70
Canada	−2.05	7.74
Denmark	−3.36	6.30
Finland	−2.92	6.79
France	−3.00	6.70
Germany	−2.88	6.83
Ireland	−3.00	6.70
Italy	−2.92	6.79
Japan	−2.40	7.36
Korea, Republic	−2.40	7.36
Netherlands	−2.88	6.83
New Zealand	−2.72	7.01
Norway	−3.12	6.57
Portugal	−3.24	6.44
Singapore	−2.92	6.79
Spain	−2.88	6.83
Sweden	−2.76	6.96
Switzerland	−2.08	7.71
Taiwan	−0.15	9.84
United Kingdom	−3.12	6.57
United States	−1.20	8.68
Upper middle		
Argentina	−5.60	3.84
Brazil	−6.00	3.40
Chile	−5.60	3.84
Czech Republic	−0.01	9.99
Greece	−2.92	6.79
Hungary	−3.39	6.27
Malaysia	−2.67	7.06
Mexico	−4.83	4.69
Slovenia	−5.04	4.46
South Africa	−2.66	7.07
Uruguay	−4.80	4.72
Poland	−3.14	6.55

Source: Reference 62.

spending level ($16) in the United States, annual funding for a comprehensive tobacco programme would equal only 0.9% of US public spending, per capita, on health. For low- and middle-income countries, the World Bank estimates that an 'essential package of public interventions' that includes tobacco as one of its components would cost between $4 and $7 per capita [60]. In contrast, global funding for tobacco control research appears to be inadequate. It is estimated that for every death due to tobacco (1990 estimates), governments and public agencies spent about $50 on tobacco research, for a global total of $148–164 million. In comparison, they spent $3000 for every HIV-related death in the same year, for a global total of $919–985 million [6]. The vast majority of research and development in tobacco control, as for HIV/AIDS, has been taking place in high-income countries.

Tobacco control programmes, including research funded by tobacco product taxes, are self-financing. While tobacco tax as a prominent source of government revenue in many high-income countries has faded, tobacco tax revenues account for a significant share of total government revenues in many upper–middle-income countries [62]. World Bank data reveal that there is ample room to increase tobacco taxes: in 1995 the average percentage of all government revenue derived from tobacco tax was 0.63%. Middle-income countries averaged 0.51% of government revenue from tobacco taxes, while lower-income countries averaged only 0.42%. An increase in cigarette taxes of 10% globally would raise cigarette tax revenues by nearly 7%, with relatively larger increases in revenues in high-income countries and smaller increases in revenues in low- and middle-income countries [62] (Table 7).

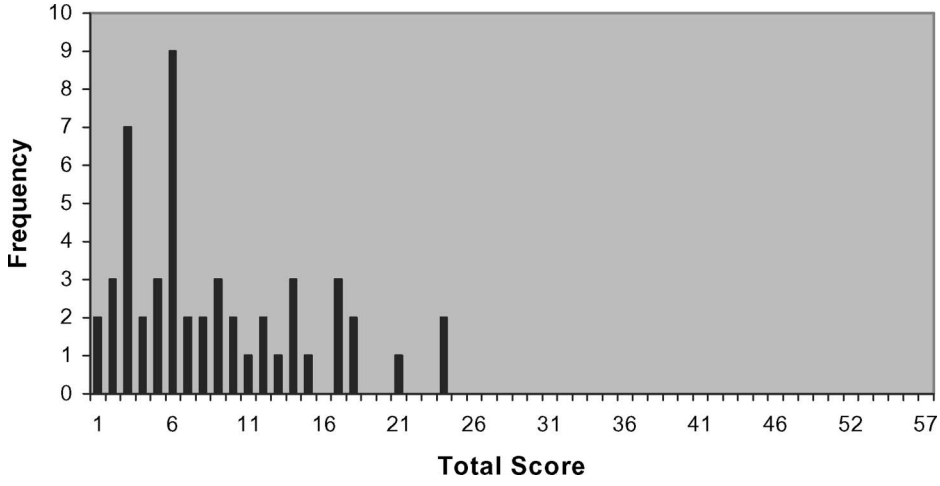

Figure 3. *Distribution of low-income legislative scores. Source: Authors.*

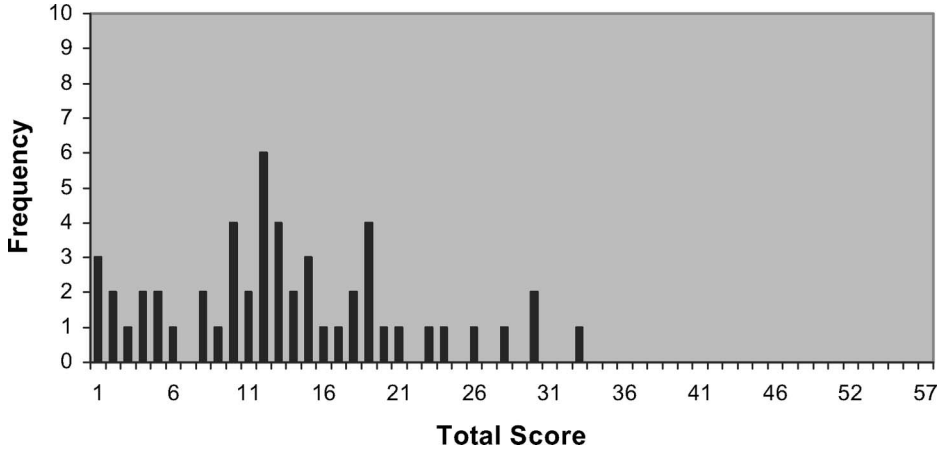

Figure 4. *Distribution of middle-income legislative scores.*

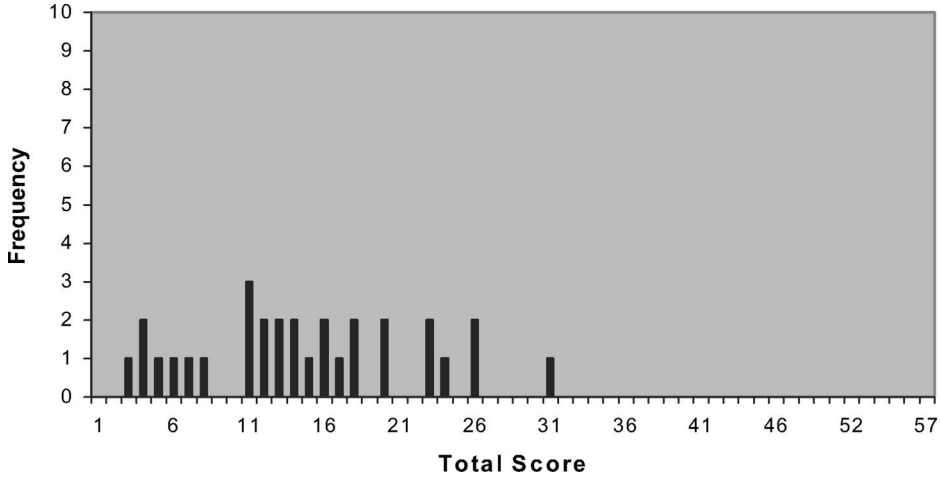

Figure 5. *Distribution of upper middle-income legislative scores.*

Conclusions

Along with HIV, cigarette smoking is the other large and growing cause of death in the world. According to current consumption patterns, about 1 billion people in the 21st century will be killed by their addiction. There is strong evidence that tobacco tax increases, the dissemination of information about the health risks from smoking, restrictions on smoking in public places and workplaces, comprehensive bans on advertising and promotion, and increased access to cessation therapies are effective in reducing tobacco use. Despite this evidence, these policies have been applied unevenly, due partly to political constraints and lack of awareness of the power of interventions.

Declaration of interest

The authors have received no payment for this paper. MC's contributions to this paper were prior to her joining Glaxo Smith Kline.

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