How to prevent 100 million deaths from tobacco

Thomas R Frieden, Michael R Bloomberg

Lancet 2007; 369: 1758–61

New York City Department of Health and Mental Hygiene, 125 Worth Street, CN28, Room 331, New York, NY 10013, USA (T R Frieden MD)**; and Office of the Mayor, New York, NY, USA** (M R Bloomberg MBA)

Correspondence to:
Dr Thomas R Frieden
tfrieden@health.nyc.gov

For the first time ever, the world's leading agent of death is a man-made substance—tobacco. If current trends continue, tobacco will kill 1000 million people prematurely during this century.[1] Tobacco, which kills at least a third of people who use it,[2] is also the largest single cause of health inequalities in some low-income populations.[3] Millions of deaths can be prevented if we take urgent action based on available information.[4]

Despite this enormous and growing burden of premature illness and death, and despite evidence showing the effectiveness of antitobacco initiatives, few countries use most of these public-health interventions to reduce tobacco use and none use them all. Although the framework convention on tobacco control (FCTC) provides context for improvement, there is currently no standard technical package for tobacco control analogous to those developed and implemented for control of tuberculosis,[5] HIV,[6] or malaria.[7] Furthermore, no quantifiable international target for tobacco control exists, and government resources and bilateral or private-sector funding are limited. Here, we propose a global target, outline a technical package, and describe a new grant programme to expand implementation of effective tobacco control.

Although global data are emerging for youth smoking,[8] data for prevalence of adult smoking are non-standardised and of uneven quality. An estimated two-thirds of the world's more than 1000 million adult smokers live in 15 low-income or middle-income nations, and 80% of the world's smokers live in 24 countries.

Because quantification of illness caused by tobacco can be difficult, particularly in developing countries, the proportion of the adult population that smokes is the most important global target for tobacco control. Current global prevalence of smoking in adults is estimated at about 25%.[1] Some developed and less-developed countries (eg, Australia, Brazil, Canada, South Africa, and Sweden) have reduced this rate to 20% or lower by implementation of effective policies; all nations and populations should be able to achieve this prevalence level.

Simply put, and for discussion reasons, the goal would be for no nation to have a smoking rate of more than 20% and for countries to reduce the absolute smoking prevalence by at least 5% (or to decrease prevalence if already 5–10% and maintain prevalence at <5% if it was at this level at the outset) between 2005 and 2020. Keeping rates low is especially important for the large population of young women in Asia and elsewhere who do not currently smoke but are targeted by the tobacco industry. Of course, these targets would need to be reviewed and agreed by countries and global authorities. If the world reduces absolute adult smoking prevalence by 5% by 2020, at least 100 million fewer tobacco-related premature deaths would occur in people alive today, and another 50 million deaths would be prevented in infants born between now and 2030 (table 1). Virtually all deaths prevented up to 2050 would be of current smokers who quit; subsequently, prevented deaths would increasingly be of people who never start smoking.[9]

Population dynamics might limit the potential to reduce prevalence rapidly;[10] whether this specific goal can be reached is not known. However, we do know that effective strategies to reduce smoking exist—and they are not being applied widely. Tobacco use can be decreased by addressing price, image, exposure, cessation experience, and monitoring (table 2).

In New York City, a comprehensive tobacco-control programme was implemented in 2002.[11] Tax increases raised the legal retail price of cigarettes by 32% to nearly US$7 per pack. Virtually all indoor workplaces, including bars and restaurants, were made smoke-free, despite vocal opposition.[12] Hard-hitting print and broadcast antitobacco advertising campaigns were initiated (in the USA, state and local restrictions on tobacco company marketing are currently pre-empted by federal legislation). Smokers were provided with free courses of nicotine-replacement treatment to help them quit;[13] nearly 20% of smokers were reached over 3 years. Rigorous surveillance was established.[14] After a decade with no change in smoking prevalence, within 2 years there were nearly 200 000 fewer smokers in New York—a decline in adult smoking prevalence from 21·6% to 18·4%. Progress on this scale faces political obstacles: although tobacco taxation is favoured by most of the public, smoke-free policies and other measures are usually controversial when introduced, and effective tobacco-control measures are almost invariably opposed by the powerful tobacco industry. Nonetheless, antismoking measures, once implemented, are generally popular and well-accepted.

	Population in 2006*	Number of smokers†	Reduction in smokers‡	Premature deaths prevented§
Current				
Adults (age ≥18 years)	4357	1089	218	73
Future				
Children (age 0–17 years)	2122*	531	106	35
Unborn (2007–2030)	3020*	755	151	50
Minimum number of smoking-related deaths prevented in the 21st century	..	..	..	158

Data are estimated number (millions). Population estimate source: US Census Bureau, International Database (accessed Feb 2, 2007, at http://www.census.gov/ipc/www/idbagg.html). *Estimated number who will survive to age 18 years, using child mortality rate under age 5 years as proxy and assuming child mortality will be reduced 50% by 2030. †Current or future smokers (assuming no change in current 25% adult smoking prevalence). ‡Assuming smoking prevalence is reduced from 25% to 20%. §Assuming a third of smokers will die from smoking-related illness.

***Table 1*: Estimated reduction in smoking-related premature deaths if global smoking prevalence is reduced from 25% to 20%**

	Description	Benefits	Comments
Price	Increase tobacco taxes and prevent smuggling	• Price increases are, by far, the most effective way to reduce tobacco use • Children, young adults, and people with low income are most price sensitive	• Tobacco taxes favoured by most of the public; allocation for tobacco control and other health and social programmes further increases popularity • Despite tobacco industry claims, increased taxation does not reduce government revenues • Addressing concerns about worker displacement from tobacco industry jobs can be politically important in some areas • Reduction of smuggling protects both health benefits and tax revenues
Image	Ban direct and indirect tobacco advertising	• Advertising and marketing bans limit industry's ability to create positive image of tobacco • If comprehensive, marketing and promotion bans also restrain industry's ability to counteract taxation with interventions that lower prices (eg, coupons, 2-for-1 sales)	• The tobacco industry has subverted advertising bans by using point-of-sale, promotions, direct mail, sponsorships, product displays, product placement, and other marketing methods • Industry advertising can also be reduced if companies are not allowed tax deductions for marketing and promotion as business expenses
	Hard-hitting, sustained antitobacco advertising campaigns	• Counter industry-created positive image of tobacco by, among other messages, emphasising harmful effects of smoking and second-hand smoke; revealing industry tactics; benefits of and potential to stop smoking; human face of suffering caused by tobacco; decline in smoking and reduction in exposure to tobacco smoke	• Antitobacco advertisements sponsored by tobacco industry shown to be ineffective or to increase tobacco use
Exposure	Establish smoke-free public places	• Protect public from tobacco smoke pollution • Increase likelihood workers will quit • Raise awareness of the health threat that tobacco smoke pollution poses to others, increasing motivation to quit • Smoke-free public places encourage voluntary establishment of smoke-free homes, protecting children and other family members and helping smokers quit • Help change image of smoking	• Laws that allow smoking in some parts of workplaces (ie, partial bans) are not effective at protecting others or encouraging cessation • Smoke-free laws are popular and well-accepted once implemented • Smoke-free laws repeatedly shown to result in either no change, or a slight increase, in revenue for restaurants and bars
Cessation services	Help smokers quit by making effective treatment available widely	• Nearly doubles smokers' chances of stopping permanently • Change image of tobacco; might facilitate policy change • Engage medical professionals in antitobacco efforts	• Tobacco dependence undertreated; combination of medication and counselling works best • Greater cost-effectiveness and health effect than most clinical interventions; less effective for reduction of tobacco use prevalence than price, image, and exposure interventions • Ethically important to use some taxes that smokers pay to help those who want to quit
Monitoring	Guide programme implementation and monitor effectiveness	• Determine prevalence and patterns of tobacco use to target and assess tobacco control interventions • Assess effect of taxation, smuggling prevention, image, exposure, cessation interventions, and knowledge about tobacco, among other topics	• Standardised, biomarker-validated definitions of smoking status needed

Table 2: **Technical package for tobacco control**

Taxation is the most effective way to reduce tobacco use,[4] and it accounted for more than half the decline attributed to New York's comprehensive programme.[11] Price elasticity of tobacco consumption in established market economies is about –0·25% to –0·5% (ie, for every 10% increase in price, tobacco consumption is reduced by 2·5–5%);[4] prevalence elasticity is estimated to be about half of consumption elasticity.[15] In the USA, young adults and people with low income are more price sensitive than other populations.[16]

Price elasticity, similarly, might be higher in low-income countries than in other regions.[4] If a target is set, prevalence and price elasticities are known, and a proportion of the target decline (eg, 50%) is allocated to effects of taxation, then establishing target tax rates for every country is possible. This tax rate will be effective only if it is periodically adjusted for inflation and for consumer purchasing power. Despite tobacco industry lobbyists' claims to the contrary, increased taxation has not reduced government revenues.[15]

Effective taxation requires prevention of cross-border and internal smuggling. Cigarettes that have been smuggled are sold at steep discounts, stimulating demand—particularly in youth and low-income populations—and undermining tax policies.[17] Implementation of the FCTC must lead to workable and effective smuggling-prevention protocols; these might draw on experiences from the arms manufacturing and controlled substances industries and hold every manufacturer legally and economically accountable for ensuring that their products are not sold illegally.[17]

Allocation of tobacco taxes specifically to tobacco control and other public-health measures is sometimes opposed by finance ministries.[4] However, if revenues provide funding for tobacco control (including services for smokers who pay these taxes) and broader health and social service programmes, then this earmarking increases the popularity of tobacco taxes.[4] In some countries, addressing concerns about workers potentially displaced from the tobacco industry can be politically important.

Changing the image of smoking is also essential to end the epidemic of tobacco use. Over recent decades, the tobacco industry has spent hundreds of billions of dollars on marketing, including traditional advertising

(eg, broadcast and print advertisments, billboards), point-of-sale materials in stores, indirect marketing (eg, sponsorship of sporting and cultural events, charitable contributions, promotional allowances to wholesalers, distributors, and retailers, free cigarettes, in-store product displays, and branded promotional items), public relations and lobbying, and targeted price discounts to offset taxation. Smoking is also frequently portrayed in movies, often placed, supported, and—in some cases—paid for by the tobacco industry despite prohibitions in some countries on the practice; a substantial amount of adolescent smoking initiation in the USA has been attributed to viewing of smoking in movies.[18]

In the USA alone, the tobacco industry, which has violated civil racketeering laws by deceiving the public about the dangers of cigarettes,[19] spends more than US$13 000 million a year on marketing, more than 80% of which is for coupons and other price interventions to counteract taxation.[20] Globally, tobacco marketing expenditures probably total tens of billions of dollars annually. Advertising bans called for by the FCTC have the potential to greatly reduce smoking rates, but only if they are comprehensive[21] and preclude both direct and indirect advertising and promotion. To be effective, bans should also prohibit price discounts, free samples, and point-of-sale advertising and promotions, including in-store product displays. Countries can also reduce tobacco advertising by not allowing tobacco companies to deduct marketing and promotion as business expenses.

Hard-hitting, sustained, antitobacco advertising that emphasises the harmful effects of smoking can be effective.[22] In the USA, California and Massachusetts reduced tobacco use substantially with strong antitobacco advertising strategies.[23,24] Tobacco companies spend $50 per person every year on advertising and marketing in the USA;[20] a 1999 report by the US Centers for Disease Control and Prevention recommended that tobacco-control programmes spend annually at least $1 per person for antitobacco advertising.[25] Globally, only a minuscule fraction of that amount is spent on antitobacco advertising; even if $1 per person a year were spent worldwide ($6000 million annually), the amount would represent just a small fraction of what the tobacco industry would spend unless tobacco advertising and promotion were restricted.

Establishing smoke-free public places protects the public from tobacco smoke pollution, increases the likelihood that workers will quit, enhances awareness of the health threat posed to others by tobacco smoke pollution, and can help to change the image of smoking. Raising awareness of the health risks of second-hand smoke—which happens when smoke-free public places are established by law—also encourages families to voluntarily establish smoke-free homes; this action protects children and other family members and helps smokers to quit.[26] Smoking restrictions must be enforced and contain no exemptions; partial bans or separate smoking rooms do not prevent exposure and do not substantially decrease tobacco use.[27]

Faced with high prices, strong antitobacco advertisements, and the inability to smoke in public places, many smokers will want to quit but most will fail without assistance. Clinical and quitline-based cessation services can double an individual smoker's chance of quitting, are highly cost effective compared with other clinical interventions, and can reduce illness and death.[28] Although cessation services reduce smoking rates far less than increasing the price or changing the image of tobacco, they can be important for altering the image of cigarettes and increase the likelihood of implementing the legal changes outlined above.

Cessation services should be provided by the clinical-care system, which should itself be smoke-free. Brief doctor's advice to patients who smoke is effective[28] but rarely done. Over-the-counter nicotine replacement medicine can be important in helping smokers quit,[29] and other methods are effective. Tobacco dependence is generally undertreated; ideally, people trying to quit should use medications in conjunction with as much counselling as possible.

Surveillance is important to guide programme implementation and monitor results. Standardised, biomarker-validated definitions of smoking status are needed. Surveillance can also help to assess taxation, smuggling, image, knowledge about tobacco, cessation experience, and other areas. Data are needed for price elasticities in different geographic areas, smuggling prevention, best public-education strategies, and other topics. The tobacco industry will inevitably oppose worldwide antismoking initiatives; its actions need to be identified and countered.

In August, 2006, one of us (MRB) announced the formation of a global antismoking initiative to help the world become tobacco-free, with $125 million in initial funding for the first 2 years. This initiative will promote the evidence-based approaches outlined here: increasing taxes and preventing smuggling to raise the price of tobacco; changing the image of tobacco by banning direct and indirect advertising and undertaking hard-hitting antitobacco public-education campaigns; protecting non-smokers from exposure to second-hand smoke; and helping smokers to quit. Programmes in low-income and middle-income countries will: support public-sector efforts to implement these interventions; support advocacy to educate communities and encourage policy change; rigorously monitor the status of global tobacco use and countries' progress in implementation of interventions; and optimise tobacco-control interventions.

To put this strategy into practice, the public sector will be supported through international resource centres for advocacy, including legal expertise and health education. The initiative will support WHO to establish a global system to hold countries accountable for effective implementation of tobacco-control policies. A

competitively awarded grant programme for low-income and middle-income countries will offer funds of US$50 000–500 000 for up to 2 years, with priority given to countries with the highest burden (particularly China, India, Indonesia, the Russian Federation, and Bangladesh, which together account for nearly half the world's smokers). Systematic surveillance of adult tobacco use will enable effective targeting of interventions and monitoring of their effectiveness. It is an unfortunate fact that this single grant more than doubled total development aid for tobacco control. Other private and public donors are encouraged to join the initiative.

Although tobacco is now the world's leading killer, and although the FCTC provides the context for progress in tobacco control, there is currently no technical package for tobacco control, no measurable target, and little funding to reverse the world's leading preventable epidemic. Substantial progress is possible if countries increase tobacco taxes, change the image of tobacco through advertising bans and antitobacco marketing, establish smoke-free places, help smokers to quit, and rigorously assess the implementation of these measures. Government economic interests in tobacco manufacturing and tobacco revenues, and tobacco industry opposition, will make implementation of these strategies challenging. But if global adult smoking prevalence declines to 20% by 2020, at least 100 million fewer people currently alive will be killed prematurely by tobacco.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgments

We thank Drew Blakeman, Jennifer Ellis, Kelly Henning, and Julie Myers for assistance with research and review of the manuscript.

References

1 Mackay J, Eriksen M, Shafey O. The tobacco atlas, 2nd edn. Atlanta: American Cancer Society, 2006.

2 Seeman I. National mortality followback survey: 1986 summary, United States—vital and health statistics, series 20, no 19. Hyattsville: National Center for Health Statistics, 1992.

3 Jha P, Peto R, Zatonski W, Boreham J, Jarvis MJ, Lopez AD. Social inequalities in male mortality, and in male mortality from smoking: indirect estimation from national death rates in England and Wales, Poland, and North America. *Lancet* 2006; **368:** 367–70.

4 Jha P, Chaloupka FJ, Moore J, et al. Tobacco addiction. In: Jamison DT, Breman JG, Measham AR, et al, eds. Disease control priorities in developing countries, 2nd edn. New York: Oxford University Press, 2006: 869–85.

5 WHO. The global plan to stop TB, 2006–2015 (WHO/HTM/STB/2006.35). Geneva: World Health Organization, 2006.

6 WHO. 2006 report on the global AIDS epidemic (UNAIDS/06.20E.1105). Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS), 2006.

7 WHO. Strategic orientation paper on prevention and control of malaria (WHO/HTM/MAL/2005.1105). Geneva: World Health Organization, 2005.

8 Warren CW, Jones NR, Eriksen MP, Asma S. Patterns of global tobacco use in young people and implications for future chronic disease burden in adults. *Lancet* 2006; **367:** 749–53.

9 Peto R, Lopez AD. Future worldwide health effects of current smoking patterns. In: Koop CD, Pearson C, Schwarz MR, eds. Critical issues in global health. New York: Jossey-Bass, 2001: 154–61.

10 Mendez D, Warner KE, Courant PN. Has smoking cessation ceased? Expected trends in the prevalence of smoking in the United States. *Am J Epidemiol* 1998; **148:** 249–58.

11 Frieden TR, Mostashari F, Kerker BD, Miller N, Hajat A, Frankel M. Adult tobacco use levels after intensive tobacco control measures: New York City, 2002–2003. *Am J Public Health* 2005; **95:** 1016–23.

12 Chang C, Leighton J, Mostashari F, McCord C, Frieden TR. The New York City Smoke-Free Air Act: second-hand smoke as a worker health and safety issue. *Am J Ind Med* 2004; **46:** 188–95.

13 Miller N, Frieden TR, Liu SY, et al. Effectiveness of a large-scale distribution programme of free nicotine patches: a prospective evaluation. *Lancet* 2005; **365:** 1849–54.

14 Mostashari F, Kerker BD, Hajat A, Miller N, Frieden TR. Smoking practices in New York City: the use of a population-based survey to guide policy-making and programming. *J Urban Health* 2005; **82:** 58–70.

15 Chaloupka FJ, Hu T, Warner KE, Jacobs R, Yurekli A. The taxation of tobacco products. In: Jha P, Chaloupka FJ, eds. Tobacco control in developing countries. New York: Oxford University Press, 2000: 237–72.

16 Centers for Disease Control and Prevention (CDC). Response to increases in cigarette prices by race/ethnicity, income, and age groups: United States, 1976–1993. *MMWR Morb Mortal Wkly Rep* 1998; **47:** 605–09.

17 Joossens L, Raw M. Turning off the tap: the real solution to cigarette smuggling. *Int J Tuberc Lung Dis* 2003; **7:** 214–22.

18 Dalton MA, Sargent JD, Beach ML, et al. Effect of viewing smoking in movies on adolescent smoking initiation: a cohort study. *Lancet* 2003; **362:** 281–85.

19 United States of America v Philip Morris USA, Inc, et al—F Supp 2d—, no 99–2496 (GK) (DDC Aug 17, 2006). Available at: http://www.tobaccofreekids.org/reports/doj/FinalOpinion.pdf (accessed Feb 5, 2007).

20 Federal Trade Commission. Federal Trade Commission cigarette report for 2004 and 2005. Washington: Federal Trade Commission, 2007.

21 Saffer H, Chaloupka F. The effect of tobacco advertising bans on tobacco consumption. *J Health Econ* 2000; **19:** 1117–37.

22 Emery S, Wakefield MA, Terry-McElrath Y, et al. Televised state-sponsored antitobacco advertising and youth smoking beliefs and behavior in the United States, 1999–2000. *Arch Pediatr Adolesc Med* 2005; **159:** 639–45.

23 Fichtenberg CM, Glantz SA. Association of the California Tobacco Control Program with declines in cigarette consumption and mortality from heart disease. *N Engl J Med* 2000; **343:** 1772–77.

24 Biener L, Harris JE, Hamilton W. Impact of the Massachusetts tobacco control programme: population based trend analysis. *BMJ* 2000; **321:** 351–54.

25 CDC. Best practices for comprehensive tobacco control programs. Atlanta: Centers for Disease Control and Prevention, 1999.

26 Borland R, Yong HH, Cummings KM, Hyland A, Anderson S, Fong GT. Determinants and consequences of smoke-free homes: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control* 2006; **15** (suppl 3)**:** iii42–50.

27 US Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. Washington: US Department of Health and Human Services, 2006.

28 Fiore MC, Bailey WC, Cohen SJ, et al. Treating tobacco use and dependence: clinical practice guideline. Rockville: US Public Health Service, 2000.

29 Reed MB, Anderson CM, Vaughn JW, Burns DM. The effect of over-the-counter sales of the nicotine patch and nicotine gum on smoking cessation in California. *Cancer Epidemiol Biomarkers Prev* 2005; **14:** 2131–36.