

TOBACCO USE AND THE CARDIOVASCULAR DISEASE EPIDEMIC IN DEVELOPING COUNTRIES: GLOBAL CRISES AND OPPORTUNITY IN THE MAKING

Tobacco use is a powerful, independent predictor of deaths related to cardiovascular disease, and is an important contributor to deaths from major chronic diseases. Unfortunately, increasing rates of tobacco use throughout the world are contributing significantly to the burden of death and disability from these diseases, especially in developing countries. If current trends continue, the annual number of people killed by tobacco use will more than triple, to 10 million by 2030. However, we have an opportunity to reverse these trends and avoid this impending epidemic of tobacco-related deaths. In this article, we examine the current global burden of tobacco-related diseases, and future projections, and conclude by emphasizing that: 1) effective strategies for curbing this epidemic are available; and 2) the time has come for effective global tobacco-control action. (*Ethn Dis.* 2003;13[suppl2]:S2-81–S2-87)

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INTRODUCTION

Tobacco use is pandemic. If the countries of the world do not act to reduce tobacco use, the number of people it kills will increase dramatically. Fortunately, we know that tobacco use can be reduced, and that large-scale, and sustained, comprehensive control programs are effective in reducing the impact of tobacco-related conditions, such as cardiovascular diseases and cancer. However, smarter, faster, and stronger methods are necessary, and the focus must be on taking action. In this article, we explore the global burden of tobacco use and its impact on rates of major diseases, such as cardiovascular diseases and cancer, and provide a framework for multifaceted tobacco control programs that can be applied in any country.

BURDEN OF TOBACCO USE

There are already a billion smokers in the world today, and, if current trends continue, by 2030, approximately a billion more young adults will have begun smoking, and the worldwide death toll from tobacco will rise from 4.6 million/year in 2000, to more than 10 million/year by 2030; approximately 70% of these deaths will occur in developing countries.¹

In 1995, 29% of the world's population aged 15 years and older smoked daily.² Low-income and middle-income countries, whose populations account for four fifths of the global adult population, accounted for 82% of the world's smokers. The East Asia and Pacific region, which includes China, ac-

counted for 36% (41 million) of all smokers. Overall, smoking prevalence rates were highest in Europe and Central Asia (40%), and lowest in sub-Saharan Africa (18%). For both males and females, there was wide variation in smoking prevalence among regions. The prevalence rates of smoking among males were highest in East Asia, the Pacific, Europe, and Central Asia, (approximately 60% for each), and lowest in sub-Saharan Africa (29% for each country). Among females, prevalence rates were highest in Europe and Central Asia (26% for each), and lowest in South Asia (5% for cigarettes and bidis combined), and in the Middle East and North Africa (6% for each). The overall prevalence rate of smoking was much higher among men (47%), compared to women (11%). The proportion of men who smoke is well above 50%, in many low-income and middle-income countries. Most epidemiological studies suggest that individuals who do not start smoking in adolescence or young adulthood, are unlikely ever to become smokers. The overwhelming majority of smokers start before the age of 25 years, often in childhood or adolescence; in high-income countries, 8 out of 10 begin in their teens.³ To track tobacco use among youth across countries using a common methodology and core questionnaire, the World Health Organization (WHO), and the Centers for Disease Control and Prevention (CDC), developed the Global Youth Tobacco Survey (GYTS). Worldwide, of the 6.2 billion people alive today, an estimated 186 million are aged 13–15 years. Of this 186 million, an estimated 34.8 million are currently using some form of tobacco, and 25.8 million (13.9%) are

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currently smoking cigarettes.⁴ Across the 6 WHO regions, the prevalence rate of cigarette smoking among youth aged 13–15 years is highest in Europe (33.2%), and the Americas (15.6%), and lowest in the Western Pacific (8.0%). Use of tobacco products other than cigarettes is highest in Southeast Asia (19.6%), and the Eastern Mediterranean (13.5%). Almost one in 4 youth who have ever smoked, smoked their first cigarette before the age of 10. In many countries, although the more affluent are the first to become smokers, it is the poor who ultimately suffer the greatest burden of disease from tobacco use.⁴

Tobacco use is a known, or probable, cause of more than 25 diseases. It is well established that prolonged smoking is an important cause of chronic disease. Prolonged smoking causes many diseases in addition to lung cancer, other cancers, chronic respiratory, and cardiovascular diseases. However, because the diseases caused by smoking can take several decades to develop, the toll of death and disability from smoking observed already in some high-income countries, has yet to be fully experienced in low-income and middle-income countries, where smoking prevalence has started to increase only recently. Moreover, the main diseases by which smoking kills people vary substantially from country to country: in America, vascular disease and lung cancer predominate⁵; in China, chronic obstructive pulmo-

nary disease causes more tobacco-related deaths than does lung cancer^{6,7}; and in India, where almost half of the world's tuberculosis (TB) deaths occur, the increased TB risk associated with smoking may be of particular importance.^{8,9}

The high rate of death from cardiovascular diseases among smokers is particularly noteworthy. Because CVD death rates are typically much higher than those for cancer or other causes associated with smoking, the number of smoking-related deaths from cardiovascular diseases, especially ischemic heart disease and stroke, is higher than that from other causes, including lung cancer, for which the relative risk is much higher. This pattern, however, is likely to change, as the overall death rate from cardiovascular diseases declines. Finally, it is worth noting that the overall smoking-related relative risk for death from cardiovascular diseases (which is approximately 2) masks a significant age gradient. Among people 50 years of age, smokers are at a 5 to 6 times higher risk for death from these diseases, compared to nonsmokers, with the relative excess declining with age. This suggests that if a smoker dies from cardiovascular disease before the age of 50 years, there is a 70%–80% chance that the disease was caused by smoking; in addition, that cardiovascular disease appears to be the principal mechanism through which smoking causes a 3-fold excess mortality rate among people of middle age. Cigarette smoking is only one of several causative factors that produce disease. This is especially true for ischemic heart disease, as smoking interacts synergistically with other factors, such as hypercholesterolemia and hypertension, to greatly increase the risk of certain smokers for heart disease. Evidence suggests that the independent risk for tobacco-related diseases attributable to smoking is comparable to that attributable to other major risk factors, such as lung cancer and heart disease.¹⁰

The extent to which smoking is responsible for deaths from diseases other

than lung cancer varies substantially from one population to another, largely due to differences in the prevalence rates of various risk factors for disease. For example, in many developing countries, because cholesterol levels are low, and the prevalence rates of pulmonary diseases are high, smoking contributes to relatively fewer deaths from cardiovascular diseases, but to relatively more deaths from pulmonary diseases.¹¹

Smokers are at twice the risk of nonsmokers for heart attack, and are at 2 to 4 times the risk for sudden death from a heart attack; in addition, this excess risk increases with the number of cigarettes smoked. Overall, cigarette smokers have coronary heart disease (CHD) rates 70% higher than those of nonsmokers, with heavy smokers dying from CHD at a rate 2 to 3 times that of nonsmokers.⁵ In addition, recent epidemiological evidence demonstrates that never-smokers exposed to environmental tobacco smoke (ETS) are at an increased risk, not only for lung cancer, but also for cardiovascular disease. In recent prospective trials and meta-analyses, researchers estimated that the relative risk for cardiovascular diseases was 1–2 to 1–3, among individuals exposed to ETS. The number of ETS-related deaths from heart disease is about 3 times the number from all other causes.¹²

Deaths from cardiovascular diseases account for a significant portion of adult deaths in all countries. More than 50 million people are estimated to have died in 1990; ischemic heart disease (IHD) was the leading cause of death worldwide, accounting for 6.3 million deaths: 2.7 million in established market economies (EME) and formerly socialist economies (FSE), and 3.6 million in developing countries. Stroke was the second most common cause of death, accounting for 4.38 million, with almost 3 million of these occurring in developing countries, followed by acute respiratory infections.¹³ Of the various cardiovascular disease pathologies, IHD

and stroke predominate in the developed countries, accounting for 75%–80% of all cardiovascular deaths. Stroke is proportionately more important as a cause of cardiovascular disease death in Eastern Europe (31%), than in Western Europe (25%). Rheumatic heart disease is estimated to cause 1%–6% of all CHD deaths in developing countries (and about 2.4% globally). Inflammatory heart disease (pericarditis, endocarditis, myocarditis, and cardiomyopathies) accounts for similar proportions of cardiovascular deaths, with the highest proportion (7.8%) occurring in sub-Saharan Africa (SSA). It is also worth noting that IHD accounts for a substantial proportion of cardiovascular deaths in all developing regions, from 52% in India, to 26% in SSA. Stroke, on the other hand, is by far the leading cause of cardiovascular deaths in China and SSA, accounting for roughly half of all cardiovascular deaths in these countries in 1990.¹⁴

FUTURE PROJECTIONS

Policy makers should be concerned, not only by the current rates of smoking-related deaths, the product of past smoking patterns, but also by the much higher death rates that are projected in coming decades as a result of current smoking, especially for low- and middle-income countries. Tobacco is projected to cause roughly 450 million deaths between 2000 and 2050. At some point in the second decade of the 21st century, deaths from tobacco will average 10 million a year. At the current rate of smoking initiation among young adults (25%–33%), an additional 500 billion tobacco deaths are expected in the second half of the century. Therefore, if current patterns continue, tobacco is expected to kill about a billion people in the 21st century, 10 times as many as it killed in the 20th.¹ Using econometric models, Murray and Lopez suggest that there will be 8.3 million to-

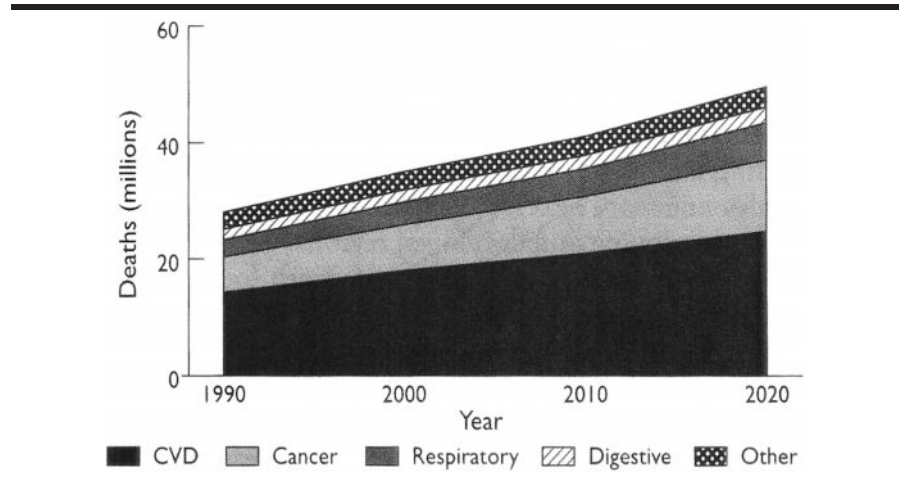


Fig 1. Baseline projections of deaths from group 2 causes, world, 1990–2020¹⁴

and tobacco-related deaths per year by 2020, and that the percentage of deaths attributed to tobacco will rise from 6% in 1990 to approximately 12% in 2020.¹³ Worldwide, the annual death rate from noncommunicable diseases is expected to rise from 28.1 million deaths in 1990, to 49.7 million in 2020, while the annual death rate from communicable maternal, perinatal, and nutritional disorders, is predicted to decline from 17.2 million in 1990, to 10.3 million in 2020 (Figure 1). It is interesting to examine how figures for disability-adjusted life years (DALYs), a measure of years lost due to disability or premature deaths from various leading causes, are expected to change over the next 3 decades (Figure 2). Figure 3 shows similar projected changes in the rank order of various worldwide causes of death.¹⁴

STRATEGIES FOR GLOBAL HEALTH ACTION

The 3 main foci of any strategy to combat the worldwide tobacco epidemic should be to prevent people from starting to smoke, to help smokers quit, and to eliminate nonsmokers' exposure to tobacco smoke. Various cost-effective strategies for doing so have had a positive impact in many countries. To build on those successes, we need to devise a

comprehensive tobacco control strategy to guide national and global action. In the following section, we explore the key components of a comprehensive tobacco control strategy that is applicable both locally and globally. The components of such a strategy should include: 1) educate the people about the health consequences of tobacco use; 2) discourage smoking primarily through tax increases; 3) pass legislative measures that ban tobacco advertising and promotion and restrict smoking; 4) provide smokers with cessation counseling and medications; 5) establish adequate tobacco-control infrastructure and management; 6) establish surveillance and evaluation mechanisms to assess the effectiveness of interventions; and 7) conduct international efforts. Figure 4 demonstrates the relationship between several of these strategies and the adult per capita cigarette consumption in the United States from 1900 through 1999.

Education and Information

Evidence about the harmful effects of tobacco use and the addictive nature of nicotine should be widely disseminated to the public. Mass media summaries of published scientific and epidemiological research, warning labels on tobacco products, school and community programs, and counter-marketing strategies, have all been shown to be ef-

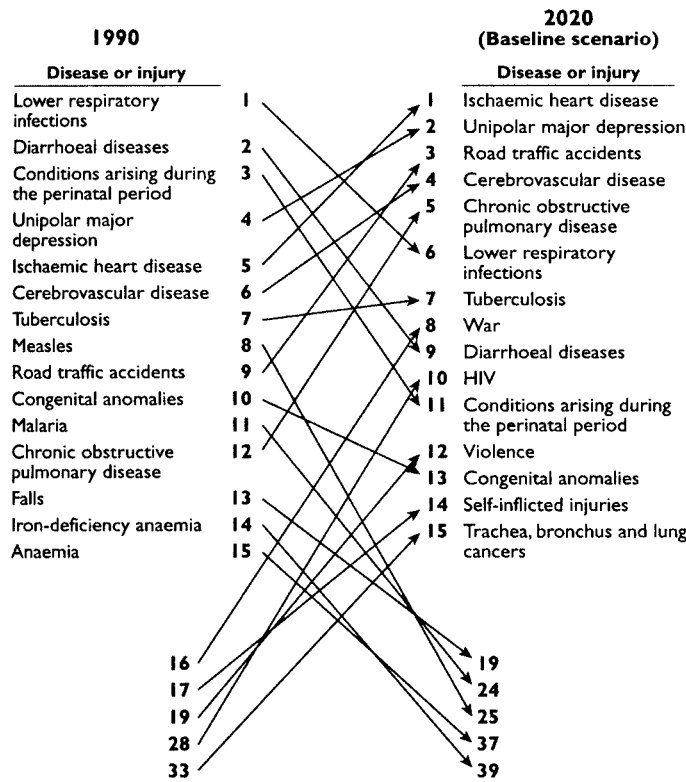


Fig 2. Change in rank order of disability adjusted life years for the 15 leading causes, world, 1990-2020¹⁴

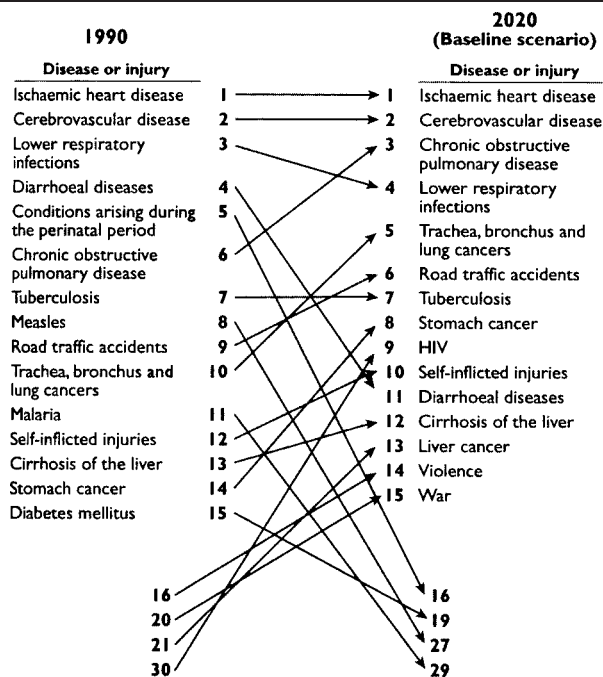


Fig 3. Change in rank order of deaths for the leading 15 causes, world, 1990-2020¹⁴

fective to varying degrees.¹⁵ Figures 5 and 6 provide examples from the United States and Canada.

Economic Measures

Tax increases are the most effective and practical strategy to reduce tobacco use. A 10% tax increase has been shown to reduce consumption by 8%. Young people, and those in lower income and education strata, are most price-responsive. Econometric models show that raising the real price of cigarettes by 10%, through taxes worldwide, would cause 40 million smokers alive in 1995 to quit, thus preventing a minimum of 10 million tobacco-related deaths.¹⁶ Tax increase strategies are important, both for generating revenue, and reducing tobacco consumption.

Policy Measures

Comprehensive legislation that prohibits tobacco advertising and promotion, smoking in public places, and underage access, and limits harmful substances in tobacco products, is an effective mechanism, when enforced. Since 1972, most high-income countries have introduced such legislation, and results from a recent study of 22 high-income countries based on data from 1970 and 1992, demonstrated that comprehensive bans on cigarette advertising and promotion can reduce smoking rates, but that more limited partial bans have little or no effect. The study's authors concluded that if the most comprehensive advertising restrictions were in place, tobacco consumption would fall by more than 6% in high-income countries.¹⁶ In another study, researchers compared tobacco consumption trends in countries with relatively complete bans on advertising, and consumption within countries without such bans, and found that, in the countries with nearly complete bans, the downward trend in consumption was much steeper.¹⁶

Clean indoor air policies in public places are important, because they protect nonsmokers from exposure to the

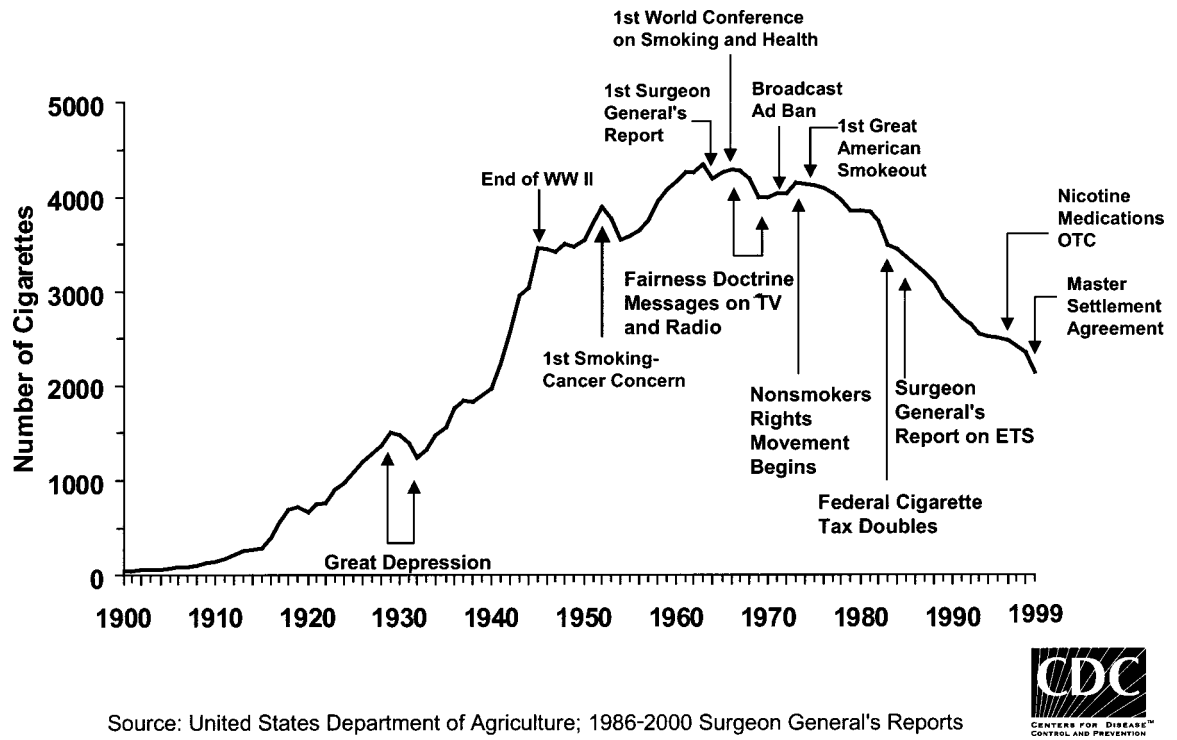


Fig 4. Adult per capita cigarette consumption and major smoking-and-health events, USA, 1900-1999



Fig 5. Examples of countermarketing. Source: CDC Media Campaign Resource Center



Fig 6. Example of a warning label. Source: Health Canada

health risks of environmental tobacco smoke, as well as reducing smokers' consumption of cigarettes, and inducing some smokers to quit.^{17,18} Many countries are implementing restrictions on smoking in public buildings, restaurants, schools, day care centers, and transportation facilities, and there is considerable evidence for the effectiveness of these restrictions.^{19,20}

Youth access laws are designed to keep tobacco products away from youth, by limiting minors' access to tobacco products from commercial sources (grocery stores, drug stores, vending machines, gas stations). However, many developing countries, where tobacco consumption is rising, lack the infrastructure and resources needed to implement and enforce such restrictions. Evidence is mixed on the effectiveness of youth access laws in reducing the prevalence rates of youth smoking.¹⁶

Cessation Measures

Programs that help smokers quit can produce a quicker public health benefit. Smokers who quit smoking before the age of 50, reduce their risk of dying in the next 15 years by 50%.²¹ Nicotine replacement therapy (NRT), and pro-

active counseling, have been shown to help people quit smoking. Unfortunately, NRT is difficult to obtain in many countries.

Infrastructure Development and Management

To be effective, a global tobacco control program will need to have an efficient infrastructure, capable of coordinating and linking program components at the national, regional, and global levels. Because a comprehensive strategy involves multiple partners, such coordination will be possible only if the global program has adequate resources and communication systems. Essential administration and management activities include: 1) recruiting and developing qualified technical, program, and administrative staff; 2) coordinating implementation across program areas, and assessing program performance; 3) creating an effective communication system; and 4) developing a sound fiscal management system.²² This may seem difficult to attain, but it is essential that adequate resources are made available for administrative technology and communication systems.

Surveillance

Results of tobacco-use surveillance can guide policy decisions, research initiatives, and the development and evaluation of intervention programs.²² Although surveillance for tobacco-related health effects remains weak in most developing countries, there has been progress in developing a globally standardized approach to measuring tobacco use. The Global Youth Tobacco Survey (GYTS) has been completed in 88 countries; an additional 39 countries are either in the field or preparing to start their survey, and 25 new countries will be trained to conduct their GYTS during 2003. The information generated from these surveys will stimulate the development of tobacco control programs, and will be used to assess progress in meeting program and policy goals. An ideal tobacco-use surveillance system would monitor variables contained in the traditional epidemiological model of agent, host, vector, environment, and incidental host.⁴ Surveillance of agent factors (ie, factors related to various tobacco products) could include monitoring levels of toxic constituents, pH, and additives. Most surveillance work monitors host factors (ie, factors related to tobacco users, or potential users), such as patterns of initiation, susceptibility to tobacco use, indicators of dependence, quitting patterns and methods, sources of tobacco, prices paid for tobacco products, usual brand, receptivity to marketing, awareness of tobacco control programs, and opinions about tobacco control policies. Vector surveillance (eg, chronicling tobacco marketing activities), and environmental surveillance (eg, national tobacco control legislation and program activities, exposure to health messages, and to tobacco promotions, prices, and placement), are also important.²² Evaluations of individual tobacco control programs should be built upon, and complement, tobacco-related surveillance systems, and programs at the national, regional, and global levels should be linked, and the

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progress of each program component should be tracked.

International Efforts

Because of the increasing globalization of the tobacco industry, some aspects of tobacco control require the leadership of international agencies such as the World Health Organization (WHO). The proposed WHO Framework Convention for Tobacco Control (FCTC) is a particularly promising vehicle for such action. The FCTC provides a basis for multilateral commitment, cooperation, and action, designed to address the rise and spread of tobacco use. All transnational tobacco control issues, including trade, smuggling, advertising, and sponsorship, require such multilateral cooperation.¹⁵

CONCLUSION

Effective evidence-based tobacco control strategies are available: We know what to do. Most tobacco control programs will use a mix of proven strategies; however, the mix will vary from country to country. The evidence from countries where comprehensive tobacco control programs have been evaluated, suggests that it is possible to significantly reduce the burden of tobacco use. By investing in these strategies, governments have an unprecedented opportunity to improve the health of their citizens. With the leadership of interna-

tional agencies, such as WHO, we have a chance to reduce tobacco use, thereby reducing the risk for cancer, cardiovascular diseases, and other tobacco-related diseases, throughout the world.

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