

Chapter 10

Global Hazards of Tobacco and the Benefits of Smoking Cessation and Tobacco Taxes

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INTRODUCTION

Tobacco use kills approximately five million people annually worldwide, accounting for over 20 percent of all deaths of adult men and 5 percent of deaths of adult women. As death rates from causes not attributed to tobacco are falling, the proportion of all adult deaths due to smoking will rise. In the 20th century, 100 million tobacco deaths occurred; nearly 70 percent were in high-income countries (HICs) and the former socialist economies of Europe. In contrast, in the 21st century, tobacco is expected to kill about one billion people, mostly in low- and middle-income countries (LMICs).

Widespread use of a few powerful interventions affecting tobacco price, information, and regulations could prevent tens of millions of premature deaths over the next few decades.

This chapter starts with the epidemiology of smoking-related diseases, focusing on contemporary estimates of the hazards of smoking and the benefits of cessation, and then describes current and future smoking patterns, including the rapid emergence of electronic cigarettes. We next turn to interventions to rapidly raise cessation rates in LMICs, in particular, higher excise taxes on tobacco products. We discuss the cost-effectiveness, cost-benefit, and poverty considerations

of tobacco control and conclude by reviewing the current state of global tobacco control implementation.

EPIDEMIOLOGY OF SMOKING-ATTRIBUTABLE DISEASES

Approximately 1.3 billion people smoke worldwide; over 80 percent of smokers reside in LMICs. Smoked tobacco accounts for about 97 percent of all tobacco sales globally (Euromonitor International 2013), mostly in the form of cigarettes, or in the case of South Asia, in the form of bidis, which typically contain about one-fourth as much tobacco as cigarettes. Inhaling tobacco smoke causes a greater diversity and incidence of disease than chewing tobacco. Active smoking is also more hazardous than exposure to secondhand smoke, although secondhand smoke contributes significantly to some diseases (IARC 2004).

Substantial Delay from Smoking Uptake to Excess Mortality

After smoking becomes common in a population of young adults, it may take more than half a century to assess reliably the full risks of mortality (Jha and Peto 2014). Five recent studies in Japan, the United Kingdom,

and the United States have examined large populations of men and women who began to smoke regularly when they were young and never quit. These five studies find a twofold to threefold increased risk of death among smokers, leading to a reduction in lifespan of at least one decade (Doll and others 2004; Jha, Ramasundarahettige, and others 2013; Pirie and others 2013; Sakata and others 2012; Thun and others 2013). The same studies included individuals who quit smoking. Those who stopped before age 40 avoided about 90 percent of the excess risk of death of those who continued. Smokers who do not start in early adult life have much smaller hazards in middle and old age. Table 10.1 summarizes the main findings for individuals, and figure 10.1 shows the risks by gender for Japan, the United Kingdom, and the United States, as well as comparable risks among men who smoke cigarettes in India.

Men born in the United Kingdom in the first quarter of the 20th century were the first major population to smoke regularly from early adult life; by 1970, the nation had the highest tobacco-attributable death rates in the world (Peto and others 1992). Sir Richard Doll's study of doctors born during the first half of the 20th century and followed for the second half showed a 10-year loss of life expectancy among those who continued to smoke (figure 10.1).

For women, smoking became common later in the United Kingdom and the United States, beginning with women born in the 1940s and 1950s. The full risks in women have been measured only early in the 21st century. By the 1980s, the lung cancer risk ratio in men who smoked versus men who never smoked

rose substantially from 12-fold in the 1960s to 24-fold in the 1980s; it stabilized at 25-fold in the 2000s. By contrast, the risks of lung cancer for women who smoked versus never-smokers rose later (Thun and others 2013). In the 1960s, it was threefold; in the 1980s, 13-fold; and in the 2000s, 26-fold (with similar ratios in women in the United Kingdom in the 2000s). This is because the typical 60-year-old female smoker in the United States in the 2000s had smoked since early adult years, whereas those who were smokers in the 1960s had not.

Cancer and Other Diseases Caused by Smoking

More than two-thirds of the 47 million deaths among adults over age 25 years worldwide in 2012 were caused by cancer, vascular and respiratory diseases, and tuberculosis (WHO 2013a). Because smoking causes many of these diseases, overall mortality from smoking—rather than cause-specific mortality—is increasingly used as a measure of total smoking risk (U.S. Department of Health and Human Services 2014). About 50 percent of the current five million smoking-related deaths worldwide occur in LMICs, and about 80 percent of these smoking deaths occur in men, but this is chiefly because of the lag in women's uptake of smoking.

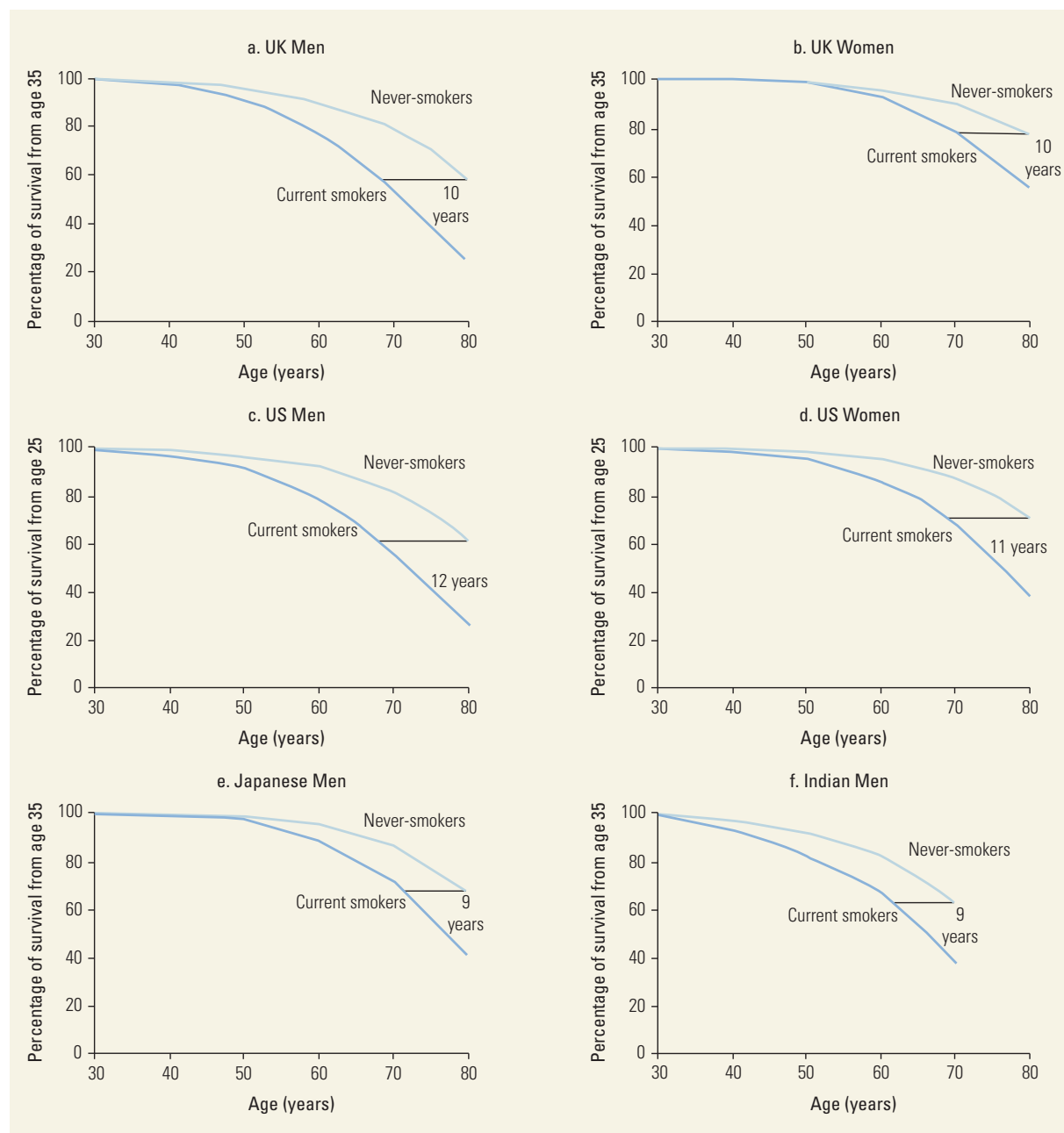
In 2012, 14 million new cases of cancer were diagnosed and about eight million cancer deaths occurred worldwide. Over 30 percent of the cancer deaths in middle-aged men and about 10 percent of those in women are due to smoking (Ferlay and others 2013). Smoking accounted for the vast majority of the 1.6 million deaths from lung cancer in 2012 (1.1 million in men and 0.5 million in women).

Table 10.1 Three Main Implications for Individuals Who Become Cigarette Smokers in Adolescence or Early Adult Life

1. The risk is big, if they continue smoking.
<ul style="list-style-type: none"> Continued smoking eventually kills at least half of men and women who smoke. Among persistent cigarette smokers, whether men or women, the overall relative risk of death throughout middle age and well into old age is at least twofold higher than otherwise similar never-smokers. Among smokers of a given age, more than half of those who die in the near future would not have done so at never-smoker death rates. On average, smokers lose at least one decade of life. This average combines a zero loss for those not killed by tobacco with the loss of much more than one decade for those who are killed by it.
2. At least half of those killed are middle aged (ages 30–69 years), losing many years of life.
<ul style="list-style-type: none"> Some of those killed in middle age might have died anyway, but others might have lived on for another 10, 20, 30, or more years. On average, those killed in middle age lose about 20 years of never-smoker life expectancy.
3. Stopping smoking works to reduce health risks.
<ul style="list-style-type: none"> Those who stop before age 40 avoid more than 90 percent of the excess risk among those who continue to smoke. Those who stop before age 30 avoid nearly all of the smokers' excess risk. Those who have smoked cigarettes since early adult life but stop at 30, 40, 50, or 60 years of age gain, respectively, about 10, 9, 6, and 4 years of life expectancy, compared with those who continue smoking.

Sources: Doll and others 2004; Jha, Ramasundarahettige, and others 2013; Pirie and others 2013; Sakata and others 2012; Thun and others 2013.

Figure 10.1 Loss of a Decade of Life among Current Cigarette Smokers versus Never-Smokers Who Are Middle Aged: Men and Women in the United Kingdom and the United States, Men in Japan, and Men in India



Sources: Data adapted from various studies. Men in the United Kingdom: Doll and others 2004; women in the United Kingdom: Pirie and others 2013; men and women in the United States: Jha Ramasundararajette, and others 2013; men in Japan: Sakata and others 2012; men in India: Jha and others 2008.

The International Agency for Research on Cancer (IARC) cancer registry data reveal that the age-standardized mortality rate from lung cancer is highest in men in Europe, Northern America, Australia/New Zealand, and Japan and lower in LMICs, reflecting the long duration of smoking in the former populations and earlier age of initiation. Men in LMICs have not yet smoked for prolonged

periods, and the lung cancer incidence and mortality rates are accordingly lower.

However, where reliably measured, the proportion of cancer deaths due to smoking is substantial in LMICs. In China, smoking caused about 40 percent of cancer deaths in men and 20 percent in women ages 35 or older in 2010 (Chen and others, forthcoming).

In India, smoking caused about 32 percent and 6 percent of cancer deaths at ages 30–69 years in men and women, respectively, in 2010. Smoking appears to have a synergistic effect on the chronic viral infections that cause liver and cervical cancers.

Smoking causes about three times as many noncancer deaths as it does cancer deaths. Cardiovascular disease is the leading cause of smoking-attributable deaths worldwide (Jha 2009). Smoking is a significant risk factor for fatal and nonfatal heart attack and stroke. In HICs, about one-half of the male and one-third of the female deaths at ages 35–69 years from chronic lung disease are due to smoking. In China, chronic lung disease accounted for a quarter of all tobacco deaths among men and women in 2010 (Chen and others, forthcoming). Among those ages 30–69 years in India in 2010, over 30 percent of deaths among men and 10 percent of deaths among women from chronic lung disease were due to smoking.

Increased risks of tuberculosis death and nonfatal tuberculosis among smokers have been observed in countries where tuberculosis remains common, most notably, in India. In India, nearly 40 percent of tuberculosis deaths among middle-aged males—about 120,000 deaths annually—are attributable to smoking. Tuberculosis is the leading cause of smoking deaths in rural areas; acute heart attack is the leading cause in urban areas. Subclinical infection with the tubercle bacillus is widespread, and smoking appears to facilitate the progression from silent to active clinical disease. Thus, smoking might contribute to the spread of tuberculosis (Gajalakshmi and others 2003; Jha and others 2008).

Effects of Cessation on Total Mortality in Individuals and Populations

Large numbers of adult males and fewer adult females have quit smoking in HICs, providing the opportunity to study the effect of quitting at various ages on subsequent mortality. The results of various studies indicate a 90 percent reduction in the excess risk of death among those who quit smoking by age 40; for those quitting by age 30, the benefit approaches the rates of never-smokers (figure 10.2, panel a) (Jha, Ramasundarahettige, and others 2013). The benefits of cessation are remarkably similar in studies in Japan, the United Kingdom, and the United States (table 10.1).

The large individual benefits of smoking cessation translate into major reductions in smoking-attributable deaths from all causes and from cancer in the overall population. In the United Kingdom, there are now twice as many ex-smokers as current smokers over age 50. Reliable indirect methods (Peto and others 2012) to calculate tobacco-attributable deaths demonstrate

a substantial reduction. Smoking-attributable deaths at ages 35–69 years in men declined by three-quarters from 1970 to 2010 (from 70,000 to 16,000 deaths). Men who died in 1970 had begun smoking between 1920 and 1940, near the peak of the smoking rate, when cessation was uncommon. The decline was caused by fewer men beginning to smoke from 1950 to 1970; a substantial proportion of this cohort ultimately quit smoking.

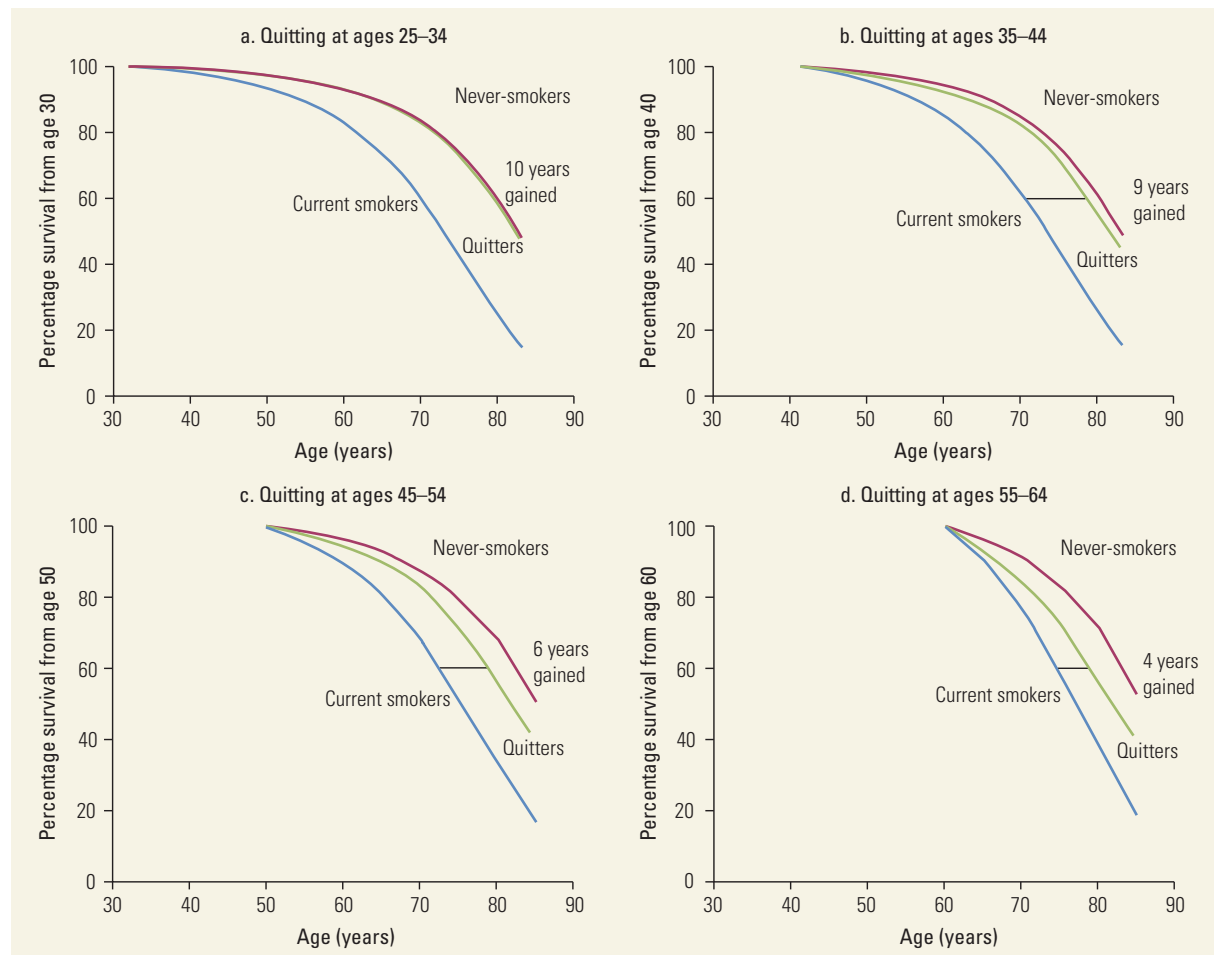
The cancer and all-cause death rates from smoking among women in the United Kingdom and the United States peaked much later, around 1995, and they have since reached a plateau. Similar declines have been seen in the proportion of all deaths due to tobacco. Notably, cancer death rates due to smoking have fallen substantially in men and have not risen in women. Death rates from cancers not caused by smoking have declined, due in part to screening and treatment of common cancers (Gelband and others 2015).

Comparably High Mortality Risks from Smoking Emerging in LMICs

Cigarette smoking rose substantially among men in many HICs in the first few decades of the 20th century and subsequently increased in women in most HICs and men in LMICs. Currently, there are about 1.3 billion smokers worldwide (Giovino and others 2012), although slightly lower estimates have been proposed (Ng and others 2014). A simple formula is that every metric tonne of tobacco produces about one million cigarettes, which leads to one death (Jha and Peto 2014).

The magnitude of the tobacco epidemic in a given country depends on the average daily consumption of cigarettes or bidis, which is generally lower in LMICs than in HICs; in India, about 80 percent of current smoking is of the lower-risk bidis, but these are being replaced by higher-risk cigarettes (Jha and others 2011). Relative to nonsmokers in India, male bidi smokers lose roughly six years, female bidi smokers lose about eight years, and male cigarette smokers lose about 10 years of life. The 10-year loss of life among Indian male cigarette smokers is about as extreme as that in the recent studies noted, despite the fact that Indian men smoke fewer cigarettes per day and start later in life than do men in HICs. The age at starting smoking is generally later in LMICs than HICs. Urban Chinese men, however, have begun to start as young as men in the United States (Chen and others, forthcoming). If similar shifts to smoking at younger ages occur in India and other populations, the eventual hazards of smoking might well be greater. Epidemiological studies have confirmed the elevated age-specific, smoking-attributable risks in Bangladesh (Alam and others 2013); China, and Hong

Figure 10.2 Effect of Smoking Cessation on Survival at Various Ages, Men and Women, United States, 2006–12



Source: Adapted from Jha, Ramasundaramhettige, and others 2013.

Kong SAR, China (Gu and others 2009; Chen and others, forthcoming; Lam and others 1997); India (Jha and others 2008); and South Africa (Sitas and others 2013). Accordingly, the future mortality risks from 2010 to 2050 in many LMICs might be greater than those from 1940 to 1980 in the United Kingdom or the United States.

Overall global death rates have fallen sharply over the past four decades, particularly from 2000 to 2010 (Norheim and others 2014). Greater declines have been seen in childhood and infectious diseases than for diseases made more common by tobacco. Hence, while it is certain that tobacco will account for an increasing proportion of a falling overall total of premature deaths before age 70 years, the future projections of the absolute total from tobacco use are less certain.

Sir Richard Peto estimated that global tobacco deaths will total about 450 million between 2000

and 2050 (Peto and Lopez 2001). Further estimations are more uncertain, but based on current initiation and cessation rates and projected population growth, from 2050 to 2100, there would be, conservatively, an additional 550 million tobacco deaths, an average of 10 million deaths per year. Of the estimated one billion smoking-attributable deaths in this century, most will be in LMICs. In contrast, there were “only” 100 million tobacco deaths in the 20th century, mostly among those born before or around World War II in HICs and Eastern Europe. Already, 80–90 million smoking deaths will have occurred from 2000 to 2015. Peto’s estimates of 50–60 million smoking deaths from 2000 to 2010 and about 400 million tobacco-attributable deaths from 2010 to 2050 remain plausible. Indeed, the chief uncertainty is not *if* tobacco deaths will reach about 10 million a year, but *when*, with the most likely scenario around 2030 to 2035 (Peto and Lopez 2001).

SMOKING AND CESSATION PATTERNS WORLDWIDE

The epidemiological data on the consequences of smoking help predict, with reasonable certainty, that deaths from smoking will be high in LMICs unless current smokers quit and potential new smokers do not start. This section reviews the statistics on current smoking and cessation across countries.

Current Smoking

The overall global volume of legal cigarette sales rose from 5.1 trillion in 1990 to 5.9 trillion in 2012, largely due to population growth. Although per-person consumption has fallen worldwide, it has risen in many LMICs (Euromonitor International 2013). About 80 percent of the 1.3 billion smokers age 15 years or older in the world live in LMICs; over half reside in eight regions or countries—Bangladesh, Brazil, China, the European Union, India, Indonesia, the Russian Federation, and the United States (table 10.2). The three-fold hazards of lifelong smoking can be applied reliably to the cohort of roughly 620 million younger current and would-be smokers in selected countries. This application suggests that at least half, over 300 million, of this cohort will be killed by smoking unless they quit.

The Global Adult Tobacco Survey, of people ages 15 years and older in selected countries, indicates that the proportion of males who smoke ranges from over 67 percent in Indonesia to about 7 percent in Nigeria. In most LMICs, male smoking is far more common than female smoking. Among adult women, for example, the proportion of smokers ranges from 24 percent in Poland to less than 1 percent in Nigeria (Giovino and others 2012).

Smoking Cessation Patterns

To determine smoking prevalence in a population, individuals are divided into three categories: current smokers, ex-smokers, and never-smokers. Ex-smoking prevalence is a good measure of cessation at a population level. An increase in cessation, along with an increasing proportion of never-smokers, reduced adult smoking prevalence in the United Kingdom between 1950 and 2005, from 70 percent to 25 percent in men and from 40 percent to 20 percent in women. In the United States, among men ages 60–64, there are about four times as many ex-smokers as current smokers (Jha, Ramasundarahettige, and others 2013). Similar rates of cessation have been reported in most HICs.

The prevalence of male ex-smoking in LMICs is much lower. Even reported figures may be misleadingly

high because they include people who quit either because they are too ill to continue smoking or because of early symptoms of tobacco-attributable illness, such as respiratory disease. A good measure of the success of tobacco control is a rising proportion of adults quitting in middle age (ages 45–64) when they can expect personal gains in health. In the European Union and the United States, where cessation has become common, about as many adults in this age group are former smokers as are current smokers. About 60 percent of all ex-smokers reside in HICs. By contrast, most LMICs, except Brazil, have far fewer former than current smokers at these ages. Cessation among women continues to lag men in nearly every country.

INTERVENTIONS TO RAISE CESSATION RATES RAPIDLY

Cessation by today's smokers is the only practicable way to avoid a substantial proportion of tobacco deaths worldwide before 2050. Halving the worldwide per capita adult consumption of tobacco by 2025 (akin to the declines in adult smoking in the United Kingdom over the past three decades) would prevent approximately 160 million to 180 million tobacco deaths over the next few decades. In contrast, halving the percentage of children who become prolonged smokers (from about 30 percent to 15 percent over two decades) would prevent 20 million deaths over the next few decades; its main effect would be to lower mortality rates by 2050 and beyond (Jha and Chaloupka 1999; Peto and Lopez 2001). Table 10.3 summarizes the effectiveness of the major interventions.

Tobacco Taxation

Aggressive taxation is the key strategy for LMICs to reduce smoking at a rate faster than that achieved by HICs. Tobacco taxes and consumption are strongly inversely related worldwide. Well over 100 studies demonstrate a strong negative relationship between cigarette pricing and consumption (Chaloupka, Yurekli, and Fong 2012; Jha and Chaloupka 1999). We review five key aspects of smart taxation:

- Price elasticity of demand for tobacco
- Affordability, the relationship of price to income growth
- Importance of smart tax structure, including excise taxes
- Implementation experience of large tax increases
- Signaling of prices to consumers.

Table 10.2 Prevalence and Number of Current and Future Smokers below age 35 and Expected Deaths, Selected Countries

Country	Current smoking prevalence, ages 15+ (percent)			Current smokers, ages 15+ (millions)	Current and future smokers, ages 0–34 (millions)	Approximate number of deaths in current and future smokers ages <35, unless smokers quit
	Male	Female	Total			
China (2010) ^a	53	2	28	317	193	97
India (2009) ^a	24	3	14	122	95	48
EU-28 (2012) ^b	32	22	27	115	54	27
Indonesia (2011) ^a	67	3	35	61	58	29
United States (2011) ^c	22	17	20	50	26	13
Russian Federation (2008) ^a	60	22	39	47	32	16
Brazil (2008) ^a	22	13	17	26	19	10
Bangladesh (2009) ^a	45	2	23	25	25	13
Philippines (2008) ^a	48	9	28	18	22	11
Turkey (2008) ^a	48	15	31	17	18	9
Vietnam (2010) ^a	47	1	24	17	14	7
Mexico (2009) ^a	25	8	16	14	14	7
Thailand (2009) ^a	46	3	24	13	8	4
Ukraine (2010) ^a	50	11	29	11	8	4
Egypt, Arab Rep. (2009) ^a	38	1	19	11	12	6
Argentina (2012) ^a	29	24	22	7	7	4
Canada (2011) ^d	20	16	17	5	2	1
Malaysia (2011) ^a	44	15	23	5	5	3
Nigeria (2012) ^a	7	1	4	4	6	3
Subtotal (HICs)				170	~80	~40
Subtotal (LMICs)				715	~540	~270
Total				885	~620	~310

Note: For future smokers in low- and middle-income countries (LMICs), we apply the smoking prevalence at ages 25–34 from the Global Adult Tobacco Survey to the United Nations 2012 population under age 25 years, plus current smokers at ages 25–34. For future smokers in high-income countries (HICs), we apply the smoking prevalence at ages 18–24 or 20–24 to the under-25 population, with an assumed 1 percent annual decline due to decreased uptake in these countries.

a. WHO-GATS, various years, various Country Reports.

b. EU-28: Zatorński and others 2012, ages 18+.

c. United States: Centers for Disease Control and Prevention 2009–11, ages 18+.

d. Canada: Health Canada 2012, ages 15+.

Price Elasticity of Demand for Tobacco

Raising tobacco taxes to achieve a 50 percent increase in tobacco prices decreases consumption by about 20 percent in HICs and by at least as much in most LMICs (that is, price elasticity of -0.4). Price elasticity estimates vary more in LMICs than in HICs, ranging from -0.15 to -0.9 , but most studies find results to be concentrated in the -0.20 to -0.60 range. In theory, people in LMICs should be more sensitive to price and nonprice tobacco control interventions because the cost

of cigarettes constitutes a larger relative proportion of income. However, in China and Russia, price elasticity estimates are closer to zero, in part due to a rapid rise in affordability.

Half or more of the effect of prices on demand results from increased quitting; the remaining effect results from reducing the amount of tobacco smoked. Higher taxes increase the number of attempts to quit smoking and the success of those attempts; in the United States, a 10 percent increase in price results in 11–13 percent

Table 10.3 Interventions and Their Effectiveness in Reducing Tobacco Consumption

Intervention	Effectiveness
Large, regular increases in excise taxes that reduce affordability	50 percent higher prices reduce consumption by approximately 20 percent (10 percent quit, 10 percent reduce the amount smoked)
Mass media counter-advertising; warning labels; plain packaging; and epidemiological studies, such as deaths from smoking on death records	Not quantified but does increase cessation rates
Complete bans on tobacco advertising, promotion, and sponsorship	Reduces consumption by approximately 15 percent in LMICs
Complete ban on smoking in public places, including workplaces	Reduces consumption by 3–14 percent
Cessation support for smokers, brief medical advice, pharmacotherapy	At six months unaided cessation is about 2–5 percent; brief medical advice doubles the quit rates (to 4–8 percent); medications triple the quit rates (to 8–12 percent)
Antismuggling technologies: local language labels, improved tax administration, and increased customs and international efforts to target smuggling	10 percent higher spending on antismuggling efforts reduces smuggling by 5 percent and consumption by 2 percent

shorter smoking duration, or a 3 percent higher probability of cessation (Tauras 1999). Recent analyses of the Global Adult Tobacco Survey data and the Global Youth Tobacco Survey find that cessation is generally price inelastic, but it is still significantly positively related to price, while initiation is generally price elastic (Kostova and others 2011; Shang and others 2014).

Higher cigarette prices are particularly effective in reducing consumption among less educated and lower-income individuals and in preventing young smokers from moving beyond experimentation into regular, addicted smoking. A comprehensive study using multiple waves of the Global Youth Tobacco Survey in 17 LMICs concluded that a 50 percent increase in cigarette prices would result in a reduction of youth prevalence of almost 40 percent. Furthermore, the estimated price elasticity of youth smoking was about -2.0 (Kostova and others 2011; Nikaj and Chaloupka 2014).

Affordability

Affordability is a concept that captures the interaction between consumers' income levels and tobacco prices. Typically, affordability is defined as per capita gross domestic product (GDP) relative to the wholesale price index for bidis or cigarettes. As income rises relative to price, affordability increases. From 1990 to 2006, cigarettes became less affordable in 59 percent of 32 HICs, but only in 38 percent of 45 LMICs. Particularly since 2003, cigarettes in some LMICs have quickly become more affordable. In India, bidis were nearly three times more affordable in 2011 than in 1990, while cigarettes were about twice as affordable (Blecher and van Walbeek 2009; Jha and others 2011). Thus, tax policy needs to take into account income

growth, particularly in fast-growing countries such as China and Vietnam.

Importance of Smart Excise Tax Structure

Most LMICs have low levels of taxation; they also have inefficient tax structures that contribute to increased consumption. For example, China has a relatively low price elasticity of demand for cigarettes; smokers are likely to switch to a wide range of cheaper brands rather than quit smoking. This low measured price elasticity in part reflects the underlying tax structure and income growth. Further, there are several types of taxes: *excises*, which are based on quantity or weight (for example, the tax per pack of 20 cigarettes); *ad valorem taxes*, which are based on the value of tobacco products (for example, a specific percentage of manufacturers' prices for tobacco products); and *other taxes* (for example, import duties).

Specific excise taxes are more important insofar as they differentiate tobacco product prices from other prices more than broader taxes do. A high reliance on *ad valorem* and similar taxes by most LMICs creates large price gaps and increases incentives to switch to cheaper products. China, like Indonesia, uses a complex tiered system with small specific, different *ad valorem* rates that rise with the cost of cigarettes (Barber and others 2008; Hu and others 2008). Indeed, the tobacco industry usually offers such advice to ministries of finance to promote complex, tiered taxation systems so as to decrease the impact of tax increases on sales (Jha 2015)

By contrast, empirical research from HICs finds that high uniform, specific excise taxes are more likely to discourage switching among different types of tobacco products, are easier to administer, and produce a steadier

stream of excise revenue (Chaloupka and others 2010). The exact impact of high excises depends on market conditions, industry efforts to counter the tax hike, and the effectiveness of tax administration. Increases in the specific excise tax decrease the relative differences between higher- and lower-priced cigarettes, effectively increasing the public health impact. The main weakness is that such excise taxes need to be adjusted periodically for inflation, which is often higher in LMICs than in HICs. Thus, a complementary strategy is to raise the excise every year in excess of inflation and income growth to reduce affordability so that the number of ex-smokers increases every year.

Implementation of Large Tax Increases

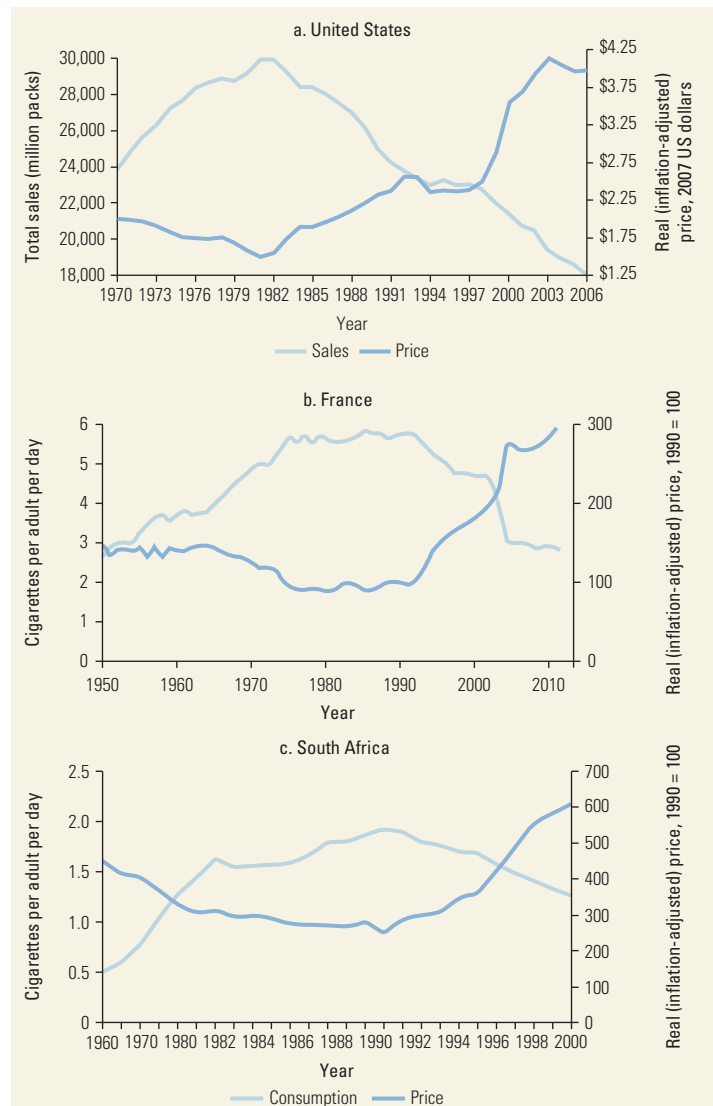
Powerful policy interventions to tax and regulate consumption and to inform consumers have reduced consumption in most HICs. The United Kingdom and the United States each took about 35 years, and Canada about 25 years, to halve per adult cigarette consumption, from about 10 to about five per adult per day (Forey and others 2013). However, France took only 15 years to halve consumption. France's uptake of smoking was chiefly after World War II, and its prevalence rose until the mid-1980s. From 1990 to 2005, cigarette consumption fell from about six cigarettes per adult per day to three (figure 10.3). This sharp decline was mostly due to a sharp increase in excise tobacco taxation starting in 1990. These excise tax increases raised the inflation-adjusted price threefold. Among men, the corresponding lung cancer rates at ages 35–44, which are a good measure of recent smoking in the population, fell sharply from 1997 onward. During this period, revenues in real terms rose from about 6 billion to 12 billion euros.

In HICs, about 64 percent of the retail price of the most popular brands consists of the excise tax; in most LMICs, the proportion of the excise tax is well below 50 percent (figure 10.4).

Excise taxes tend to be higher and account for a greater share of retail prices in HICs, but LMICs are increasing the proportion of excise tax to retail prices, as seen in HICs. In Turkey, the excise share as a proportion of the retail price rose to 67 percent; in Thailand, it rose to 58 percent; the rise contributed to a decline in adult smoking prevalence rates in both countries (WHO 2013b; WHO-GATS, various years).

The Mexican government raised the tobacco excise in 2012 (WHO 2013b). This rise contributed to an estimated decrease in cigarette sales of 30 percent, which may avoid about 100,000 deaths over the next 30 years (Hernandez-Villa and others, personal communication). In South Africa, the excise tax as a percentage of the

Figure 10.3 Inverse Relationship of Consumption and Price in the United States, France, and South Africa, Various Years

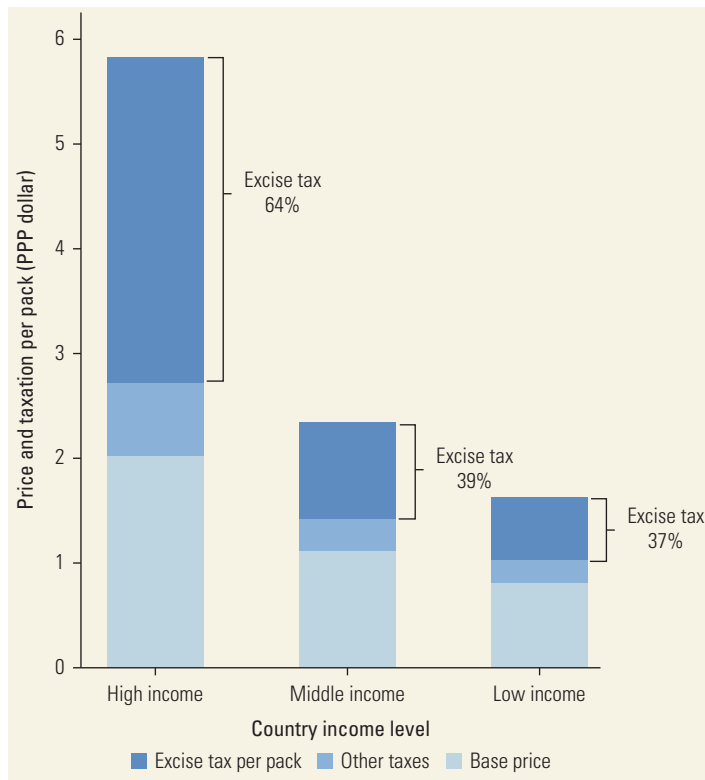


Sources: Based on data from the Tobacco Institute (United States) and personal communications from C. Hill (France) and C. van Walbeek (South Africa).

retail price fell to about 20 percent around 1990, but it subsequently rose to nearly 40 percent. Consumption fell from about four to two cigarettes per adult per day. Poland's tax increases have doubled the real price of cigarettes and decreased consumption. Mauritius has raised excise taxes by about 30 percent, which has reduced consumption. More recently, the doubling of excise taxes in the Philippines is expected to raise the average price by 70 percent and reduce consumption by about 40 percent (Jha and Peto 2014).

The World Health Organization (WHO) recommends that excise taxes account for 70 percent of the retail price

Figure 10.4 Retail Price of the Most Popular Brand and the Proportion Due to Excise Taxes by Country Income Levels, 2012 (US\$)



Source: Adapted from WHO 2013b.

Note: Prices are expressed in dollars adjusted for purchasing power parity (PPP). In low- and middle-income countries, tripling specific excise taxes on tobacco would approximately double street prices, because non-excise taxes and retailer mark-up would also rise. In the European Union, more complex variations of specific excise taxes on tobacco are used. Data are for 48 high-income countries, 95 middle-income countries, and 30 low-income countries.

of cigarettes and that countries raise excise levels more than inflation levels and income growth to reach that point (WHO 2010). Based on WHO data for the most popular brand, achieving this level of excise would result in the weighted price per pack rising from US\$0.8 per pack to US\$1.4 in low-income countries, from US\$1.5 per pack to US\$2.6 in middle-income countries, and from US\$6.3 per pack to US\$10.6 in HICs. Such excise tax increases, while large, have already been achieved in some countries, including Canada, France, the Philippines, Poland, and South Africa, and in some states in the United States.

An increase in cigarette taxes of 25 and 50 percent globally would raise cigarette tax revenues by 14 percent and 25 percent, respectively, as the fall in demand is less than proportional to the price increase in most countries (WHO 2013b). The overall increase in government revenue would be about US\$100 billion (Jha and Peto 2014).

Signaling the Effects of Price Increases

Tobacco consumption changes in response to announced taxation changes (Becker, Grossman, and Murphy 1994; Chaloupka 1991; Gruber and Köszegi 2001). For example, even the debate on a tax increase in Switzerland, which was not adopted by popular vote, led to decreased consumption (Kenkel and Chen 2000). There are likely two mechanisms for this decline. The first is rational price expectations. Consumers respond to future price expectations for cigarettes, despite their addictive properties. Second is the signal that governments and peers give about the undesirability of smoking, leading people to reconsider cessation. In the United States, the higher price responsiveness by youth has been linked in part to peer effects, in which one quitter who might be more responsive to price increases influences other teenagers to do the same (Tauras and Chaloupka 2004).

Thus, governments can announce future tobacco tax targets to decrease current and future consumption, in much the same way that central banks announce inflation targets. For example, Australia and New Zealand have opted to raise tax rates to ensure that affordability decreases. France started a similar policy in 1991, increasing cigarette prices by 5 percent or more in excess of inflation every year. As a result, French ex-smoking prevalence at ages 45–64 is now well above the European Union average (Jha 2013; Zatoński and Mańczuk 2010).

Health Information and Counter-Advertising

With more than 40,000 studies on smoking and health published over the past five decades, it is easy to assume that the health consequences of tobacco are well known worldwide (IARC 2004; U.S. Department of Health and Human Services 2014). Although this is often the case in HICs, even in these countries many smokers minimize the personal relevance of these risks. Awareness of the hazards of smoking and the benefits of cessation is much lower in most LMICs. In India, few smokers know that 70 percent of smoking deaths occur during productive middle age or that the average number of years of life lost from cigarette smoking is nearly 10 years. The Global Adult Tobacco Survey revealed that only 23 percent of Chinese adults know that smoking causes strokes, heart attacks, and lung cancer. The survey also revealed the widespread belief in most countries that smoking *does not* cause strokes: over 50 percent in India, 39 percent in Mexico, 33 percent in Russia, 30 percent in Vietnam, and 27 percent in Brazil.

Smoking patterns in Western countries have changed in response to control policies and increased information.

Data on tobacco hazards help build public support for control measures, such as higher prices and bans on advertising and promotion. A systematic review found that nine of 11 mass media campaigns evaluated had reduced smoking prevalence or increased cessation rates (Bala and others 2013). Decreases in smoking prevalence were largest in HICs, where coverage of issues related to tobacco in the news media is consistent. For example, the 1962 report by the British Royal College of Physicians, and the 1964 U.S. Surgeon General's Report, in combination with the publicity that followed each publication, reduced consumption by 4–9 percent initially, and by 15–30 percent in the longer term in both countries, and indeed in other countries, such as Switzerland (Kenkel and Chen 2000).

Prominent, rotating pictorial warning labels on tobacco products are effective at portraying risks to smokers and can reach even illiterate individuals, which is important in countries such as India, where half the smoking deaths occur among the uneducated. Thailand changed the warnings from 30 percent text-only to 50 percent pictorial in 1996; subsequent surveys noted an increase from 34 percent to 54 percent of people who claimed that the warnings made them think about health risks “a lot,” with 31–44 percent “a lot” more likely to quit (International Tobacco Control Project 2009). The impact has been similar in other countries.

In 2011, Australia became the first country to legislate plain packaging for tobacco products. Plain packaging aims to standardize the look of cigarette packages by mandating the removal of all brand imagery, including logos and trademarks. Manufacturers are required to print the brand name in a required size, font, and place and to include prominent pictorial health warnings. This goes beyond the pictorial warning labels used in Canada and introduced in the United States. The result is that smokers perceive their plain-packaged cigarettes to be lower quality and to experience lower satisfaction. Smokers were also more likely to consider quitting (Wakefield and others 2013). Experimental research demonstrates that plain packaging enhances the effectiveness of health warnings, helps dispel false beliefs, and reduces the appeal of smoking (Hammond 2010).

Reliable reporting of smoking deaths is possible with the simple addition of a smoking status question to South Africa's death certificates, for example, “Was the dead person a smoker five years ago?,” which is asked of living respondents (Sitas and others 2013). A similar strategy in India obtains the smoking status of the deceased and the respondent during household surveys of the causes of death (Dikshit and others 2012; Jha and others 2008).

Bans on Advertising and Promotion

Cigarettes are among the most heavily advertised and promoted products in the world. Cigarette companies spend over US\$9 billion annually on advertising and promotion in the United States alone, spending has risen in recent years (Federal Trade Commission 2015). The spending in the United States is relevant globally because it funds research and industry marketing strategies on advertisement and promotion of cigarettes globally.

In HICs, partial bans on tobacco advertising have had little effect on consumption, as the industry shifts to other media, price-reducing promotions, or sponsorship of events, such as rock concerts. However, comprehensive bans reduce consumption by 6–7 percent, taking into account differences in price and nonprice control interventions. For example, complete tobacco advertising bans in Norway and Finland reduced smoking demand by 9–16 percent and 7 percent, respectively. Such bans may be twice as effective in LMICs. In a study of 50 LMICs, comprehensive bans reduced consumption by 14.4–15.5 percent, and by about 5.5 percent in the broader sample of 76 countries. Limited bans still had some impact, in part because the marginal impact of bans is greater where no or little tobacco control has occurred (Blecher 2008).

Restrictions on Smoking in Public Places

Restrictions on smoking in public places are primarily intended to reduce nonsmokers' exposure to passive tobacco smoke. However, comprehensive restrictions in HICs also raise attempts to quit, so that overall consumption falls by 3–4 percent. Tobacco consumption significantly decreased after laws restricting smoking were implemented in Germany, Ireland, and the Netherlands, but not in France (Mons 2011).

According to a systematic review of studies (most from HICs), workplace and community smoke-free policies reduce tobacco use prevalence by a median of 14 percent. These policies are most effective when strong social norms help make smoking restrictions self-enforcing (IARC 2009). Reduced hospital admissions for cardiac events and an improvement in some health indicators consistently occur after smoking is banned in public places. This appears to be more related to increased cessation—in particular, among working-age adults, in whom smoking causes a large proportion of the acute heart attacks (Jha and others 2009)—and less related to reduced environmental smoke exposure triggering acute heart attacks.

Smoking Cessation Treatments

Most of the ex-smokers in the world have quit unaided. However, unaided quit rates are only about 2–3 percent at six months. Physician support or telephone- or Internet-based counseling and cessation support can increase these low rates. A systematic review noted that Internet and mobile telephone programs roughly doubled short- and long-term self-reported quitting (Whittaker and others 2012). Another systematic review from pooled data in 17 trials demonstrated a significant increase in the rate of quitting in those who received brief physician advice compared with no advice, increasing unaided quit rates by another 1–3 percent (Stead and others 2013). Pharmacological treatments, including nicotine replacement therapies, bupropion, and varenicline, further improve the likelihood of quitting, with success rates two to three times higher than when pharmaceutical treatments are not employed (Hartmann-Boyce and others 2014). In addition, over-the-counter access to such medications increases access and decreases cost. Cytisine, a cessation drug used commonly in the former socialist economies, was more effective than a placebo for smoking cessation in Poland. As cytosine is much less expensive than standard drugs, it might be practicable in LMICs (West and others 2011).

Electronic Cigarettes

In recent years, there has been rapid development of e-cigarettes or other noncombustible products. In the United States, e-cigarettes are now more commonly used than traditional cigarettes among high-school students (National Institute of Drug Abuse 2015). In most LMICs, these products are mostly unregulated and not subject to traditional tobacco control policies. It remains unknown whether these products result mostly in adult cessation, or whether they also are significant gateway or bridge products that might increase the uptake of cigarette smoking by youth or diminish cessation by adults. No studies have yet reliably documented if young e-cigarette smokers actually quit after a few years. Clinical trials confirm that e-cigarettes, used as nicotine replacement, can raise adult cessation rates, comparable to other nicotine replacement products (Bullen and others 2013). Multinational tobacco companies are expanding into the nontobacco nicotine delivery business. However, access to e-cigarettes remains more limited in LMICs than HICs.

Much more epidemiological and economic research is needed in this rapidly changing field. The United States and other high-income countries are discussing nuanced regulation that would allow some promotion of e-cigarettes to adults, but not for children. Bearing in

mind that most LMICs have far less regulatory capacity currently, interim policies should try to encourage cessation and avoid the pathways to use of manufactured cigarettes. Key policies include the following: (a) restrict advertising and promotion of e-cigarettes comparable to comprehensive bans on cigarette advertising, even though this is a more blunt instrument than ideally suited to helping adult smokers quit; (b) ensure that bans on smoking in public places also cover e-cigarettes; and (c) ensure, as much as possible, separation of the ownership of these companies by cigarette companies (Jha and Peto 2014). Taxation strategies for e-cigarettes are feasible (Huang, Tauras and Chaloupka 2014), but would need to raise the price of cigarettes even more, so as to encourage cessation.

Supply-Side Interventions

In contrast to the effective interventions designed to reduce demand, scant evidence exists to indicate that restricting supply can effectively reduce consumption. Limitation of youth access to tobacco products, cross-border trade restrictions, and crop substitution and diversification are largely ineffective in reducing consumption, given that supply will always respond to demand (Jacobs and others 2000). Recent debate has included phasing in outright bans on sales to birth cohorts, such as anyone born after 2000. These strategies have not yet been tested (Reuter 2013). Importantly, most of the deaths from smoking before 2050 will occur in current smokers, so to the extent these efforts draw political attention away from taxation and regulation aimed at encouraging cessation and reducing initiation, they could be counterproductive.

However, controlling cigarette smuggling is effective. An estimated 6–11 percent of the 5.9 trillion cigarettes sold globally in 2006—about 600 billion cigarettes—enter the market without being taxed. This amounts to approximately US\$50 billion in lost revenue, excess consumption, and increased deaths (Joossens and others 2009). The main determinant of smuggling is not price differences from different tax regimes, but corruption, organized criminal networks, and weak tax administration.

A common misconception by governments and policy makers is that illicit trade will increase as cigarette taxes rise. Clearly, higher taxes increase the financial incentives for smugglers, but these claims ignore factors of equal or greater importance in making smuggling attractive, such as the following: (a) weak governance and lack of high-level commitment by governments; (b) ineffective customs and excise administration;

(c) corruption and complicity of cigarette manufacturers; (d) presence of informal sectors and distribution channels; and (e) population perceptions and socioeconomic status.

A study by Yurekli and Sayginsoy (2010) showed no clear correlation between the illicit trade market and the tax rate for the most popular cigarettes from a sample of 76 countries. By contrast, a stronger correlation was seen between illicit trade markets and weak governance; countries with strong governance experience lower illicit trade levels than those with weak governance.

In HICs, companies have been convicted in criminal courts for encouraging smuggling. In addition to harmonizing prices among countries, effective measures to counter smuggling include prominent tax stamps and warning labels in local languages, better methods for tracking cigarettes through the distribution chain, aggressive enforcement of antismuggling laws, and stronger penalties (IARC 2011).

Spain provides a good example of effective measures to reduce smuggling. Spain raised its investment in intelligence tenfold over five years, increased customs activity in border areas, and developed international collaborations to target smuggling (Joossens and Raw 2008). As a result, the market share of smuggled cigarettes fell from 16 percent to 2 percent, and tax revenues more than doubled, netting US\$68 for every dollar spent on smuggling control. A 10 percent increase in price, paired with a 10 percent increase in spending on smuggling controls, would decrease smuggling by 5 percent, reduce consumption by 2 percent, and increase tax revenues by nearly 8 percent (Yurekli and Sayginsoy 2010). The Canadian government raised cigarette taxes in 2014, and also funded US\$100 million for better police enforcement against smuggling (Jha 2014). Even in the presence of smuggling, tax increases will reduce consumption and increase revenue. For example, South Africa saw a rise in reported smuggling from 0 percent to 6 percent in the years when it raised excise taxes, but revenues continued to rise (Van Walbeek 2006).

COST-EFFECTIVENESS OF TOBACCO CONTROL

Costs

Tobacco is a major contributor to the large and increasing global burden of noncommunicable diseases (NCDs). A recent paper uses the value of lost output approach to estimate the impact of NCDs on worldwide GDP (Jha, Nugent, and others 2013). It employs the WHO's EPIC model to simulate the macroeconomic effects of NCDs (see DCP3 volume 5,

Cardiovascular, Respiratory, Renal, and Endocrine Disorders) on labor and capital, which determine economic output, from 2011 to 2030 (table 10.4). Using conservative estimates attributing about 33 percent of cardiovascular disease, about 50 percent of cancers, and 60 percent of chronic respiratory diseases to tobacco use, the total economic loss from tobacco is expected to be about US\$12.7 trillion dollars over the next few decades. This loss translates to about 1.3 percent of GDP spent on tobacco-associated diseases every year, or approximately US\$0.9 trillion in 2010 terms.

Cost-Effectiveness Analysis

Tobacco control is highly cost-effective. Significant price increases and comprehensive tobacco control measures are cost-effective in all WHO regions, according to 2002 analysis of data from 2000 (table 10.5).

For 23 LMICs, an increased real price of cigarettes to reduce smoking prevalence by 10 percent, in combination with mid-range estimates of nonprice interventions, would reduce the smoking prevalence rate by 20 percent. Over three decades, about three million deaths from cardiovascular disease would be averted: two million from respiratory disease and one million from cancer (assuming price elasticity ranges from -0.40 to -1.20). The cost of implementation would be US\$0.04 to US\$0.32 per person, which would be largely, if not completely, offset by the increased revenue from the tax (Asaria and others 2007).

A US\$0.50 increase in the tax on cigarettes and small cigars, keeping pace with inflation and the growth of people's income, would reduce the federal budget deficit in the United States by about US\$42 billion through 2021 (Baumgardner and others 2012). Tax revenues would be higher and spending on Medicare slightly lower, although spending on Social Security would rise slightly as more people would live longer. Even in the long run, there would be a net positive budgetary impact, given that the higher revenues from the tax would exceed any increase

Table 10.4 Economic Costs of Tobacco, 2010–30
US\$ trillions

Region/disease	Vascular	Cancer	Chronic lung	Total	Total due to tobacco
Low and middle-income countries	9	5	2	16	7
High-income countries	7	3	3	13	6
World	16	8	5	29	13

Source: Adapted from Jha, Nugent, and others 2013.

Table 10.5 Range of Cost-Effectiveness Values for Price Increases, Nicotine Replacement Therapies, and Nonprice Interventions, by World Bank Regions, 2000
(2002 US\$/DALY saved)

World Bank region	33% price increase	NRTs with effectiveness of 1–5%	Nonprice interventions with effectiveness of 2–10%
	Low and high estimate	Low and high estimate	Low and high estimate
East Asia and Pacific	2–30	65–864	40–498
Europe and Central Asia	3–42	45–633	55–685
Latin America and the Caribbean	6–85	53–812	109–1,361
Middle East and North Africa	6–89	47–750	115–1,432
South Asia	2–27	54–716	34–431
Sub-Saharan Africa	2–26	42–570	33–417
World	13–195	75–1,250	233–2,916

Source: Adapted from Jha, Chaloupka, and others 2006.

Note: Country economies are categorized according to 2002 World Bank regions. DALY = disability-adjusted life year; NRT = nicotine replacement therapy.

in longevity-related spending. Another study demonstrated that tobacco tax increases are cost-effective from the health care perspective, even factoring in the medical costs from years of life gained (van Baal and others 2007).

Poverty Considerations

Smoking in most countries is more common in lower-income and lower-education groups (Palipudi and others 2012), and smoking causes greater disease burdens in the poor than in the rich. In several HICs and Poland, smoking deaths account for at least one-half of the differences in the middle-age risk of death between men who are richer and more educated versus men who are poorer and less educated (Jha, Peto, and others 2006).

A recent report from the Asian Development Bank highlights the equity implications of tobacco taxation for five high-burden countries: China, India, the Philippines, Thailand, and Vietnam (ADB 2012). This study found that a 50 percent increase in price (resulting from excise tax increases of 75 percent to 122 percent) would decrease the number of current and future smokers by almost 67 million, save 27 million people from tobacco-related deaths, and generate in excess of US\$24 billion in additional revenue annually (an increase of 143–178 percent above existing cigarette tax revenue). Importantly, each country's poorest socioeconomic groups would undertake a relatively small proportion of the extra tax burden but would gain a substantial proportion of the health benefits from smoking reduction.

The ratio of health benefits obtained by the poor to the additional taxes paid by the poor ranges from 1.4 to 9.5. Poorer income groups spend more of their income

on tobacco than do richer groups, but the higher price responsiveness by the poor in China showed that after a 50 percent price increase, those in the lowest two quintiles of income would gain 5 and 1 percent in net income, whereas only the higher income quintiles would lose income after the tax increase on tobacco (Verguet and others 2015). Main and others (2008) conclude that tax and price policies reduce inequalities, but they find that cessation policies might increase inequities, given the greater likelihood of quitting among higher social groups. In LMICs with low levels of awareness of smoking risks and higher illiteracy levels, pictorial warning labels might help to reduce inequalities.

IMPLEMENTATION OF TOBACCO CONTROL INTERVENTIONS

Case Study: Tobacco Control in Uruguay

In Uruguay, smoking is a major cause of avoidable mortality; in 2004, smoking contributed to 14 percent of the country's total deaths (Sandoya and Bianco 2011).

Uruguay ratified the Framework Convention on Tobacco Control (FCTC) in 2004; by 2005, the country began to implement increasingly comprehensive tobacco control measures. Starting with banning tobacco advertising except at the point of sale and tobacco sponsorships, Uruguay outlawed smoking in enclosed public spaces and workplaces. It also required primary health care providers to give free diagnosis and treatment of tobacco dependence, and stipulated that pictograms with health warnings must cover 80 percent of the front and back of cigarette packages. Terms like *light*, *mild*, and *low in tar* were banned. Following a

sequence of tax increases, the real consumer price of a pack of cigarettes rose by 88 percent from January 2003 to December 2010.

Abascal and others (2012) evaluated the impact of these tobacco control measures by comparing Uruguay with neighboring Argentina. Per-person consumption of cigarettes fell by 4.3 percent annually in Uruguay but increased by 0.6 percent in Argentina; the prevalence of tobacco use in adolescents decreased by 8 percent annually in Uruguay and decreased 2.5 percent in Argentina; and the prevalence of tobacco use by adults decreased by 3.3 percent annually in Uruguay and decreased by 1.7 percent in Argentina.

The impact of specific interventions is difficult to estimate, but studies suggest that comprehensive tobacco control policies should be adopted. Reductions in tobacco use of the size seen in Uruguay (approximately 23 percent over six years) would have a significant impact on the future global burden of tobacco-associated diseases.

Globalization and Tobacco Control

A new major challenge to tobacco control is the globalization of the tobacco industry. Globalization increasingly challenges strong domestic tobacco control policies under various trade and investment agreements (in addition to challenges in national courts). For example, the major multinational tobacco companies have sued the government of Uruguay for its aggressive tobacco control policies. Australia's plain packaging legislation is being challenged by Philip Morris Asia under the bilateral investment treaty between Hong Kong SAR, China, where the corporation is based, and Australia, as well as by the Dominican Republic, Honduras, and Ukraine through the World Trade Organization (WTO) (Oliver 2015). Similarly, Philip Morris International is challenging Uruguay's graphic warning labels and limit on brand variations under a bilateral investment treaty between Switzerland and Uruguay, while Indonesia won its WTO case against the United States' ban on clove-flavored cigarettes.

International Initiatives

The main vehicle to accelerate tobacco control is WHO's FCTC, the first global treaty on public health, which has been signed by 180 countries. The FCTC has specific provisions for the introduction of the strategies with proven effectiveness discussed in this chapter. The main limitation of the FCTC is that it is largely a statement of intent; the specific actions needed to implement the provisions in each country require ongoing

technical support. The highest priority is countering the active influence of the tobacco industry, which seeks to secure complex tax regimes favoring certain segments of the tobacco market, as well as to lobby for initiatives to confuse governments on tobacco taxes (Jha and Alleyne 2015).

The 2013 World Health Assembly called on governments to decrease the prevalence of smoking by one-third by 2025 (WHO 2011); doing so would avoid more than 200 million deaths from tobacco over the remainder of the century (Jha 2009; Jha and Peto 2014). However, few governments are investing resources in tobacco control measures. HICs spent the largest amount (US\$1.4 per capita in 2010), which was less than 1 percent of the revenues from tobacco taxes. Middle-income countries spent a great deal less (a little more than US\$0.1 per capita in 2010); low-income countries spent about US\$0.1 per capita in 2010 (WHO 2013b).

Bloomberg Philanthropies and the Bill & Melinda Gates Foundation have pledged, collectively, nearly US\$700 million to fund global tobacco control programs. Effective use of these funds could avoid a substantial number of deaths in the coming decades as a result of increased adult cessation, and even more deaths could be avoided in the second half of the 21st century from lower increases in youth smoking rates.

CONCLUSIONS: AVOIDABLE TOBACCO DEATHS BEFORE 2050

Earlier estimates (Jha 2009; Jha, Chaloupka, and others, 2006) have examined the potential impact of a 70 percent price increase and a 10 percent reduction in tobacco consumption from nonprice interventions, such as bans on public smoking and information measures, among the global cohort of 1.1 billion smokers in 2000. Price increases have the greatest impact on future tobacco mortality; a 70 percent higher price would prevent more than 110 million deaths, or one-fourth of all expected premature deaths from tobacco worldwide. Of the avoided deaths, about 25 million would be from cancer and 50 million would be from vascular disease. Nonprice interventions would prevent 35 million deaths.

Worldwide, a one-third reduction in smoking could be achieved by doubling the inflation-adjusted price of cigarettes; in many LMICs, this price increase could be realized by tripling the real excise tax on tobacco. Other nonprice interventions could help to reduce consumption and make the substantial increases in real excise taxes politically acceptable. The main challenge remains to try to bring forward the time when large numbers of current smokers quit.

NOTES

World Bank Income Classifications as of July 2014 are as follows, based on estimates of gross national income (GNI) per capita for 2013:

- Low-income countries (LICs) = US\$1,045 or less
- Middle-income countries (MICs) are subdivided:
 - lower-middle-income = US\$1,046 to US\$4,125
 - upper-middle-income (UMICs) = US\$4,126 to US\$12,745
- High-income countries (HICs) = US\$12,746 or more.

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