

Medical research

Are we losing the war on cancer?

from Marie M. Cohen and Jared M. Diamond

CANCER is the second leading cause of death in the United States, and to defeat it, the government in 1971 declared a 'war' to be led by the National Cancer Institute (NCI) of the National Institutes of Health (NIH). Since then, NCI has spent \$15 billion, its current annual budget is close to \$1 billion (the largest of any NIH institute), and other government and private agencies devote \$1 billion more to cancer. What progress has been made?

There have been impressive advances in curing certain cancers, notably most childhood cancers, Hodgkin's disease and certain leukaemias and testicular cancers. But these cancers are rare compared with those of the lung, colorectum, breast, prostate and stomach. The overall picture in the United States is summarized in NCI publications (see, for example, ref. 1) and in a recent controversial article by Bailar and Smith². Relative 5-year survival rates (cancer patient survival adjusted for deaths from other causes by comparison with a similar age distribution from the general population) have improved slightly from 47 to 49 per cent between 1973 and 1978, the most recent years analysed. Despite this, age-adjusted mortality rates (see figure) have been increasing because age-adjusted incidence rates have increased. Thus, by the least equivocal criterion — mortality — we are losing the war on cancer.

Some disagree with this view. "The national statistics are inevitably a few years behind the times and therefore do not reflect the most recent advances in treatment"³. "The implication that the war on cancer is being lost is ridiculous. There are many cures already there. They just haven't come out of the computer"⁴. But this latter view, although often advanced in the past decade, "has never been vindicated by national statistics when these eventually became available"³. If predictions of future trends should consider recent advances, they should also consider setbacks such as the long-continuing steep rise in incidence and mortality of lung cancer (see figure), which is likely to leave the overall mortality trend flat or

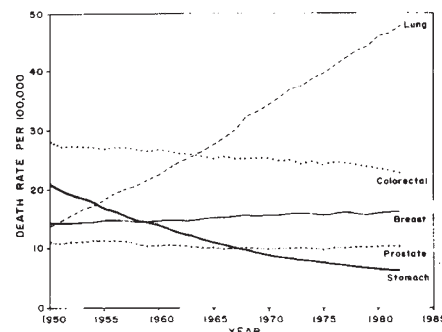
Errata

In the article by Velia Fowler (*Nature* 322, 777; 1986) the figure was incorrectly attributed to ref. 4. In fact it was taken from ref. 6: Byers, T. J. & Branton, D. *Proc. natn. Acad. Sci. U.S.A.* 82, 6153; 1985.

In the article by R. Letolle (*Nature* 323, 19; 1986) the start of the second paragraph should read "In 1886 Crookes had just discovered yttrium..."

rising in the foreseeable future.

Cancer researchers disagree strongly about how to fight the war. One view is to continue present NCI policy, which puts more money into treatment (especially its biochemical/cellular aspects, which have undoubtedly spawned advances in treatment) than into prevention (see page 184 of ref. 1). Perhaps new drug development,



Age-adjusted mortality rates for five of the commonest cancers in the United States, 1950–1982. Age adjusted to the US population of 1980. (From ref. 2.)

monoclonal antibodies and studies of oncogenes, retroviruses and immunology will produce breakthroughs. It is agonizingly difficult to decide at what stage an expensive, long-term strategy should be considered a failure or whether it requires more time. One guide is to consider whether there are other, undersupported approaches with more promise. Several suggest themselves.

First, smoking is estimated to cause 30 per cent of cancers. It is the main cause of the rise in lung cancer since 1945 to its current rank as the commonest cancer and also contributes to cancers of the oesophagus, bladder, pharynx and mouth^{1,5}. Although NCI spends about \$20 million a year in a programme to control tobacco use, the tobacco industry spends \$2 billion on advertising and the US government spends \$3.5 billion to subsidize the tobacco industry. In Norway a national anti-smoking programme that involved banning cigarette advertisements resulted in fewer people taking up smoking. An end to subsidies and a ban on tobacco advertising would save the US government a sum nearly equal to the entire NIH budget while also promoting the war on cancer.

Second, lung cancer exemplifies a broader, self-evident point: it is better to prevent cancer than merely to try to treat it. As suggested by geographical variation in cancer incidence as well as dramatic shifts in incidence when a human group migrates from one country to another,

about 80 per cent of cancers are thought to have environmental causes, including 35 per cent that are influenced by diet^{1,5}. Changes in environmental factors, and not changes in treatment, are responsible for the two biggest recent components of change in US cancer mortality: the rise in lung cancer and the decline in stomach cancer (see figure). These facts, as well as elementary common sense, suggest that more money should be spent on cancer prevention than on cancer treatment — the reverse of present policy.

Third, for a prescribed drug to be efficacious, patients must take it. Do they? A recent study by Levine *et al.*⁶ monitored patient compliance by measuring blood levels of prescribed drugs and their metabolites after the patient had supposedly taken a dose. Patients claimed to have taken about 35 per cent of their doses, but in fact compliance was only 17 per cent, a value raised to 40–50 per cent by intensive educational and supportive programmes. Few oncologists are aware of these astonishingly low compliance rates, and even fewer devote much effort to patient education or to measuring compliance. When MOPP, a multi-drug chemotherapy for Hodgkin's disease, is said to produce a cure rate of 50 per cent, does this mean that the real cure rate is 50 per cent, or that the rate was 100 per cent but only 50 per cent of patients were compliant? Nobody knows, and there is surely a strong case for research on improving compliance with existing drugs rather than inventing new ones.

Finally, physicians tend to treat cancer as a biochemical/cellular process that either kills the patient or is cured, leaving no other consequences requiring professional attention. In fact, 'cancer' has become a group of mostly chronic illnesses in which the new patient must cope with repeated disruption or devastation of personal competence, morale, family relations, friendships, career and income⁷. There is little support for research in this area. There is also insufficient funding for professional personnel to help surviving cancer patients rebuild family relations, career and self-image, although physicians routinely make such referrals for patients surviving heart attacks.

Given the obvious advantage of avoiding cancer, why is more support given to treatment than to prevention? Part of the reason may be a confusion between the goals of basic and applied biology. The goal of applied biology is to solve prob-

1. National Cancer Program. 1983–84 Director's Report and Annual Plan FY 1986–1990 (NIH, Bethesda, 1986).
2. Bailar, J.C. & Smith, E.M. *New Engl. J. Med.* 314, 1226 (1986).
3. Cairns, J. *Scient. Am.* 253(5), 51 (1985).
4. Holland, J. *The Cancer Letter* 12, 7 (1986).
5. National Cancer Program NCI Fact Book (NIH, Bethesda, 1985).
6. Levine, A. *et al. Proc. Am. Soc. Clin. Onc.* 3, 71 (1984).
7. Cohen, J. *et al. Psychosocial Aspects of Cancer* (Raven, New York, 1982).