Carpe Diem: Time to Seize the Opportunity for Cancer Prevention

Graham A. Colditz, MD, DrPH

INTRODUCTION

In his plea for increased resources to implement cancer prevention strategies, Graham Colditz, MD, states that half or more of cancers in the U.S. and other high-income countries are preventable with information already available. He describes the data-driven possibilities: screening, vaccination, exercise, smoking cessation, sun protection, safe sexual practices, and moderate to no alcohol intake, as well as approaches to implement these strategies and makes a compelling case for using resources for this purpose. Dr. Colditz is Associate Director of Prevention and Control in the Alvin J. Siteman Cancer Center, and Niess-Gain Professor in the Department of Surgery at the Washington University School of Medicine. He received his PhD in epidemiology from Harvard University, and his Internal Medicine Training at the Royal Brisbane Hospital in Australia. Dr. Colditz has an enormous volume of publications, with over 800 original research articles. He has worked to identify lifestyle and environmental factors that affect people’s health, and to develop and teach cancer prevention strategies at the individual and community levels. His research also powers a website—www.yourdiseaserisk.wustl.edu—that helps people assess their risk of developing cancer, diabetes and other diseases as well as suggesting ways to lead longer, healthier lives. His work is inspirational in combining excellent scientific investigation with dedication to making results available and useful to non-scientists.

Gini F. Fleming, MD, Cancer Education Committee Chair

Convincing evidence shows that 50% or more of the approximately 1.6 million new cases of cancer diagnosed each year in the United States are preventable through a combination of lifestyles choices and screening. The majority of these behaviors are well within reach of most individuals and communities, and they include factors such as, regular physical activity, eating a healthier diet, and getting regular cancer screening tests. As such, broad-based implementation focused on fostering such behaviors has a huge opportunity to reduce the burden of cancer in the United States and other nations.

Yet, budget realities remain focused on areas other than prevention. The National Cancer Institute’s budget for fiscal year 2012 included just six percent of allocations to prevention and control, less than that spent on program management. And a review of budget allocations to breast cancer research shows that at most seven percent of National Institute of Health research projects (not dollars) focuses on breast cancer prevention, and only one percent of Department of Defense breast cancer research program expenditure is allocated to research on prevention. To address the burden of cancer as effectively and efficiently as possible, prevention and control must become a true resource priority, with funding on par with other key areas.

The United States and other high-income nations have long developed a “cancer culture”—one marked by lifestyle profiles that together greatly increase cancer risk. This includes, among other factors, low-uptake of human papillomavirus vaccination, persistent rates of smoking, high rates of inactivity and obesity, and poor diet. There is immense potential to reduce the cancer burden by focusing prevention resources in a relatively small number of key areas.

PREVENTION OF INFECTION-ASSOCIATED CANCERS

Worldwide, an estimated 2 million new cases of cancer each year are because of infections. Infections account for roughly 23% of cancers in less developed countries and 7% of cancers in more developed countries. Although several infectious agents have been classified as “carcinogenic to humans,” the agents that account for a majority of infection-related cancers are human papillomaviruses (HPV; causes of...
cervical and other anogenital cancers, as well as a subset of oropharyngeal cancers), hepatitis B and C viruses (causes of liver cancer), and *Helicobacter pylori* (*H. pylori*; a cause of gastric cancer).\(^4\)

Cervical cancer accounts for approximately half of all infection-related cancers in women.\(^4\) Prevention involves HPV vaccination before first sexual activity, coupled with cervical cancer screening, which can identify treatable, precancerous cervical lesions. In the United States in 2010, less than one-third of girls between the ages of 13 and 17 had received all three doses of HPV vaccine.\(^5\) This contrasts sharply with countries such as Australia, which has implemented a national, school-based HPV Vaccination Program: roughly 70% of Australian girls between the ages of 12 and 17 have received three doses of HPV vaccine.\(^6\) Overcoming barriers to widespread HPV vaccination—such as low public awareness and lack of physician recommendation—will be necessary to achieve the full potential of prevention.

Vaccination also plays an important role in the prevention of hepatitis B-related hepatocellular carcinoma. The World Health Organization recommends routine vaccination of infants soon after birth.\(^7\) A vaccine is not available for hepatitis C virus (HCV), which can be transmitted through contact with contaminated blood, through unprotected sex with an infected individual, or from mother to infant. Reduced transmission, coupled with improved recognition and treatment of HCV infection, have the potential to reduce the occurrence of HCV-related hepatocellular carcinoma.

*H. pylori*—a bacterium that colonizes the stomach—causes noncardia gastric cancer as well as B-cell mucosa-associated lymphoid tissue (MALT) gastric lymphoma.\(^8\) Eradication of *H. pylori* appears to reduce the risk of gastric cancer.\(^9\)

### TOBACCO CONTROL

2014 marks the 50th anniversary of the first Surgeon General’s report on smoking: *Smoking and Health: Report of the

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### KEY POINTS

- Half or more of the cancers in the United States and other high-income countries could be prevented if we acted on what we know now.
- Continuing to build on the science of prevention is important, but should not delay, or take resources away from, acting on the good evidence that we already have.
- To address the burden of cancer as effectively and efficiently as possible, prevention and control must become a true resource priority, with funding on par with other key areas.
- Currently available strategies for cancer prevention include vaccination and safe sexual practices; smoking cessation; increase in physical activity; healthy body weight; healthy diet and moderate or no alcohol intake; sun protection and avoidance of indoor tanning; and screening.

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### PHYSICAL ACTIVITY

More than half of the United State adult population does not meet recommended guidelines for aerobic physical activity.\(^11\) Approximately 30% of men and 34% of women get very little or no leisure-time activity.\(^12\)

Lack of regular exercise is estimated to cause five percent of cancers, largely through the link with breast cancer and colon cancer.\(^1\) A meta-analysis by Wolin et al found that compared to those who were least physically active, men who were most active had a nearly 25% lower risk of colon cancer. Active
women had just over 20% lower risk. For breast cancer, higher levels of regular activity throughout life has been shown to lower the risk of the disease in both white and black women by 20% compared to women who get little or no activity. Lowered lifetime exposure to serum estrogen is a likely mechanism through which regular activity protects against breast cancer. Strong data suggest that increased activity levels in the adolescent years also play an important role in adult risk through this same mechanism.

As with other cancer prevention efforts, approaches to improve rates of physical activity must cut across many strata—from schools, to workplaces, to cities and states. Examples of policy approaches that can begin to address issue of inactivity include increasing availability of and access to school-based physical activity programs; increasing community and workplace programs that promote and support physical activity; and creating a built environment that promotes and supports activity.

HEALTHY WEIGHT
The disturbing national and global trends of increasing rates of overweight and obesity are well documented. In the United States, close to 36% of the population is obese and close to 70% of the population is either overweight or obese. Globally, obesity rates have risen dramatically in many countries with once traditionally low rates.

It is estimated that weight gain and obesity cause 100,000 or more new cases of cancer each year in the United States. An analysis by Renehan et al of prospective data from over 2 million men and women found overweight and obesity linked to an increased risk of cancers of the breast (after menopause), colon, kidney, pancreas, endometrium, and esophagus (adenocarcinoma).

Evidence showing that weight loss can lead to a demonstrated lower cancer risk is still developing. This poses a research challenge as weight loss, and especially weight loss sustained over many years, is difficult for many people to achieve. However, a long-term follow-up analysis of the Nurses’ Health Study by Eliassen et al found substantial weight loss (22 pounds or more) maintained over time could lower the risk of breast cancer in postmenopausal women who had not used hormone replacement therapy by over 50% compared with those who had little or no weight loss.

As intractable as the obesity epidemic has seemed, positive signs indicate that it is at least beginning to level off in some groups. Creating and continuing broad-based efforts to combat obesity can further this positive trend. Examples of such policy-based efforts include better-integrating weight control into clinical care through improved reimbursement structures and other incentives; improving access to high-quality food in communities, schools, and workplaces; and creating infrastructure and surroundings that support physical activity. The use of mobile phone-based tools to aid weight control is an area that is quickly developing and showing good promise. The generally low-cost and broad-reach of such technology makes it appealing as a public health intervention.

HEALTHY DIET AND ALCOHOL
A 2010 analysis of NHANES 24-hour recall data by Krebs-Smith et al found that an astonishingly high percentage of the United States population does not meet federal recommendations for a healthy diet. Close to 100% did not eat enough whole grains and vegetables, and a very large percentage ate too few fruits and too many empty calories.

Although overall adult diet does not have as strong a link with cancer risk as some other established risk factors, there is solid evidence that many specific aspects of diet are linked to specific cancers, including cancers of the mouth, pharynx, larynx, esophagus, lung, stomach, pancreas, liver, colon, breast, and prostate. Approximately 5% of all new cases of cancer are directly linked to dietary factors, not including alcohol.

A diet targeted at lowering cancer risk is one that focuses on plant-based foods (fruits, vegetables, and whole grains); keeps red meat to a minimum, especially processed meat; and is low in sodium. A daily multivitamin containing vitamin D and folic acid may provide added protection against certain cancers and other chronic diseases.

Though moderate alcohol intake has certain health benefits, moderate consumption can also increase the risk of certain cancers, including breast and colon cancers. Drinking in youth and young adulthood seems to have a pronounced effect on later breast cancer risk.

Most adults who drink moderately do not need to stop for health reasons, but those who do not drink, should not be encouraged to drink moderately for health reasons. All heavy drinkers should be encouraged to cutback or stop drinking altogether. Data on the acute and chronic risks of youth and young adult drinking point to urgency in addressing high rates of alcohol use—and binge drinking—in these groups.

Policy efforts to improve adolescent and adult diet should include approaches, such as: broad-based promotion of nutrition education in schools, including the entire school community (students, teachers, administrators, staff, and families); promotion of policies that help improve the affordability of healthy food choices, particularly in areas where food purchasing options are limited; and funding of effective communication campaigns that promote healthy eating. Alcohol policies should focus on helping limit youth and young-adult drinking.

SUN PROTECTION AND AVOIDANCE OF INDOOR TANNING
Among non-Hispanic whites in the United States, the incidence of melanoma has increased markedly over time among both men and women, and among all age groups, including children and adolescents. Rates of squamous cell carcinoma and basal cell carcinoma have also increased.

Solar radiation and ultraviolet (UV)-emitting tanning de-
VICES cause skin cancer and are classified as group 1 carcinogens (carcinogenic to humans) by the International Agency for Research on Cancer.27 Skin cancer prevention requires sustained sun protection efforts (Australia has led the way in this area28) and complete avoidance of UV-emitting tanning devices. The use of UV tanning devices is particularly risky for young people, yet remains common in the United States. A small but growing number of states within the United States now ban indoor tanning before the age of 18. Additional work along these lines will be necessary to reduce exposure to UV-emitting tanning devices.

CANCER SCREENING

Compared to many other behaviors that help reduce cancer risk, screening is a relative success story. Just over 73% of adult-aged women in the United States have had a Pap test in the past 3 years, and nearly 65% of all age-eligible adults have had recommended colorectal cancer screenings.11,29 Yet, given the ability of these tests both to prevent disease and to detect it early in more curable stages, there remains much room for improvement, especially at the state level where there can be great variance in screening rates. Continuing trends in better funding of preventive care, with a particular focus on low-income populations, can further improve uptake of recommended cancer screenings.

MAKING CANCER PREVENTION A REALITY TODAY

To implement effective cancer prevention, we first need a solid scientific knowledge base linking modifiable risk factors with cancer risk. We have this. We then need social strategies that can foster and support sustained behavior change and deliver screening and vaccines to populations. We have this as well.

What is currently lacking is the political will to allocate resources, prioritize incentives and rewards, and implement regulations that reinforce behaviors that will prevent cancer. Given that we know today that 50% or more of cancer is preventable, gathering political support for prevention should be our highest priority. One likely reason for its current limited support is simply the nature of prevention. Its success is marked by silent victories. Those who do not get cancer do not have compelling stories of survival that often accompany cancer treatment. And the understated approach of prevention—putting into practice the knowledge we already have—does not garner the same political and research excitement associated with newer technologies and the hunt for undiscovered and unproven cancer risk factors.

Of course, research across the full spectrum of cancer is essential and needs to continue. Cancer prevention, however, must be funded in proportion to its potential effect. If we do not act, with the aging United States population, the number of new cancer cases diagnosed annually will double within 35 years.

In a 2013 Science paper on the cancer genome landscape, Vogelstein et al call on government and philanthropic organizations to dedicate greater resources to prevention and early detection, reasoning that although treatment of advanced cancer is key, it should only be called on when prevention and early detection fail.30 They conclude with the lines: “We believe that cancer deaths can be reduced by more than 75% in the coming decades, but that this reduction will only come about if greater efforts are made toward early detection and prevention.” 30

We have the knowledge. We need the resources. It is time to act. Today.

For online appendices and patient prevention materials, visit: http://tinyurl.com/4a4g2j

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