We have arrived at a watershed in cancer prevention and control. After two decades of increases, US cancer incidence rates (for all sites combined) decreased an average of 0.7% per year ($p>0.05$), and cancer mortality rates (for all sites combined) decreased an average of 0.5% per year between 1990 and 1995 ($p<0.05$). Death rates and incidence rates decreased for three of the four major cancers, i.e., lung, prostate, and colorectal cancers. And for female breast cancer, incidence rates stopped increasing and leveled off from 1990 to 1995, while the death rate decreased significantly.1

These trends are variously due to a mix of interventions relating to cancer risk factors, most notably tobacco control, screening, treatment, and access to advanced cancer care across the entire spectrum of site-specific cancers. Although decreasing mortality rates might be attributable to the slew of interventions outlined above, declines in incidence are related exclusively to individual and population-wide efforts to reduce, if not entirely eliminate, the more common risk factors in the genesis of cancer.

**Preventing Cancer**

Cancer is largely a preventable illness. Two thirds of cancer deaths in the US can be linked to tobacco use, poor diet, obesity, and lack of exercise, all of which can be modified by action at both individual and societal levels. Nevertheless, public awareness of the opportunity to prevent cancer in this way is still sadly lacking; in contrast, public concern about environmental carcinogens remains out of proportion to the true risk and is one of our more persistent and enduring myths, diverting attention from larger, more common risks.

**Diet**

Although stemming the epidemic of tobacco smoking has been our most effective means for preventing cancer, poor diet is quantitatively an equivalent risk factor to tobacco and a fertile area for immediate individual and societal intervention. A recent review of worldwide evidence on diet and cancer concluded that high fruit and vegetable consumption reduces the risk for at least 10 different cancers, including cancers of the lung, stomach, colon, esophagus, and larynx. Also, evidence is mounting that increased consumption of legumes and grains reduces the risk for stomach and pancreatic cancers. Red meat consumption is implicated in the development of
certain cancers, as is salt in stomach cancer. Total fat intake and saturated animal fats are linked to the occurrence of hormone-related, lung, and colorectal cancers.\(^2\)

**ALCOHOL AND EXERCISE**

The use of alcohol is not only synergistic with tobacco use in causing cancers of the upper respiratory and gastrointestinal tracts, but is implicated also in cirrhosis-mediated liver cancer and cancers of the breast and colon.

Higher levels of physical activity can reduce the incidence of colorectal cancer and may help reduce cancers of the breast and prostate. According to the Harvard group, if the entire population increased their level of physical activity by 30 minutes of brisk walking per day (or the equivalent energy expenditure in other activities), we would observe a 15% reduction in the incidence of colon cancer.\(^3,4\) The vast body of scientific data on cancer risks and prevention has been translated by the American Cancer Society into user-friendly public policy guidelines, which appear in this issue of *CA* on page 346.\(^5\)

**EFFECT OF POVERTY**

It is also clear that poverty is a significant carcinogen. Cancers of the lung, stomach, uterus, cervix, and others are more common among the poor and underprivileged. Potential confounding factors in this relationship are the fact that poverty is associated with greater tobacco use, poorer nutrition, less exercise, high body weight, alcoholism, and increased exposure to infectious agents.\(^6\)

**Limitations of Randomized Controlled Trials**

In this issue of *CA*, two prominent physician epidemiologists with extensive research portfolios in the area of nutrition and cancer discuss two rather different aspects of this science. The Byers’ article, a learned discourse on “What Can Randomized Controlled Trials Tell Us About Nutrition and Cancer Prevention?” poses a key question. The randomized controlled trial has been the gold standard for elucidating many etiologic hypotheses in medicine. Byers makes a series of very thoughtful points after summarizing the status of all completed randomized controlled trials, as well as those that are currently underway.

One important observation Byers makes is that “Whole foods or whole-diet interventions cannot easily be incorporated into randomized controlled trial designs, certainly not in a blinded way. Typically, for reasons of economy, such trials study only individuals at high risk of neoplasia for short periods of time.” He cautions, therefore, that “randomized controlled trials can usually answer only narrowly defined questions, and cannot easily assess the effects of long-term dietary patterns. Consequently, it may be unwise to study only those at high risk.” Therefore, Byers rightly postulates that (future) “trials should also be designed to be long-term, testing nutrients over many years among people at average risk.”

Another key lesson in Byers’ article is that “Disappointing results from randomized controlled trials designed to answer only narrow questions about the biology of carcinogenesis should not distract us from counseling patients on the basis of the extensive database that already exists from observational studies.”

Having identified the limitations of randomized controlled trials in this area of research, Byers concludes, “There remains compelling evidence that eating five or more servings of fruits and vegetables per day can substantially reduce the risk of some of the most commonly occurring cancers in the US. The combined effects of nutrients as contained in the mixtures commonly known as whole foods seem to be more effective in reducing cancer risk than are nutrients contained in supplements. This simple con-
clusion can be a sound basis for broad nutritional advice to the population, as well as for clinical counseling of individual patients.” (Emphasis added.)

**Guidelines 2000**

The other diet-related article in this issue of CA by Willett, addresses the subject from a more global perspective. Willett walks us through a recent history of nutrition and cancer, providing a succinct review of a series of nutrients and what is known about their relationships to several site-specific cancers, as well as a proposed set of “Goals for Nutrition in the Year 2000.” Not surprisingly, Willett’s recommendations overlap with and are remarkably similar to the American Cancer Society’s nutritional guidelines (Willett’s Table 2, page 346), with one notable addition, i.e., his recommendation that a multivitamin containing folic acid be taken, particularly if alcohol is consumed daily. Willett also reiterates the two-decade-old Doll and Petro mantra when he says, “By taking these actions, approximately one third of cancers could be avoided.” He concludes, “Although the additional data will be important, available evidence justifies strong efforts to reduce cancer incidence by modification of diet and increases in physical activity.” (Emphasis added.)

**Old News?**

The importance of diet and exercise is not a new finding for the lay public or medical practitioners. The same cancer risk factors of too much meat and a deficiency of vegetables and exercise were the subjects of learned discussions in the peer-reviewed medical literature over a century ago. For instance, 100 years ago, W. Roger Williams (The Lancet, December 1898) wrote, “In England four and a half times as many people die now from cancer as a half a century ago. Probably no single factor is more important in determining the outbreak of cancer in the predisposed than high feeding. Many indications point to the gluttonous consumption of meat as likely to be especially harmful. Statistics show that the consumption of meat has reached the amazing total of 131 pounds per head per year, which is more than double what it was half a century ago. No doubt other factors co-operate, among these I should be inclined to name deficient exercise and deficiency in fresh vegetable food.” It wasn’t until 1981 that the subject came to a head with Doll and Peto’s landmark article and the National Academy of Sciences’ first consensus report on the subject the following year.

**Effecting major dietary and nutritional changes to modify cancer risk factors must be initiated at the population level.**

Most areas of biology in general, and medicine in particular, are in a state of perpetual inquiry. However, as we build our knowledge base, life must go on. Public policy and medical consensus should more closely reflect Immanuel Kant’s dictum, “It is often necessary to make a decision on the basis of information sufficient for action but insufficient to entirely satisfy the intellect.” This is a view that is widely held, especially in areas as much removed from medicine as business and economics. In 1996, the late Dr. William Vickrey of Columbia University and Dr. James Mirrlees of Cambridge University shared the Nobel Prize in Economics for their work on “asymmetric information,” a concept that explains how people can make better decisions despite incomplete information.
Given the vast body of science on diet and cancer (admittedly incomplete but not inconclusive), we have enough information for concerted action as proposed by this issue’s preeminent researchers Willett and Byers. What we might consider now, on the subject of diet and cancer, is what don’t we know and when didn’t we know it?

**Effecting Change**

Effecting major dietary and nutritional changes to modify cancer risk factors must be initiated at the population level. California as a state has provided groundbreaking leadership, both in tobacco and dietary change in this area.\(^\text{10}\)

There is also a legitimate and extremely important role for the practicing physician to play—which is to counsel his/her patients about diet and exercise, as she/he should about tobacco use. An ancillary benefit of a significant improvement in the diet of the US population would be a reduction in other chronic diseases, especially cardiovascular disease and diabetes.

There has been a sea change in thinking since cancer prevention, and especially the issue of diet and cancer, surfaced several decades ago. The American Cancer Society has been and probably will continue to be the greatest agent for change in this regard. In our vision for the year 2015, the Society has set a 50% mortality rate reduction goal and a 25% cancer incidence rate reduction goal.\(^\text{11,12}\)

These mortality and incidence reduction goals can never be met without community-based dietary interventions as broad and intensive as some of the more notable community tobacco interventions implemented to date.

Some view our goals as overly optimistic because they are premised on the collaboration of the entire cancer prevention and control constituency in the US. Whether the larger cancer control community will join the American Cancer Society in this concerted effort to reduce cancer incidence and mortality remains to be seen. If they do, without hyperbole, we will be on the threshold of a public health advance so significant that its impact would quantitatively dwarf many of our past medical achievements.

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