

INTRODUCTION

The prevention agenda

Despite our relative wealth of knowledge about the causes of cancer, the disease persists — and the burden is worsening. Prevention demands political will, ample funding and a change in mindset.

BY TIFFANY O'CALLAGHAN

Half a century ago, more than 75% of British men smoked; today, that figure is closer to 20%. This drop has cut lung cancer deaths in middle aged men in the United Kingdom by as much as half. A similar trend, albeit less steep, is evident in other countries where smoking has declined, including the United States

And that's not the only significant advance in preventing cancer. Screening has also made an impact. The pap smear, to detect precancerous cells in the cervix, has helped cut US cervical cancer mortality rates from 5.5 per 100,000 in 1975 to just 2.4 in 2007. Antiviral vaccines are another success story: introduction of the hepatitis B virus (HBV) vaccine in 1982 cut chronic HBV infection rates among children in some countries from 15% to less than 1%, which has translated into reduced rates of liver cancer in adults. Hopes are high that vaccines against the human papillomavirus (HPV) will make similar inroads.

In spite of these encouraging trends, cancer — in all its guises — continues to undermine global health. In 2008, there were 12.7 million new cancer cases and 7.6 million deaths according to the American Cancer Society (ACS), costing the global economy nearly US\$900 billion. By 2030, the World Health Organization (WHO) predicts we'll face more than 21 million new cancer cases and 13 million deaths each year at skyrocketing costs to society.

The vast bulk of cancer research is trying to find treatments for people who are already sick. But approximately a third of cancers are caused by tobacco and at least a quarter are attributed to other lifestyle factors. The focus on cures only perpetuates the Sisyphean task of keeping cancer at bay. With all that we know about preventable causes of cancer, why is the incidence of cancer increasing? The answers are as complex and intertwined as the causes themselves.

WILLPOWER REQUIRED

The sources of cancer are manifold. It's clear that there are environmental effects: second generation immigrants exhibit the disease patterns of their compatriots not of their ancestors¹. But there's more to it than exposure. Although up to 90% of lung cancer is caused

by smoking, fewer than a sixth of smokers develop the disease. Some cancers are caused by faulty genes, such as *BRCA1/2* in breast and ovarian cancer; other cancers are fuelled by hormones such as oestrogen, testosterone or insulin. And then there are pathogens: the WHO estimates that 6% of cancers in wealthy nations and 22% in low- and middle-income countries are caused by viruses such as HBV, HPV and hepatitis C virus (HCV), bacteria such as *Helicobacter pylori* and waterborne parasites. Lifestyle affects cancer risk, too. In the past two decades as waistlines have expanded, so has the evidence linking obesity with the risk of breast, endometrial, colorectal and other cancers.

Yet even when the causes are understood, it is not easy to translate that knowledge into preventive actions. It was the 1950s when British epidemiologist Richard Doll proved smoking causes lung cancer, but it took decades to whittle away at the cigarette culture. Smoking restrictions imposed in the past 10 years were the result of a slow, incremental gathering of medical data and political will. Eventually “it became convincing to the public, at which point it was much easier to regulate,” says David Hunter, an epidemiologist at the Harvard School of Public Health.

Smoking, however, is something of a special case. Building the political will for smoking bans in workplaces and public

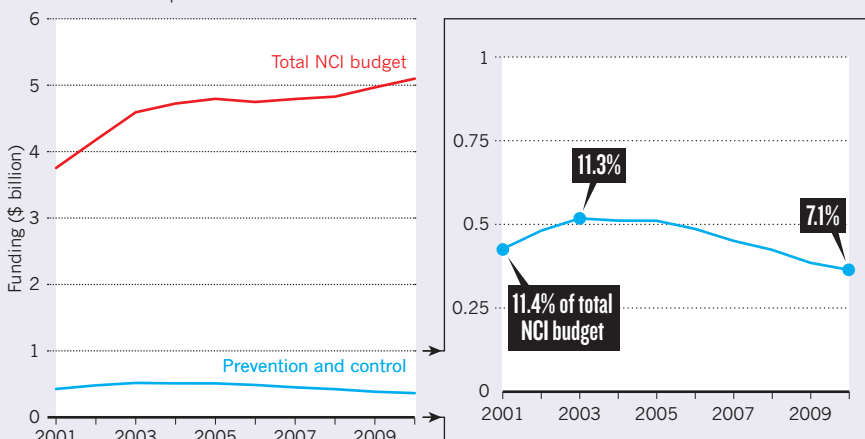
facilities hinged on the health risk of second-hand smoke to non-smokers. Could similar regulations be introduced when “there is not a direct cause and effect between your behaviour and my potential illness?” asks Hunter. Public health advocates can argue, for example, that obesity-related illnesses increase overall healthcare costs, but the logical steps from eating habits to obesity and then cancer risk are less straightforward. “That's a much more indirect case and it's harder to make,” Hunter points out.

Future cancer prevention strategies might curtail individual choice — be it mandating vaccinations, banning trans-fats or taxing unhealthy food. These are treacherous political waters. “They are hard decisions that will not be popular,” says Arnie Purushotham, an oncologist at the Integrated Cancer Centre (ICC), King's College London.

The unpopularity of such policies is evident from recent examples. Despite widespread efforts to promote access to the HPV vaccine, the ACS estimates that fewer than one in four girls who begins the course of vaccinations actually finishes it — partly owing to the social stigma associated with a cancer caused by a sexually transmitted infection. Efforts like the 2006 trans-fats ban in New York City are often decried as ‘nanny state’ meddling. Attempts to pass a 1% tax on sugary drinks in New York were ridiculed — in January 2011 the state's health commissioner

PREVENTION'S DECLINING SHARE

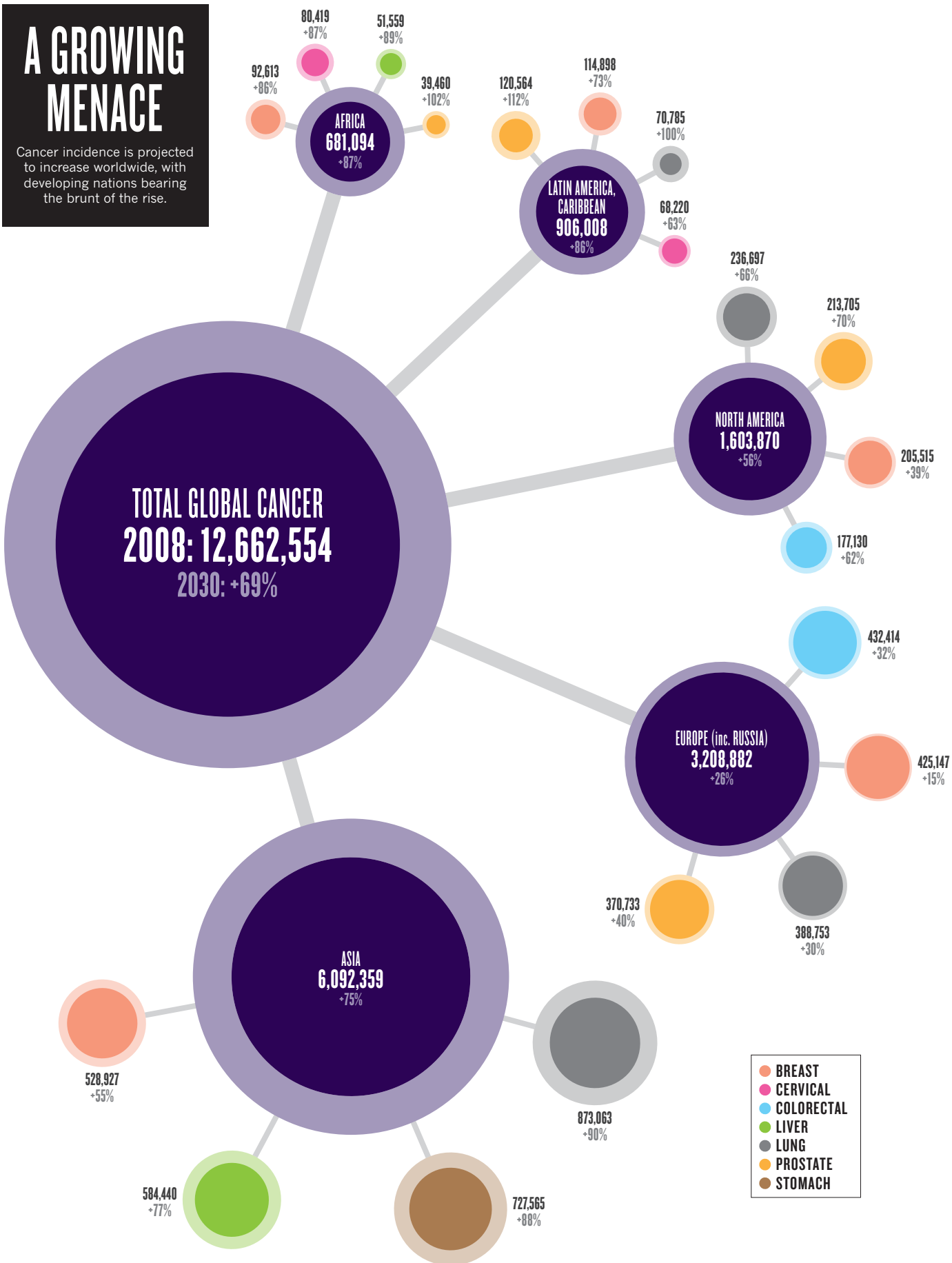
Although the budget of the US National Cancer Institute is steadily increasing, the amount — and the share — devoted to prevention is in decline.



SOURCE: NCI

A GROWING MENACE

Cancer incidence is projected to increase worldwide, with developing nations bearing the brunt of the rise.



said the tax was off the table, for now at least.

The broader notion of cancer as a preventable disease is not yet fully accepted. A study published in May 2010 found that the more local news coverage of cancer watched by Americans, the more likely they were to have fatalistic views of the disease². Such ideas are even more problematic in a world of growing cancer risks, as developed countries export their bad habits. “Tobacco companies moved away from rich countries to poor countries,” says Peter Boyle, head of the International Prevention Research Institute in Lyon, France. Higher rates of smoking, obesity and alcohol consumption mean low-income countries will struggle, but without the infrastructure to cope. “The poor countries of the world are going to be absolutely hammered in the next couple of decades by the diseases that are common in the developed countries now,” says Boyle. And cancer is leading the charge.

ELUSIVE FUNDING

Prevention research costs money, but funding decisions tend to be skewed in favour of developing treatments. Prioritizing prevention requires long-term thinking, yet government research goals can shift with each election. Ten years ago, 11.4% of the National Cancer Institute’s annual budget was specifically allocated to cancer prevention and control. Since then, that allocation has steadily declined (see Prevention’s declining share, page S2). According to a report by Purushotham and colleague Richard Sullivan for the G20 summit in 2010, less than 4% of worldwide public funding for cancer research goes to prevention.

Some of the reasons for this distribution are obvious. The need for treatment is urgent, and survivors often go on to champion the cause. Prevention lacks this powerful advocacy group. “There is not a grateful patient to pressure the politicians to increase funding for the disease they have or have been cured from,” says Hunter. In prevention, he adds, “the successes are virtual. With a cure, or even just a short increase in life expectancy, it feels more real for the public”.

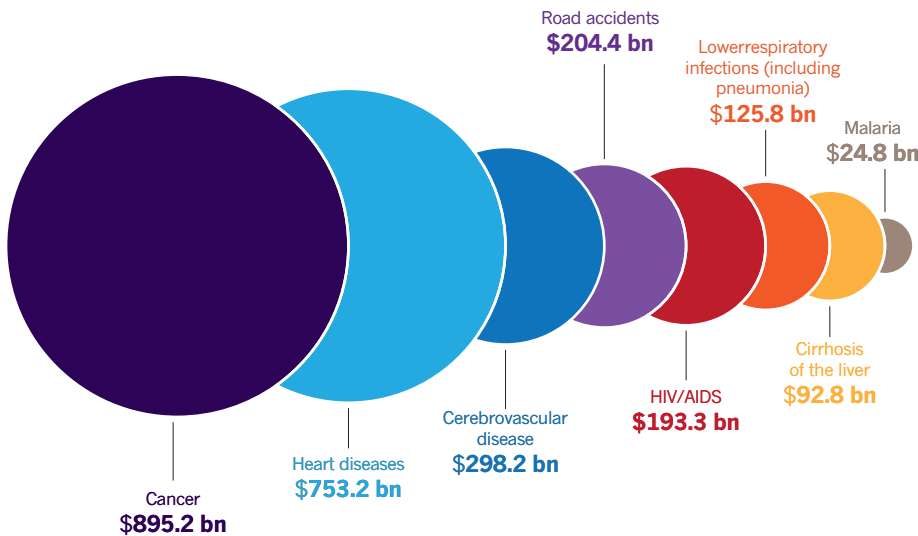
Moreover, prevention research “entails a very different form of research than setting up a lab and getting some mice and putting some carcinogen on them,” says Ian Magrath, at the International Network for Cancer Research and Treatment, a not-for-profit organization based in Brussels, Belgium. “The type of research you have to do takes a much more fuzzy form because it involves human behaviour and psychology.”

Industry financing models struggle too. Developing a new treatment can cost as much as US\$1.3 billion. That figure could be greater for medicines that have a higher safety requirement. When you take a preventive drug, “how

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COUNTING THE COST OF CANCER

The burden of cancer, calculated as the cost of years lost from ill-health, disability or early death, outweighs all other health concerns.



SOURCE: THE GLOBAL ECONOMIC COST OF CANCER (ACS, 2010).

much risk are you willing to take? Most people would say zero,” says Kenneth Kaitin, a pharmacologist at Tufts Center for the Study of Drug Development in Boston, Massachusetts. Proving prevention is also harder and more time-consuming than proving treatment. “You have to have a large enough sample size of people who would eventually have cancer to

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prove that this is not just by chance,” says Kaitin. “In essence you’re proving the negative.” Timing has other ramifications. Drug patents are filed in the early stages of clinical testing, and apply for 20 years or so, depending on extensions. After approval, which can take 10 years or more, a company has limited time before the drug goes generic. Long trials will eat into that time, reducing ability to recoup investment. And that is assuming they can negotiate reimbursement from insurers. Compared with drugs for treatment, Kaitin says, “it’s even more cumbersome and onerous for a company to try to justify reimbursement to prevent a disease.”

LOOKING FORWARD

Despite these hurdles, cancer prevention advocates are pushing ahead. “You have to try to do something that is achievable,” says Purushotham. Many research organizations are starting to infuse a prevention ethos into their medical approach. At the ICC, prevention messages are being added to the patient consultation process. If a patient comes in with a lump that turns out to be benign, for

example, Purushotham’s team asks the patient about lifestyle factors that could elevate their cancer risk. The ICC also has a pilot programme underway for ‘speed dating’ between family doctors and cancer specialists, enabling oncologists to inform physicians about the latest cancer detection and prevention research.

In certain institutions, prevention is slowly moving up the list of cancer priorities. In 2009, of all the programmes at the Yale Cancer Center (YCC), the prevention programme received the largest slice of NCI funding. And to promote better collaboration between disciplines, researchers in the YCC have monthly meetings with colleagues they wouldn’t otherwise meet — psychologists working with molecular geneticists, epidemiologists collaborating with clinicians — to share data and talk about new strategies. “We try to increase cross-talk,” says Yong Zhu, co-director of Yale’s cancer prevention programme. “We need to increase our communication among different research groups.”

So the message is slowly being heard. “A prevention agenda is critical to have any kind of impact on the disease for the future,” says Purushotham. As the global health community lays the foundation for future policies, perhaps gathering the necessary will for widespread cancer prevention is a matter of reminding ourselves of some age-old wisdom. As Thomas More, the sixteenth century philosopher, once wrote: “It is a wise man’s part, rather to avoid sickness than to wish for medicines.” ■

Tiffany O’Callaghan is a freelance writer based in London.

1. Boyle, P, Levin, B. (eds) *World Cancer Report 2008*. (IARC Press, 2008).
2. Niederdeppe, J. et al. *Journal of Communication* **60**, 230–253 (2010).