

# The exploding worldwide cancer burden: the impact of cancer on women\*

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Although age-adjusted cancer death rates have started to decline in the United States and other developed nations – thanks in large part to widespread screening programs that detect cancers at early, treatable stages – cancer in developing countries is on the rise. Ironically, rising life expectancy in those nations along with the adoption of ‘Western’ lifestyles will leave many more people vulnerable to cancer. Unfortunately, the early detection tools and treatment technology that have helped control cancer in wealthier lands are often not readily available in many other countries.

Much of this increased cancer burden will take the form of cancers that affect women – not only breast, cervical, and other gynecologic cancers but colorectal cancer, lung cancer, and other malignancies related to tobacco. Physicians specializing in cancer care for women need to be alert to every opportunity to improve cancer screening and prevention among the growing, aging populations of less-developed countries.

Less precise but less costly and more widely available screening techniques may save thousands more lives than the most sophisticated technology because low-cost programs can be applied widely instead of being reserved for a fortunate few. In addition, education and prevention efforts directed toward tobacco use need to be put in place to help stem an epidemic of tobacco-related cancers that has largely peaked in developed countries but looms ominously in the future of developing nations.

In 1998, for the first time, age-adjusted cancer mortality rates declined in the United States<sup>(1)</sup>. That trend is expected to continue, a testimony to the progress that has been made over the last 50 years in the prevention, detection, and treatment of this disease. It would be a mistake, however, to allow optimism over what we

have achieved in this and other highly developed countries to obscure the reality of the cancer problem on a worldwide basis.

In Third World countries and developing nations, the impact of cancer is often thought to pale in comparison with other illnesses such as infectious diseases and AIDS, in particular. The substantial suffering caused by those diseases does not obscure the fact that the toll of cancer is increasing rapidly and dramatically in many countries and that access to the technology and therapies that have made it possible for developed countries to produce declining mortality rates is largely unavailable or even absent in much of the world.

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## Changing demographics

To a great extent, the explosion of cancer worldwide is a function of changing demographics. For the most part, cancer is a disease of aging and the world population is growing larger and older. Further, the causes of cancer often begin long before the disease manifests itself, so in effect, we reap the ugly fruit of our exposures years after they actually occur. Exposures and cumulative genetic risks that occur in the middle years often produce cancer in the latter part of life. To illustrate how compelling demographics are in terms of cancer incidence and mortality, look at three of the most basic measures of demographic change: total population, life expectancy, and age of death.

Table 1 shows that by 2025, the world's population is expected to grow from the level of 5.8 billion in 1998 to almost 8 billion, an increase of 37%<sup>(2)</sup>. By that year, there will be 800 million people over the age of 65<sup>(2)</sup>, a staggering increase of 105%. Those over 65 will then make up 10% of the world population.

As Table 1 indicates, significant increases in both life expectancy and average age at death are projected as well. The implications of these demographic changes are enormous, not just in terms of cancer incidence and mortality but in more global terms. They will influence almost every aspect of how we inhabit our planet.

Many developing countries are now locked in a virtual catch 22 with regard to the health of their populations. Throughout most of Africa and Asia and portions of South America, infectious diseases continue to predominate<sup>(2)</sup>. While the current and potential impact of AIDS on the individuals living in these areas and on the social and political structures of their nations is devastating<sup>(3)</sup>, it is only the most visible and destructive of a number of infectious conditions that continue to plague these countries. At the same time, however, as economies grow and emerging countries advance, many types of non-com-

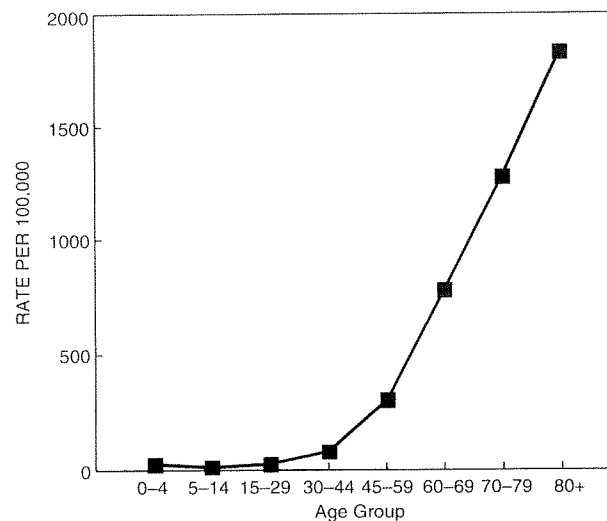


Fig. 1. Estimated global incidence rate of all cancers by age, both sexes, 2000. Data source: Ref. <sup>(6)</sup>.

municable chronic diseases such as cancer and heart disease begin to emerge as major killers. People in every corner of the globe are adopting the Western lifestyle; along with the Nike sneakers and hip hop music often come smoking, high-fat diets, and decreased levels of exercise.

As the world population grows and ages, it is inevitable that the numbers of cancers will increase as well, but the burden will fall disproportionately on developing nations. From 1975 to 2000, the total number of cancer cases worldwide rose from 5.9<sup>(4)</sup> to 10 million<sup>(5)</sup> (a 69% increase).

To illustrate how dramatically the aging of populations influences cancer trends, Figure 1<sup>(6)</sup> shows that worldwide, cancer is predominantly a disease of older populations with incidence in both genders peaking between the ages of 50 and 80. As populations in developing countries age, we can expect increases in cancer incidence.

**Table 1.** Vast changes in world demographics

### Population

5.8 billion 1998–8 billion 2025 (37% ↑)

People >65 years 390 million 1998–800 million 2025 (105% ↑). Reaching 10% of total population

### Life expectancy

65 years in 1995 and 73 years in 2025

In France, 200 people >100 in 1950 and by 2050 to 150,000 (750× ↑). By 2025, 274 million Chinese >60 years – more than population of US

### Age at death

1995 – 21% under 5 years; 43% over 65

In 2025 – 8% under 5 years; 63% over 65

Source: Ref. <sup>(2)</sup>.

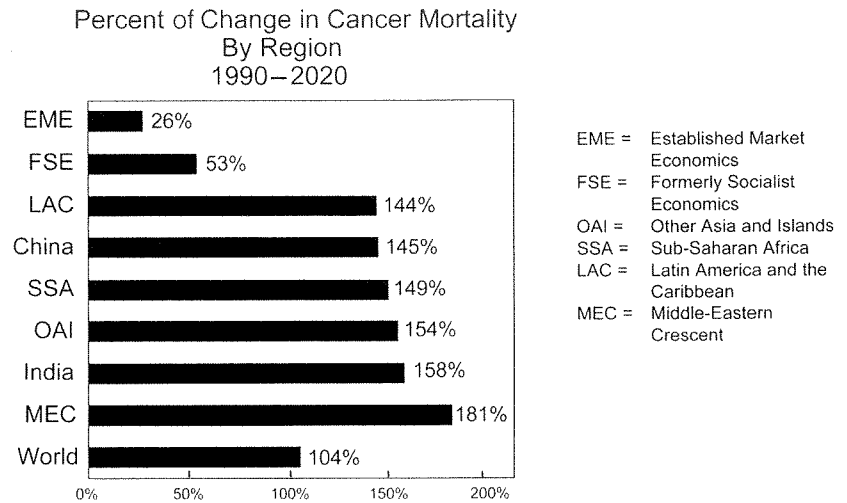


Fig. 2. Mortality growth rates in developing economies are significantly higher than elsewhere. Source: Ref. (7).

Figure 2 illustrates the dramatic growth in mortality rates in developing countries, rates that range from 144 to 181%<sup>(7)</sup>. By the year 2020, it is projected that 74% of all cancer deaths will occur in developing countries, compared to the current 60% (Fig. 3), with the most common fatal cancers worldwide being those of the lung, stomach, colon-rectum, liver, esophagus, and breast<sup>(7)</sup>.

Table 2. Incidence and mortality of cancer in women worldwide, 2002

| Rank | Incidence    | Cases* | Rank | Mortality* |
|------|--------------|--------|------|------------|
| 1    | Breast       | 1050   | 1    | 373        |
| 2    | Cervix       | 470    | 5    | 233        |
| 3    | Colon/rectum | 446    | 4    | 238        |
| 4    | Lung         | 337    | 2    | 293        |
| 5    | Stomach      | 318    | 3    | 241        |

Source: Ref. (8).

\*Numbers of cases and deaths (1000s).

### Cancer in women

It is appropriate for physicians with a focus on gynecologic cancer to take particular note of the burden of cancer in women. As shown in Table 2<sup>(8)</sup>, breast cancer continues to be the most prevalent cancer in women worldwide as well as the major cancer killer. It is followed in incidence by cancers of the cervix, colon-rectum, lung, and stomach. Ovarian cancer ranks seventh among the top ten cancer killers in women. Sixty-eight percent of all cancer deaths in women occur from diseases that are potentially addressed and treated by physicians who focus on gynecologic oncology.

Because breast cancer remains the most common cancer in women and the most common cause of cancer deaths in the world, its patterns, underlying causes, and management require great attention. Worldwide, there are more than a million new breast cancer cases each year, resulting in almost 375,000 deaths<sup>(9)</sup>.

Breast cancer has traditionally been associated with Western diets and lifestyles, and over 50% of cases continue to occur in industrialized nations (Fig. 4)<sup>(8)</sup>. Three broad strategies have been explored to control breast cancer – primary prevention, early diagnosis, and treatment.

Total Deaths Will Double...

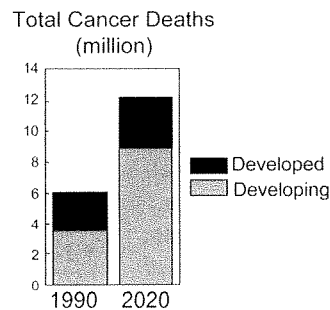
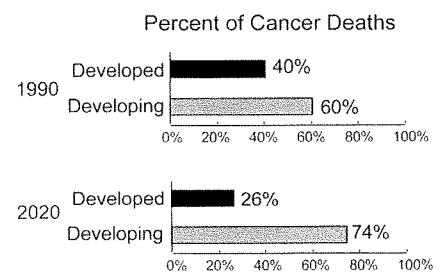


Fig. 3. By 2020, 74% of all cancer deaths will be in the Developing World. Source: Ref. (7).

...Increasing the Burden on the Developing World



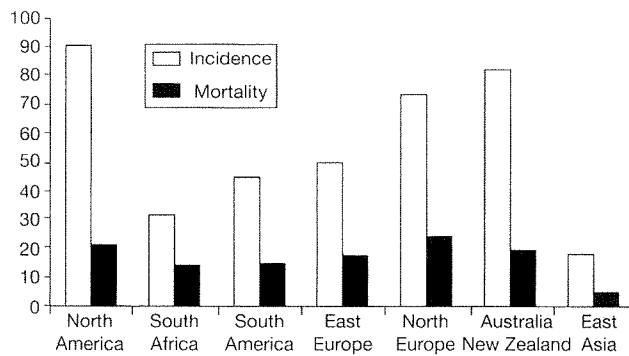


Fig. 4. Breast cancer: age-standardized incidence and mortality rates. Source: Ref. (8).

Primary prevention has often focused on reducing the behavioral risk factors for this disease, including high-fat diets and obesity. Women are encouraged to reduce the percentage of fat in their diets, to avoid obesity and, whenever possible, to extend the duration of lactation following pregnancy. Recent evidence suggests that long-term hormonal replacement either with estrogens alone or with estrogen-progesterone combinations increases the late risk of breast cancer<sup>(10)</sup>.

Intriguing new data suggests that smoking in post-pubertal girls may markedly increase breast cancer risk<sup>(11)</sup>. This suggests that efforts to educate girls in the age range of 8–14 years about the potential consequences of smoking during this period of their lives may well reduce breast cancer risk in later life.

Early detection of breast cancer through breast self-examination (BSE), clinical breast examination, and regular mammography has been extensively utilized in developed countries, but the availability of mammography varies greatly worldwide. The strongest documented benefits come from mammography. There is substantially less evidence of established benefit from either BSE or clinical breast examination (performed by a physician or other health-care personnel).

Paradoxically, it is these latter two techniques that are more available in developing countries. Early diagnosis using these techniques has been successful, anecdotally, and is well understood by women. However, critics have questioned the value of mammography as well as other early diagnostic techniques for reducing mortality from breast cancer. These data raise complex issues and also pose the perplexing question of whether it is possible to deliver an effective public health message that is complex in nature.

What is scientifically clear is that all the breast cancer screening methods have raised awareness of breast cancer and have resulted in discovering tumors

at an earlier stage, but not all of these have been linked to reductions in mortality. While the public desires simple, easily comprehended statements with clear-cut results, these are not always possible.

Nowhere is this dilemma better illustrated than in the results of the huge BSE trial conducted in Shanghai, China<sup>(12)</sup>. In this study, 266,064 women working in 519 factories were randomly assigned either to a group receiving BSE instruction or to a control group with no intervention. The instruction group were also given reinforcement sessions one and three years following the initial instruction, plus medically supervised BSE every six months for at least five years and frequent reminders to do BSE. The results of this trial are summarized in Table 3, and they are not encouraging.

Despite the intensity of the intervention and the high compliance rates among the participants, breast cancers were not detected at an earlier stage, and there was no reduction in mortality compared to the control group. The only significant difference was that the BSE group had more biopsies and more diagnosed benign breast disease. The conclusion from this well-designed trial is that BSE by itself does not appear to be an effective means of reducing the death rate from breast cancer. This is particularly disturbing because BSE is a relatively simple, low-tech method that could be implemented in virtually any setting.

In developing countries, breast cancer control efforts cannot always apply widespread and extensive mammography as a primary approach. To compensate for that lack of availability, they have often employed a comprehensive educational approach and have relied more heavily on periodic or targeted mammography as a strategy for early detection.

One such example is the Brazilian Cancer Control model<sup>(13)</sup>. The study population of women from adolescence through old age receive education, information, and examinations by health professionals, frequently non-MDs, and regular mammograms when age appro-

Table 3. Breast self-examination (Shanghai Trial)

- 266,000 women randomized to instruction versus control
- 260 factories instructed – 259 controls
- Instructions by specially trained factory workers
- Reinforcement at 1, 3, 6, and 9 months first year then once in year two
- Tumors not detected at earlier stage
- 135 (0.10%) deaths not instruction group and 131 (0.10%) in control group
- BSE group had more biopsies, more benign breast disease
- No mortality reduction with BSE

Source: Ref. (12).

appropriate. Women who are at increased risk are identified and referred to programs that provide more intensive screening and appropriate treatment when necessary. Women with possible abnormalities receive clinical breast examinations and mammography with referral to specialized treatment centers when a suspected or diagnosed cancer occurs. As demonstrated by Brazilian Cancer Control Program (Fig. 5), this approach has been shown to be effective in detecting breast cancers at an earlier and generally more curable stage. The Brazilian model, however, does require access to diagnostic and treatment centers.

### Cervical cancer

Interesting worldwide incidence patterns of cervical cancer suggest a growing burden in developing countries. Cancer of the cervix already is the second most prevalent cancer in women worldwide and the fifth leading cause of cancer deaths<sup>(8)</sup>. There are over 470,000 cases annually and 233,400 deaths<sup>(8)</sup>. Worldwide, the incidence of cervical cancer is declining, but 80% of all cases are found in developing countries, with the highest rates being in Latin America, Sub-Saharan Africa, and Southeast Asia.

These high rates persist despite the existence of a proven cost-effective screening technique, the Pap smear. In developed countries, the Pap smear has, of course, become a routine and accepted part of a woman's health examination and is easily adaptable to widespread screening programs.

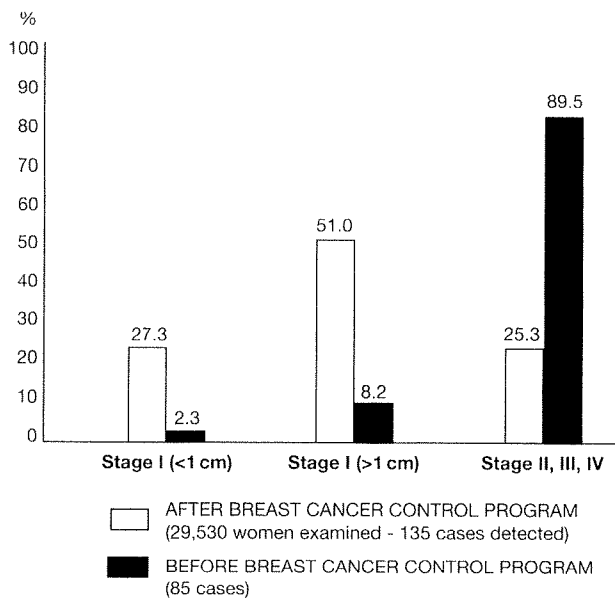


Fig. 5. Breast cancer control: impact of Brazilian Cancer Control Program. Source: Ref. (13).

In recent years, the use of thin prep has enhanced the sensitivity of the Pap smear<sup>(14)</sup> and the addition of HPV testing has further increased both specificity and sensitivity<sup>(15)</sup>. Although the cost of HPV testing may limit use in developing countries at the present time, wider use of the test should produce lower costs.

Systematic screening for cervical cancer has markedly reduced mortality rates in every developed country where it has been applied. For example, overall mortality rates for American women of all ages and races dropped from 7.5 per 100,000 in 1969 to about 2.5 per 100,000 in 2000<sup>(16)</sup>. For African-American women, the decline in deaths was even more striking – from 18/100,000 in 1969 to 5.5 in 2000<sup>(16)</sup>. Indeed, in British Columbia, where extensive and systematic screening of the entire population is possible, deaths from cervical cancer have been practically eliminated<sup>(17)</sup>.

The same cannot be said for developing countries, where 80% of the cervical cancer deaths occur. A variety of social and economic factors have served as barriers to implementing cervical screening programs in many of these countries. Among the barriers are financial constraints, lack of resources, lack of technical expertise, and in many cases, cultural and educational barriers that have stopped women from taking advantage of screening programs even when they do exist.

New technologies, however, provide hope that these obstacles can be reduced by simpler screening techniques. These include VIA, or visual inspection of the cervix using a 4% acetic acid solution, and HPV testing using samples that are self-collected on a vaginal tampon. Both are easy and inexpensive and, by virtue of being self-administered, avoid cultural issues.

There is also strong evidence that even less frequent screening can result in reduced death rates from cervical cancer<sup>(18)</sup>. Data show that screening once a decade beginning at age 25 yields a 61% drop in mortality<sup>(19,20)</sup> and that even a single screening between ages 36 and 37 will reduce mortality by 25% or more<sup>(21)</sup>.

The virtues of these new approaches in developing countries are well-illustrated by a cost-benefit model of the female population of Thailand that employed seven different cervical cancer screening strategies, including Pap smears, VIA, HPV, and combinations of these methods<sup>(18)</sup>. The model then compared the costs and benefits of each strategy and their effectiveness. Table 4 summarizes the results of this impressive study, in which all seven strategies demonstrated a reduction in mortality compared to no screening.

The costs of these methods (shown in US dollars) varied widely, ranging from \$121 to \$6720 per life year saved. VIA, performed at five-year intervals

**Table 4.** Cervix cancer: cost benefit of screening in less-developed countries

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|---|
| Seven screening techniques modeled for Thailand   |
| Pap smears, VIA, HPV, and combinations  |
| All strategies saved lives and reduced mortality compared to no screening   |
| Cost per year of life saved varied widely – \$121–\$6720  |
| VIA every 5 years in ages 35–55 with immediate treatment – least expensive (\$517 per year of life saved) and most effective (↓mortality 83%) |
| Estimated cost – \$0.79/women – \$4.7 million total annual cost   |

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Source: Ref. <sup>(18)</sup>.

between ages 35 and 55 and followed immediately by treatment of abnormalities, was found to be the least expensive option and saved the greatest number of lives, with a cost per life year saved of \$517 and reduction of 83% in mortality. Concern about the self-administered aspects of VIA, and the possibility of false positive and negative results, may require additional clinical training for those managing the screening programs.

According to the Thailand model, cytology with an 80% sensitivity is a reasonable alternative if 90% of women undergo follow-up after an abnormal smear. The study found that compared with no screening, combined Pap smear and HPV testing at 5-year intervals between ages 20 and 70 could reduce cervical cancer deaths by more than 90%. At a cost of \$1683 per life year saved, this more rigorous screening remains more than three times as costly as the VIA method.

This study offers strong evidence that reductions in cervical cancer mortality can be achieved worldwide using techniques that are less expensive, more culturally acceptable, and less frequent than those that are the norm in developing countries.

The future of cervical cancer prevention is even brighter with the potential for developing human papillomavirus vaccines. There is strong evidence that viral genes E6 and E7 of HPV-16 and HPV-18 inactivate P53 and Rb tumor-suppressor genes, thus immortalizing the cervical epithelial cells<sup>(22–26)</sup>. Recombinant vaccines and those using virus-like particles are currently being tested in phase I and II trials and to date have been shown to be immunogenic and safe<sup>(27)</sup>.

Recently, the first report of the therapeutic effectiveness of papillomavirus vaccines was published. In a double-blind study of 2392 women vaccinated with an HPV-16 virus-like particle vaccine, none of the vaccinated women developed infection with HPV-16 and none developed cervical intraepithelial neoplasia<sup>(28)</sup>. Although more work is required to establish

the efficacy of these vaccines in preventing human cervical cancer, these vaccines offer the very real possibility of a major step forward in the control of this disease within the next decade.

### Colorectal cancer

Although generally not considered to be a 'women's cancer', colorectal cancer strikes men and women with equal frequency. It is now the third most frequently occurring cancer in women and the fourth leading cause of female cancer deaths, with over 446,000 cases yearly and 238,000 deaths worldwide<sup>(8)</sup>.

Colorectal cancer provides another example of a disease for which there are effective but underutilized methods of screening and early detection. Because of difficult access to and availability of the more advanced screening technologies in many areas of the world, attention has turned to some of the primary prevention opportunities for reducing the incidence of this disease.

Regular colonoscopy and sigmoidoscopy in people over 50 years of age has been demonstrated to be extremely effective in reducing the incidence of invasive colorectal cancer – largely because it leads to the removal of precancerous polyps. These proven methods are increasingly available but still underutilized in developed countries. Unfortunately, they are not generally available, not practical nor cost-effective in many underdeveloped areas of the world.

With adequate follow-up of abnormal results, however, fecal occult-blood testing alone can reduce colon cancer deaths by 30%<sup>(29–30)</sup> – saving 71,400 lives annually based on estimated worldwide colorectal cancer mortality<sup>(8)</sup>. Fecal occult-blood testing is more widely available, relatively inexpensive, and may well represent a cost-effective strategy in areas where limited screening resources exist.

The risk factors for colorectal cancer are largely associated with a Western diet and lifestyle. Increasing the consumption of fruits, vegetables, and high-fiber

grains<sup>(31)</sup>, limiting fat intake<sup>(32)</sup>, and maintaining normal body mass<sup>(33)</sup> can reduce colon cancer risks.

Regular physical exercise<sup>(34)</sup> and a regimen of low-dose aspirin<sup>(35)</sup> have also been shown to reduce the risk of fatal cancers of the colon and rectum as well as cancers of other digestive organs, including the esophagus<sup>(36)</sup>. Studies have shown that women who take one aspirin a day diminish their risk of colorectal cancer by as much as 38%<sup>(37,38)</sup>.

## The tobacco epidemic

It is difficult to comprehend the extent to which the world seems to accept the death toll from tobacco use. Story after story appears in the media focusing on the horrors of AIDS in developing countries, and justifiably so, but there is no equivalent concern for the rapidly increasing death rates from lung cancer and other tobacco-related cancers (Table 5) and non-cancerous conditions caused by tobacco use.

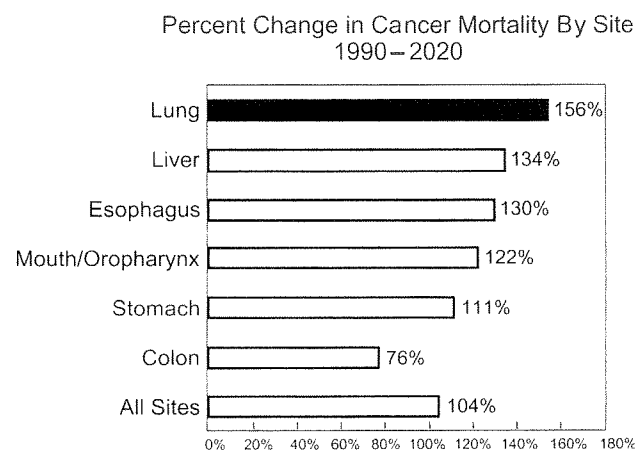
Tobacco use, simply stated, is a worldwide epidemic producing a staggering number of worldwide deaths. The figures are astonishing. Tobacco kills one in ten adults worldwide. One of every two long-term smokers will die of some tobacco-related disease, and half of those deaths will occur in productive middle age. Some 500 million people alive today will eventually die of tobacco use<sup>(39)</sup>.

Figure 6<sup>(7)</sup> shows that lung cancer is the fastest-growing cause of cancer deaths worldwide. Also, increasing rapidly is mortality from cancers of the esophagus and mouth/oropharynx, both linked closely to tobacco use. As with so many of the other cancers discussed in this article, the heaviest burden of the tobacco epidemic will fall on people living in developing countries<sup>(40)</sup>.

For several other major cancers, there is reason for cautious optimism. Liver cancer, the second-fastest growing, will in all likelihood decline as the benefits of the hepatitis B vaccine are felt throughout the areas of the world in which this disease is endemic. There is

**Table 5.** Tobacco use and cancer

| Tobacco-related cancers | Increased risk  |
|-------------------------|-----------------|
| Lung cancer             | Two- to 25-fold |
| Larynx                  | Two to 27-fold  |
| Oral cancer             | 13-fold         |
| Esophagus               | 1.8–11-fold     |
| Pancreas                | Twofold         |
| Bladder                 | Fivefold        |
| Renal                   | ↑               |
| Cervix                  | ↑               |



**Fig. 6.** The fastest growing causes of cancer deaths. Source: Ref. <sup>(7)</sup>.

also real potential for decreasing the death rates from stomach cancer by treating the infectious agent *Helicobacter pylori*<sup>(41,42)</sup>. However, the tobacco epidemic remains the dominant single preventable cause of cancer on a worldwide basis.

As large as the problem of tobacco-related cancers is today, it is destined to become much larger. Careful analysis of tobacco use patterns has established four characteristic stages of tobacco use worldwide (Fig. 7)<sup>(43)</sup>. Stage I exists where tobacco use is very low and the tobacco-related mortality is correspondingly low. Stage II exists in countries where tobacco use is rising but where death rates have not yet begun to peak. Stage III exists where both tobacco use and death rates are rising, and stage IV exists in countries where smoking rates have peaked and death rates are high but beginning to decline.

Currently only 4–5% of all tobacco users live in the United States<sup>(44)</sup>. Although the number of US smokers remains disappointingly high, the tobacco epidemic has peaked and death rates have been dropping steadily since the mid-1980s. The United States, with Western Europe, Great Britain, Canada, and Australia, is in the fourth stage of this epidemic, as shown in Figure 7.

It is profoundly disturbing to note that the most densely populated countries in the world are only in stage I or II. Doubtless, over the next 20 years, the world will see an explosion of tobacco-related deaths in these parts of the world.

By the year 2020, it is projected that seven of every ten people killed by tobacco will be from low- and middle-income countries – countries in which few, if any, serious efforts to curtail tobacco use have been made at this time. In China, for example, where a 1996 survey indicated that 61% of rural dwellers believed

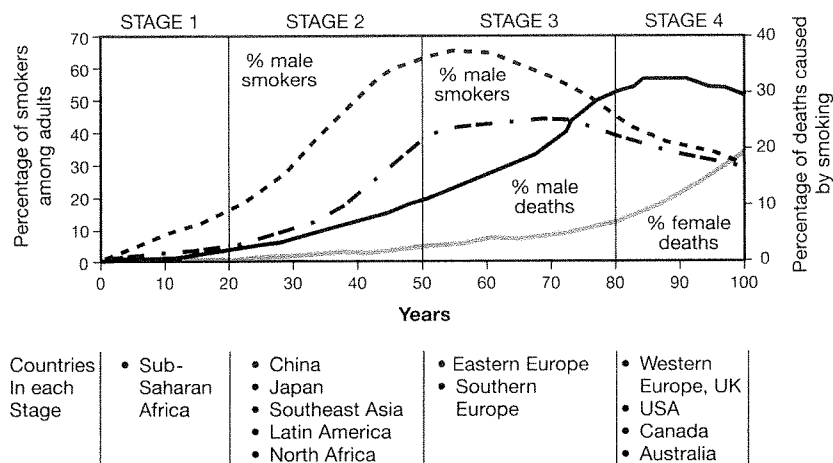


Fig. 7. Four stages of the tobacco epidemic. Adapted from: Ref. (43).

that smoking involves 'little harm', 300 million men and 20 million women smoke and the numbers are increasing<sup>(45)</sup>. Worldwide, it is estimated that from 82,000 to 99,000 young people a day start smoking and risk becoming addicted to tobacco<sup>(46)</sup>, regrettably assuring that the problem will continue to grow far into the 21st century.

What can be done to counter the tobacco epidemic? The single most effective means of reducing smoking appears to be making cigarettes more expensive by raising taxes on tobacco products. Evidence indicates that a 10% increase in the cost of a pack of cigarettes leads to a 4% reduction in use in developed countries and an 8% reduction in developing nations<sup>(40)</sup>.

Figure 8 illustrates the effect of cigarette price increases in Canada by graphing the decline in tobacco consumption in relation to the increase in its price<sup>(47)</sup>. These authors point out that taxes are responsible for approximately two-thirds of the retail price of cigarettes in Canada compared to 20% in the United States. The slope of the decline in per capita tobacco

consumption has been about 30% steeper than the trend in the United States, which suggests that a vigorous national policy including high taxation and strong legislation toward tobacco control can bring about significant declines in tobacco consumption<sup>(47)</sup>.

Additional strategies for tobacco control include taking tobacco out of the public consciousness through comprehensive bans on advertising and promotion. These strategies have also proved an effective means of reducing consumption. In Norway, Finland, Canada, New Zealand, and France, complete advertising bans have produced a 4-9% decline in use<sup>(48-50)</sup>.

The benefits of banning media advertising have been significantly subverted, however, by the use of other means of advocating tobacco use. These have included extensive promotion of smoking behavior in movies; sponsorships of events and concerts, many targeted to youthful audiences; and merchandising of products bearing cigarette names. While the tobacco settlement of 2000 bans many of these activities in the United States, they continue unabated and unchecked in many nations throughout the world.

Anti-tobacco forces have mounted an effective counterattack on tobacco use with a variety of effective strategies. These include extensive media campaigns on the dangers of smoking as well as education on the health consequences of smoking directed to virtually every segment of the population. It is reasonable to state that everyone in the United States, regardless of age and socio-economic status, has been exposed to multiple anti-tobacco messages. That is certainly not the situation in many other parts of the world and is the major challenge for worldwide public health in the 21st century.

That the percentages of US smokers continue to hover between 20 and 30%<sup>(51)</sup> is disturbing and

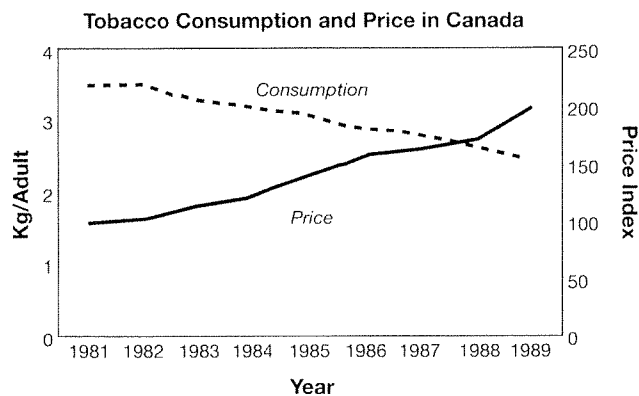


Fig. 8. Tobacco consumption and price in Canada. Source: Ref. (47).



bears witness to the willingness and capacity of individuals to engage in behaviors that they fully understand are detrimental to their health. New pharmaceutical approaches to smoking cessation, such as nicotine replacement medications and antidepressant drugs, may improve this situation, but long-term comparative evidence is still lacking.

A meticulous assessment of tobacco-control interventions for the Task Force on Community Preventive Services systematically reviews the effectiveness, applicability, other effects, economic evaluations, and barriers to use of selected interventions<sup>(52)</sup>. These reviews provide the basis for recommending selected interventions for specific populations or in specific circumstances. How cultural differences from country to country affect the success of the tobacco-cessation efforts remains an open question, especially in the Third World.

For hardcore smokers, the only deterrent may be continuing to restrict smoking in workplaces and public places, thereby cutting down on the amount of time available for smoking and removing the dangers of secondhand or passive tobacco exposure.

In countries where efforts at tobacco control are just getting under way, the pro-tobacco forces generally raise a series of questions or obstacles to tobacco-control efforts. It has been suggested that tobacco-related premature death is actually cheaper and makes less impact on the countries' total health-care cost<sup>(53)</sup>. In truth, there is strong evidence that the lifetime health-care costs are greater for smokers than for non-smokers<sup>(54)</sup>.

Others have raised questions regarding job losses in countries with significant tobacco-production economies. Actually, alternative crops can be grown successfully and money spent on tobacco will be used elsewhere. Generally, countries with established tobacco-control programs have experienced no net job loss<sup>(55,56)</sup>.

Opponents of tobacco control frequently argue that higher tobacco taxes will reduce government revenues. In reality, the proportionate reduction in tobacco use does not equal the size of the tax increase. So a 10% increase in tobacco taxes actually produces a 7% increase in tax revenue<sup>(40)</sup>.

Other opponents have suggested that smuggling will inevitably occur in countries that impose tobacco taxes. While to some extent this does occur, tobacco consumption still declines while tax revenue increases in spite of smuggling<sup>(57)</sup>.

Many opponents of tobacco control have suggested that these restrictions and taxes primarily and preferentially affect the poor. Actually, tobacco consumes a greater proportion of the income of the poor and any tax generally produces a greater reduction of

smoking and therefore greater health benefits in poorer populations than in those with more economic resources<sup>(57,58)</sup>.

The cancers most closely associated with tobacco use are not exclusively problems for women and therefore might not be thought of as the responsibility and province of physicians involved with gynecologic cancers. However, as mentioned earlier, 68% of the deaths from the top ten cancer killers of women are diseases treated, potentially discovered, or prevented through encounters with physicians involved in gynecologic cancer care.

That fact emphasizes our responsibility to take a strong stand against tobacco use worldwide. As physicians, we should support financial assistance to build a worldwide capacity for tobacco control; oppose trade policies that undermine other countries' tobacco-control efforts; learn from and implement the effective tobacco-control policies in place throughout the world; and oppose legislation that limits other countries' ability to sue over tobacco smuggling.

Clearly, the burden of cancer is growing worldwide as the result of an expanding and aging population, an increasingly global culture, and the inability or unwillingness of many nations to take advantage of the progress that has been made in preventing, diagnosing, and treating cancer. While cancer remains a universal problem, that burden is shifting significantly to the less-developed countries of the world. As physicians, and cancer specialists, it is important to be mindful of the dimensions of the cancer problem throughout the world and to assume a level of personal and professional responsibility for alleviating the suffering and death caused by this disease.

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