Promoting Healthy Lifestyles

Policy, Program, and Personal Recommendations for Reducing Cancer Risk

2006-2007 ANNUAL REPORT PRESIDENT'S CANCER PANEL

U.S. DEPARTMENT OF HEALTH
AND HUMAN SERVICES
National Institutes of Health

National Cancer Institute

This report is submitted to the President of the United States in fulfillment of the obligations of the President's Cancer Panel to appraise the National Cancer Program as established in accordance with the National Cancer Act of 1971 (P.L. 92-218), the Health Research Extension Act of 1987 (P.L. 99-158), the National Institutes of Health Revitalization Act of 1993 (P.L. 103-43), and Title V, Part A, Public Health Service Act (42 U.S.C. 281 *et seq.*).

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Suzanne H. Reuben
for
The President's Cancer Panel

August 2007

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Erratum

This erratum contains updated information regarding two issues in the 2006/2007 Annual Report, *Promoting Healthy Lifestyles: Policy, Program and Personal Recommendations for Reducing Cancer Risk.*

1) On page 10, Table 1 – American Cancer Society (ACS) Guidelines on Nutrition and Physical Activity for Cancer Prevention, a bullet point was inadvertently omitted under number 3, Consume a Healthy Diet, with an Emphasis on Plant Sources. It should be the second bullet point in the list and should read:

- Eat five or more servings of a variety of vegetables and fruits each day.

Readers wishing to review the guidelines in full should consult: Kushi, LH, Byers T, Doyle C, Bandera EV, et al. *CA: A Cancer Journal for Clinicians* 2006;56:254-281.

2) Since publication of this report, the Panel has received comments regarding the estimated number of premature deaths that can be attributed to obesity and the magnitude of obesity's contribution to premature death relative to other contributing factors (Page 9, third paragraph). In large measure, these comments have reflected a lack of consensus in the field about eliminating data about groups of people, for example smokers or those with chronic disease, to obviate potential confounding factors and biases. Currently, no population-based data exist to support ranking causes of death such as obesity versus smoking.

Another issue to be taken into account when reading the literature on this topic is a lack of clarity in terminology; for example, terms such as "premature deaths," "excess deaths," and "preventable deaths" are sometimes used interchangeably but without consistent or clearly stated definition. Similarly, "contributing factor," "underlying causes," "death attributable to," and "death associated with" are used without clear definition to characterize the impact of various lifestyle factors on mortality. This problem complicates comparisons of estimates produced by different researchers. Uniform definitions for terms such as these would be useful in developing and comparing estimates of the impact of lifestyle factors.

The Panel acknowledges the complexities involved in calculating the impact of lifestyle factors on health and anticipates that continuing efforts to quantify the magnitude of obesity's contribution to causes of death (e.g., heart disease, cancer) will refine these estimates. Doing so will be important in charting the health effects of the nation's escalating obesity problem, including its impact on mortality as well as on morbidity.

The President
The White House
Washington, DC 20500

Dear Mr. President:

The year 2007 brought the announcement of the steepest decline in cancer deaths ever recorded in the United States. This milestone reflects the wisdom of our national investments in cancer research and care and is one of the most encouraging signs of progress since the war on cancer was declared in 1971. Yet this year alone, over a half million more Americans will lose their battle with cancer. Tragically, nearly two-thirds of these deaths could have been prevented through changes in lifestyle.

Over the past year, the Panel examined how lifestyle affects cancer risk, and the concrete actions that governments, communities, and individuals can take to reduce that risk through lifestyle changes. Although many factors may affect cancer risk, the Panel focused on our national epidemic of obesity – the product of unhealthy diet and physical inactivity – and on tobacco use and environmental tobacco smoke exposure. Despite irrefutable evidence that modifiable behaviors are linked to numerous types of cancer and the implementation of a multitude of programs to combat risk-promoting behaviors, many millions of Americans continue to practice unhealthy lifestyles. The Panel identified key policy, industry, and cultural barriers that prevent the public from receiving the information and interventions necessary to make healthy choices and thereby reduce their cancer risk.

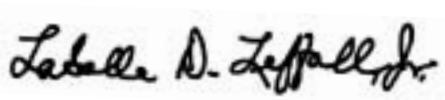
Although efforts have been made to halt alarming obesity trends by promoting healthier eating and physical activity, the number of organizations, institutions, and individuals that have made a commitment to healthy living still is too small. Further, the important role of entities not usually considered a part of the National Cancer Program – the media, the agricultural system, city planners, and educators, to name a few – has been underappreciated.

Moreover, the Panel was troubled to find that the efforts of those committed to an America less burdened by cancer often are compromised by Federal, state, and local policies that have decreased the availability and affordability of healthy foods, limited physical education in schools, and created a built environment that discourages physical activity. Ineffective policies, in conjunction with limited regulation of sales and marketing in the food and beverage industry, have spawned a culture that struggles to make healthy choices – a culture in dire need of change. To minimize the growing financial burden that cancer inflicts on our nation, we must dramatically increase our focus on disease prevention and ensure that preventive services, including nutrition and physical activity interventions, become an integral and reimbursable component of primary care. These changes can only be realized with the exercise of strong political will, and the Panel calls upon the leaders of our nation to make public health a priority.

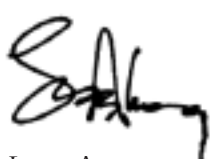
As importantly, policymakers at all levels of government have an obligation to enact legislation to eliminate disease and death caused by tobacco use and environmental tobacco smoke exposure. The Panel recommends foremost that the influence of the tobacco industry – particularly on America's children – be weakened through strict Federal regulation of tobacco product sales and marketing. In addition, it is critical that our nation not only participate in global tobacco control efforts, but that the United States set a standard in developing and implementing exemplary programs and interventions that reduce tobacco use and smoke exposure. To do so, tobacco prevention programs must receive adequate funding and smoking cessation services must be better incorporated into standard health care.

Research has shown that adopting a healthy lifestyle is an effective defense against cancer. While public and private organizations must coordinate efforts to educate the American public about the relationship between healthy behaviors and disease prevention, individuals can only adopt healthy lifestyles if they have the resources and opportunities to do so. This country must not ignore its moral obligation to protect the health of all Americans. We can and must empower individuals to make healthy choices through appropriate policy and legislation, and the Panel urges you to use the power of your office toward this life-saving goal.

Sincerely,



LaSalle D. Leffall, Jr., M.D., F.A.C.S.
Chair



Lance Armstrong

Margaret L. Kripke, Ph.D.

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Executive Summary

Many Americans say they fear cancer more than any other disease. In each of the past two years, small but encouraging decreases in cancer deaths have been recorded. But cancer still claims more than a half million lives each year in the United States, and nearly 1.5 million new cases are diagnosed annually. Tragically, two-thirds of these deaths – and many thousands of new cases – could be avoided. Tobacco use and environmental tobacco smoke (ETS) exposure account for nearly a third of all cancer deaths in America, and unhealthy diets are believed to account for another third.

The President's Cancer Panel has noted with growing concern the accelerating increase in obesity among adults and children, the mounting evidence linking obesity to higher risk for numerous cancers, and the lack of recent progress in reducing tobacco use. Between September 2006 and February 2007, the Panel convened four meetings to examine the current evidence regarding the effects of diet, nutrition, physical activity, tobacco use, and tobacco smoke exposure on cancer risk as well as ongoing and potential actions to reduce the national cancer burden by promoting healthy lifestyles.

Lifestyle and Cancer Risk – Current Approaches to Cancer Prevention

Few would disagree that the cancer and other disease-related morbidity, mortality, health care costs, and productivity losses associated with unhealthy lifestyle behaviors are escalating at an alarming rate. Studies indicate, however, that many people believe they have little ability to affect their cancer risk, despite clear evidence that healthy lifestyle behaviors can reduce the chance of developing the disease.

Research Emphases in Cancer Prevention and Control

Interest in cancer prevention and control research appears to be increasing as the toll of cancer and related health care costs grow, but funding still is quite limited compared with support for cancer detection and treatment research. Little cancer prevention and control research is behavioral or policy-oriented, although greater knowledge in both areas is essential to inform and improve primary and secondary prevention efforts.

…achieving social change…will require unprecedented will and commitment.

— James Levine, M.D., Ph.D.
Mayo Clinic College of Medicine

Most of the federally-sponsored cancer prevention research underway or planned emphasizes exploring genetic and/or molecular biologic indicators or predictors (markers) of cancer, metabolic pathways, and possible interventions (e.g., preventive agents) to interrupt the multi-step cancer development process before invasive disease occurs. Although this work is important and should continue to be supported, it ignores the macroenvironment

and the physical, social, and cultural contexts within which food choices, opportunities for physical activity, and tobacco use and smoke exposure occur. Moreover, population-level benefits from this research are decades away. In the more immediate term, the principal causes of lung and numerous other cancers are amenable to change through behavioral and policy/environmental interventions, which offer the best chance of substantially reducing the cancer burden.

Sick Care, Not Well Care

Our health care system continues to be strongly oriented to the provision of acute care. Most physicians are trained principally to treat disease, not to help people remain well. In addition, the amount of time physicians usually spend with each patient is extremely limited due to productivity pressures (i.e., to see a given number of patients each day), causing office visits to focus primarily, if not entirely, on the presenting complaint.

As the Panel has noted in previous reports, procedures to address episodes of acute illness or treat chronic conditions are covered by health insurance, but reimbursement is scarce or nonexistent for services (excluding cancer screening for early detection) to maintain wellness or prevent disease, such as counseling, education, outreach, and behavioral or psychosocial interventions. Medicare reimbursement levels for medical services reflect a continuing lack of emphasis on disease prevention in the current health care system, and most private health plan reimbursement policies and schedules quickly mirror Medicare payment rates. Medicare reimbursement policies also influence state Medicaid payment rates. In the private sector, a major barrier to coverage for behavioral or other cancer risk-reducing interventions has been the short-term profit mentality of publicly-held private insurers and many corporations. Employee turnover and resultant changes in health plan participation have made both insurers and employers hesitant to invest in preventive interventions because of doubts that they would be the ones to enjoy whatever health care cost savings might accrue.

Wellness Initiatives – Bridging the Gap, Promoting a Culture of Wellness

In growing numbers, however, larger employers and some state and local governments are attempting to counter rising health care costs, productivity losses, and the health care system's lack of emphasis on disease prevention by devising and implementing wellness programs. Regardless of their motivation, these programs are promoting a culture of wellness and individual empowerment regarding personal health that has not previously existed in many segments of the population. In addition, numerous publicly-sponsored and other health promotion-oriented Web sites now offer tools to help people adopt healthier lifestyles.

This is a promising trend, but many millions of Americans will continue to lack access to wellness services such as these, perhaps for many years. Promoting a culture of wellness may be most challenging among people in part-time and low paying jobs and the unemployed who lack employer health or Medicaid benefits, those without a usual source of care, individuals without computer access, those less educated and/or health literate, those living in neighborhoods in which it is unsafe to exercise outdoors and where fresh food access is limited, and individuals whose first language is not English. A number of local governments and community organizations, in some cases with Federal financial assistance, are attempting to reach these populations with culturally tailored fitness, nutrition, and other interventions.

Reducing Cancer Risk Through Diet, Nutrition, and Physical Activity

The term, "energy balance," as applied to human health, typically refers to the integrated effects of diet, physical activity, and genetics on growth and body weight over an individual's lifetime. Increasingly, scientists are becoming aware of the importance of understanding the effects of energy balance on cancer development and progression and on cancer survivors' quality of life post-treatment. Weight, body composition, physical activity, and diet affect numerous physiologic systems and therefore can alter the cancer process at many points.

Obesity, Diet, Nutrition, and Cancer

Almost two-thirds of the U.S. adult population is overweight, and approximately half of those individuals are obese. It has been estimated that if current trends persist, 74 percent of the adult population will be overweight or obese by 2010 and by 2016, more than half of the population is likely to be obese. As an overall public health problem, obesity due to unhealthy lifestyle may be challenging tobacco use in its population impact – certainly with respect to associated morbidity – and has led some to believe that it could result in shortened life expectancy in the relatively near future. Estimates of obesity-related mortality vary, but a 2005 Centers for Disease Control and Prevention (CDC) study estimated that approximately 112,000 deaths are associated with obesity annually in the United States, making obesity the second leading contributor (after tobacco use) to premature death.

We all must come to grips with the reality that our society has dramatically altered the way we live, eat, work, and play.

— Dwayne Proctor, Ph.D., M.A. Robert Wood Johnson Foundation

Obesity rates vary considerably among population groups, with higher rates observed among the poor and some ethnic/minority groups. The escalating rates of overweight and obesity among children and adolescents are of great concern since these individuals have as much as an 80 percent risk of becoming overweight adults.

The list of cancers associated with obesity continues to grow; established or suspected obesity-related cancers include:

- Breast (postmenopausal)
- Prostate (advanced)
- Pancreas
- Esophagus (adenocarcinoma)
- Gastric Cardia (adenocarcinoma)
- Endometrium
- Colon and Rectum
- Liver
- Gallbladder
- Kidney (renal cell)
- Non-Hodgkin's Lymphoma
- Multiple Myeloma
- Leukemia
- Stomach (men)
- Ovary
- Uterus
- Cervix

Some of these correlations between obesity and cancer risk, incidence, and prognosis are better established than others. Studies have found overall cancer death rates as much as 50 percent higher in obese men compared with their normal weight counterparts, and more than 60 percent higher cancer death rates among obese women.

Efforts to halt and reverse current obesity trends are unlikely to succeed without the participation and collaboration of governments, non-governmental organizations, industry, educators, and individuals. For example, current agricultural and public health policy is not coordinated – we heavily subsidize the growth of foods (e.g., corn, soy) that in their processed forms (e.g., high fructose corn syrup, hydrogenated corn and soybean oils, grain-fed cattle) are known contributors to obesity and associated chronic diseases, including cancer.

The upcoming reauthorization of the Farm Security and Rural Investment Act of 2002 (the Farm Bill) provides an opportunity that must not be missed to strongly increase support for fruit and vegetable farmers, improve the national food supply, and enhance the health of participants in the national school lunch, food stamp, and Women, Infant, and Children food assistance programs. Greater efforts are needed to improve the nutrition environment, particularly in lower income areas, to ensure that all people have physical and financial access to healthy food. Although some school districts are attempting to improve the school nutrition environment, the quality of most school food service offerings is poor due to the use of processed government surplus foods and the availability of unhealthy foods in school vending machines, cafeterias, and school stores.

Food marketing, particularly to children, emphasizes unhealthy food products. Currently, such marketing is regulated only by voluntary guidelines established by the food and beverage industries. In addition to more effective oversight of food advertising, coordinated public education is needed to teach children and adults about healthy eating to avoid cancer, heart disease, hypertension, and diabetes. Constructive involvement of the media will be essential to reach these objectives.

…there's a balance that has to be struck when we begin to have these conversations about our food system. It can't just be a corporate focus. It has to be a focus that has a social justice emphasis.

— LaDonna Redmond
Institute for Community Resource Development

The links between cancer, diet, and obesity have not been accepted sufficiently by the health insurance industry to motivate widespread coverage for health-promoting/cancer prevention services such as nutrition counseling or obesity-related treatment services. Obesity itself typically is not a covered medical condition. An individual must develop an established obesity-related condition (e.g., diabetes, hypertension, heart disease, high cholesterol) to receive reimbursed treatment. However, the treatment generally only covers services to control the obesity-related disease, but not to address its underlying cause. This situation reflects the overall acute care orientation of the health system; for example, the services of a nutritionist or dietitian seldom are reimbursed outside of a specialized cardiac rehabilitation or diabetes management program. Health care providers have a crucial role in helping patients understand the meaning of energy balance and body mass index (BMI), the necessity of reducing caloric intake in order to lose weight, and the increased risk for many cancers due to obesity.

Employers can help employees control their weight and reduce health care costs related to cancer and other chronic diseases by offering healthier choices at worksite food service facilities and vending machines, manipulating prices to make healthier options more appealing than unhealthy ones, and actively encouraging employee fitness.

Thus, multi-pronged nutritional interventions have the potential to increase individual awareness of the relationship between diet and cancer, and also reach the family, community, and society as a whole. Barriers to healthy eating must be removed and greater resources should be provided for vulnerable populations. In addition, support is needed for people who are making healthy changes, and population-level nutrition policies are required.

Physical Activity and Cancer

The importance of physical activity in cancer prevention, independent of diet and obesity, is becoming better understood. According to 2005 Behavioral Risk Factor Surveillance Survey (BRFSS) data, a quarter of all adults engage in no leisure time physical activity. Less than half engage in moderate or vigorous physical activity as recommended by CDC. By age 18 to 22 years, only 26 percent of males and 12 percent of females engage in moderate or strenuous activity at least five times per week. Inactivity during childhood and adolescence is of particular concern because it increases the likelihood of being inactive as an adult, and less active adults are at greater risk of developing colon cancer, heart disease, and high blood pressure.

Cancers with an established or suspected association with physical inactivity include:

- Colon
- Rectum
- Endometrium
- Breast
- Kidney
- Ovary
- Prostate
- Lung
- Testis

Though findings to date vary by cancer site and population studied, inactivity generally is associated with higher cancer risk and protective effects of exercise increase with frequency, intensity, and duration of activity. Though most research to date has focused on the efficacy of physical activity in cancer prevention, accumulating evidence also demonstrates that exercise influences other aspects of the cancer experience, including cancer detection, coping ability, rehabilitation, and survival.

As with obesity, diet, and nutrition, numerous initiatives and Web sites have been established by Federal and non-governmental organizations to encourage people to become more active. Those that have been evaluated have shown variable success and may be most effective as part of a multi-pronged physical activity intervention. Numerous states and localities are launching programs and environmental improvements to increase physical activity among residents, usually as part of broader wellness initiatives.

The built environment is a key influence on the likelihood that people will adopt and maintain an active lifestyle. Research on adults has found a direct relationship between the convenience of places to walk and the proportion of adults meeting current activity recommendations. In many neighborhoods, lack of sidewalks, inadequate lighting, and other safety concerns are significant disincentives to outdoor physical activity. Many neighborhoods lack playgrounds and other recreational facilities; in others, available facilities need substantial refurbishment to be both safe and attractive. Moreover, as suburbs radiate further from city centers, residential communities are being placed far from employment centers and shopping hubs, necessitating auto travel to commute to jobs and accomplish shopping and other routine tasks.

The decline of physical education in schools unfortunately has coincided with unhealthy changes in family eating patterns (e.g., increase in percentage of restaurant meals eaten, eating "on-the-run"), increased sedentary leisure activities, and other changes in common behavior patterns.

...there has been very limited study of the benefits of physical activity for long-term cancer survivors, survivors of understudied cancer sites, and minority or medically underserved groups, and these need to be priorities for future funding.

— Kerri Winters-Stone, Ph.D. Oregon Health & Science University

For example, few children still walk to school. Diminished participation in physical education is one of several factors contributing to increasing obesity rates among children and teens. Physical education has been all but eliminated in many schools, largely due to pressures to improve performance in core academic subjects. In schools that offer physical education, classes usually are large, limiting the amount of time each child can participate actively. Only a handful of states measure children's body mass index and report the results to parents. In addition, most schools still offer little more than traditional team sports; some are beginning to focus on individually-oriented activities that all students can enjoy throughout life, regardless of baseline skill levels.

Widely available and increasingly diverse forms of media entertainment are key contributors to sedentary lifestyles that are a major factor in climbing obesity rates. According to one estimate, children aged 8 to 18 years spend an average of 6.5 hours per day either in front of a screen (e.g., television, video console, non-homework related computer) or listening to music. Data on adult use of media entertainment are scarce, but some studies suggest substantial levels of use, particularly among adults who also report engaging in no physical activity. Moreover, the ability of media coverage to shape public opinion and reinforce various behaviors (e.g., perceptions of fitness and physical activity as normative and desirable behaviors) is extremely powerful. This influence should be used to promote healthy lifestyles that would help reduce the burden of cancer and other chronic diseases.

Though still not commonplace, some employers are trying to encourage recreational physical activity among employees. These efforts usually are part of a broader wellness program that may target obesity, diabetes and hypertension control, and other health issues. The motivation typically is to induce employees to improve their health in order to reduce health benefit costs and improve worker productivity.

As is true regarding diet and nutrition counseling, most primary care providers do not routinely counsel patients about the importance of physical activity and the level of activity needed to lose weight and maintain a healthy weight. Like nutrition counseling, physical activity counseling or services seldom are reimbursed by public or private health insurance plans except in the context of cardiac rehabilitation or physician-prescribed physical therapy.

Because physical activity is not a routine part of most Americans' lives, individuals and families will need to find and create opportunities to become more active. Individuals also can advocate for themselves and their families for changes to make neighborhoods more exercise-friendly for adults and children, and for meaningful physical education in schools.

Reducing Cancer Risk by Eliminating Tobacco Use and Exposure

Tobacco use is the number one cause of preventable death in the United States, and the second leading cause of death in the world. It is estimated that if current tobacco use trends continue, by 2020 approximately 10 million tobacco-related deaths will occur each year, with more than a billion tobacco-related deaths in the 21st century.

Tobacco Use and Cancer

The only known way to reduce tobacco-related death and disease is the prevention and cessation of tobacco use and environmental tobacco smoke (ETS) exposure. In effect, if the population ceased smoking, this single behavior change would be tantamount to a vaccine against one-third of cancer deaths. Half of all long-term smokers – particularly

those who began smoking as teens – will eventually die prematurely from a disease caused by tobacco; half of these people will die in middle age, losing on average 20 to 25 years of life expectancy.

Nicotine in tobacco causes addiction as powerful and self-reinforcing as addiction to drugs such as cocaine and heroin. Tobacco use has been established unequivocally as a causative or contributory agent in the development of a growing list of cancers:

- Lung
- Trachea
- Bronchus
- Esophagus
- Oral Cavity
- Lip
- Nasopharynx
- Nasal Cavity
- Larynx
- Paranasal Sinuses
- Stomach
- Bladder
- Kidney
- Pancreas
- Uterine Cervix
- Acute Myeloid Leukemia

Susceptibility to tobacco carcinogens and subsequent cancer development is believed to be affected by numerous factors, including but not limited to familial genetic predisposition, other genetic alterations, DNA repair capacity, differences in carcinogen metabolism, defects in cell signaling pathways, cell/environment interactions, and chronic inflammatory processes. Smoking also is a major cause of heart and cerebrovascular disease, chronic bronchitis, and emphysema.

In 2005, 20.9 percent of U.S. adults (18 years of age and older) were current cigarette smokers; smoking prevalence remains higher among men (23.9 percent) than among women (18.1 percent). Smoking prevalence is higher among the poor compared with those with more resources, varies considerably among racial/ethnic groups, and generally decreases with increasing educational level.

Several population groups are particularly vulnerable to tobacco initiation, continued use, and consequent disease. Perhaps the most important of these is youth; since the younger people are when they begin to smoke, the more likely they are to become addicted adult smokers. More than 80 percent of adult smokers become addicted as teenagers. Nicotine-addicted adolescents typically overestimate their ability to stop smoking when they choose, and most relapse after a quit attempt. Of particular concern, the decline in teen smoking rates that began in the late 1990s appears to have flattened, in part due to the introduction of numerous new tobacco products designed to appeal to young people (e.g., flavored cigarettes and cigars). Similarly, use of smokeless tobacco (ST) products by youth declined after the mid-1990s, but has begun to increase again, in part due to the introduction of many new youth-targeted flavored ST products. ST use is strongly associated with smoking initiation. Other populations of special concern with regard to smoking initiation and ongoing tobacco use include young adults, women, racial/ethnic minorities, the poor, active military personnel, veterans, cancer survivors, persons with mental illness, and the gay and lesbian communities.

More Americans will die in just the next three years from tobacco than have died in all previous wars combined. We would have to have the equivalent of five World Trade Centers destroyed or people killed to equal the number of deaths that we see in just one week in this country from tobacco.

— K. Michael Cummings, Ph.D., M.P.H.
Roswell Park Cancer Institute

As is true concerning efforts to address poor diet and nutrition, physical inactivity, obesity, and the added cancer risk attributable to these lifestyle factors, numerous stakeholders are involved in the current tobacco problem in the United States and worldwide – and its

solution. Evidence-based methods exist to reduce tobacco use initiation and facilitate cessation (e.g., tobacco tax increases, smoke-free environments, anti-smoking campaigns and education) and to treat tobacco users (pharmacologic and behavioral interventions). These tools must be applied more broadly and in concert at both individual and population levels to substantially reduce the burden of cancer due to tobacco use.

It is not an exaggeration to characterize the tobacco industry as a vector of disease and death that can no more be ignored in seeking solutions to the tobacco problem than mosquitoes can be ignored in seeking to eradicate malaria. Over the past half century, the industry has developed highly sophisticated strategies to oppose effective public policies and programs to reduce tobacco consumption, reaching into all levels of the political system and maintaining public denial in the face of overwhelming scientific evidence of addiction and harm from tobacco products. The tobacco companies also have manipulated product design and contents to increase their addictiveness and appeal.

Key actions needed at the Federal level to reduce the disease burden of the tobacco pandemic in the United States and globally include ratifying the Framework Convention for Tobacco Control, authorizing the Food and Drug Administration to regulate the content and marketing of all tobacco products, increasing the Federal tobacco excise tax, and excluding tobacco and tobacco products from all international trade agreements. In addition, the Federal commitment to tobacco control research does not reflect the burden of disease caused by tobacco and must be strengthened.

Despite having ample funds with which to administer effective tobacco control programs, only a handful of state governments have ever supported tobacco control efforts at the level recommended by CDC – a mere 7.3 percent on average of state tobacco tax revenues and annual payments under the 1998 Master Settlement Agreement (or similar state/industry settlements). Moreover, for reasons including industry and political pressures and competing priorities (e.g., highway construction, debt service), many previously robust programs have had most or all of their funding withdrawn. The tobacco companies have been quick to fill this void with vastly increased product promotion to targeted populations. States need to restore and/or increase funding for tobacco control and continue to raise excise taxes, which have been shown to discourage tobacco use, particularly by youth.

Important tobacco control investments and partnerships exist among numerous non-governmental organizations and with Federal agencies such as CDC and the National Cancer Institute. These should be continued and expanded.

Media portrayals of smoking as a pleasurable, attractive, and normal adult activity are enormously powerful influences on young people's attitudes about smoking and the likelihood that they will use tobacco. Therefore, the media have a significant moral responsibility to not promote the use of deadly tobacco products, and can have a far reaching influence in actively discouraging tobacco use.

Direct health care costs due to tobacco-related disease are now estimated at $75 billion annually, and indirect costs exceed $81 billion. Smokers have higher overall health care costs compared with nonsmokers, and family members of people who smoke often have higher health care costs compared with families in which no one smokes. It is in the mutual interests of employers, public and private sector

The U.S. Federal Government has been literally the world leader in establishing the science base in terms of the health effects of smoking — our Surgeon General's reports are read in every country in the whole world. And yet we have done so little in the face of so much evidence.

— Matthew Myers, J.D. Campaign for Tobacco-Free Kids

health insurers, and the health care system to work together to provide tobacco use cessation services to all who need them and thereby reduce health care costs, lost productivity, and suffering due to cancer and other diseases caused by tobacco.

Clearly, the most important thing individuals can do to reduce tobacco-related cancer risk is to cease using any form of tobacco. Individuals also can support anti-tobacco policies and programs (e.g., to prevent youth access to tobacco and improve anti-tobacco education in schools) and support mandated insurance coverage for comprehensive tobacco cessation services.

Environmental Tobacco Smoke (ETS) and Cancer

Cigarette smoke contains more than 4,000 chemicals (e.g., cyanide, formaldehyde, benzene, arsenic, DDT, acetylene, ammonia), including 69 known carcinogens as well as poisonous gases such as nitric oxide and carbon monoxide. These chemicals come from the tobacco itself and the combustion of the myriad substances added by manufacturers to make tobacco products more palatable. ETS causes approximately 3,000 lung cancer deaths each year among nonsmokers in the United States, and is a significant contributor to cardiac, respiratory, and other diseases in individuals exposed to it. In total, ETS exposure claims the lives of approximately 38,000 nonsmokers annually. There is no safe level of exposure to ETS.

The momentum toward passage of smoke-free laws has been gathering speed and received a significant push with publication of the Surgeon General's report on ETS. In addition to protecting nonsmokers, smoke-free laws are estimated to help the 70 percent of smokers who want to quit by providing them with public environments free from any temptation or pressure to smoke.

The strongest resistance to smoke-free ordinances typically comes from bar and restaurant owners, who fear a significant loss of business if smoking is prohibited on their premises. Such fears have proven to be unfounded. As of July 3, 2007, approximately 162 million Americans are living in locales with smoke-free ordinances. During the period from the beginning of the Panel's meetings (September 2006) until publication of this report (August 2007), at least 133 new smoke-free laws were passed by state, county, and local governments. However, despite the dramatic increases in the passage of smoke-free workplace laws, an estimated 30 percent of workers continue to be exposed to ETS, and exposure varies considerably by occupation. Bar and restaurant workers are among the most highly exposed.

Tobacco industry attempts to thwart smoke-free policies have been well documented. Smoke-free laws pose a major threat to tobacco sales because they reflect a changing culture in which tobacco use is becoming increasingly unacceptable. The industry continues to oppose new smoke-free laws and is actively pursuing ways of replacing revenues lost due to smoke-free ordinances and laws. To counter decreasing tolerance for smoking and smoke exposure, the tobacco companies are developing and marketing a growing number of smokeless products, including some that are spitless. These products allow smokers to maintain nicotine dosage and still comply with smoking restrictions. They also help the industry avoid losing as customers smokers who quit using cigarettes.

...in study after study after study in the localities and at the state level, when we do an analysis of what the revenues were before and after a smoke-free law passes, [the results] are always the same. Either it has had no impact whatsoever on revenues or it increased business. Smoke-free laws are good for health and good for business.

— Cynthia Hallett, M.P.H. Americans for Nonsmokers' Rights

Some individuals and families still permit smoking in the home, in the car, and around children, exposing family members and visitors to significant ETS levels. Changing this situation will require personal action. Individuals also can protect themselves and their families from ETS exposure by patronizing smoke-free businesses and voting for smoke-free local and state ordinances.

Conclusions

The President's Cancer Panel has long maintained that participants in the National Cancer Program include not just research institutions, health care entities, and patient advocates, but all of the institutions, organizations, industries, and individuals that by their action or inaction contribute to reducing or exacerbating the national burden of cancer. In large measure, cancer researchers and the acute care health system have been charged, albeit erroneously, with addressing the epidemics of obesity- and tobacco-related cancer morbidity and mortality. They cannot do this without a change in focus, and they cannot do it alone.

Policy decisions that would enable more people to choose cancer risk-reducing behaviors have been limited both in number and scope. Yet cancer control research evidence clearly recognizes the critical need for legislative, policy, and environmental changes to support individual behavior change. The public health infrastructure – which has enormous potential for promoting healthy behaviors – is underdeveloped and undervalued. The important roles of government at all levels, the health care and insurance systems, and entities not usually considered to be participants in the National Cancer Program – the media, city planners, employers, the agricultural system, the educational system, the food, beverage, and restaurant industries, to name only a few – have been underappreciated.

Who is Responsible for What?

Discussions of disease prevention almost inevitably include debate as to the relative responsibilities of the individual and institutions in addressing the issues discussed in this report. The Panel concludes that:

Government and institutions have an obligation to protect the public health. Citizens have the right to expect that the government and other influential institutions will not promulgate and support policies that cause direct harm to health or, by omission, allow harmful circumstances that require institutional intervention to go unaddressed. The power of policy as a behavior change strategy is well recognized and must be applied constructively and thoughtfully to reduce the toll of cancer associated with poor diet, inactivity, and tobacco. Population-level solutions are needed to help resolve the lifestyle-related problems contributing to cancer risk, and it is up to policymakers to authorize and support the implementation of such solutions.

The health care community must coordinate and integrate education and prevention messages related to obesity, diet and nutrition, physical activity, tobacco use, and environmental tobacco smoke exposure with educational

If you look at…what causes adult cancer globally, what causes it is generally exposures that people sustain from products that are mass produced by corporations and marketed…. tobacco…alcohol…fast food...chemicals and pesticides….The only way we're going to make any progress at all against any of these mass marketed goods is to have a partner in government that actually is willing to persuade corporations to start to think about doing things that are in the public interest.

— James Sargent, M.D.
Dartmouth-Hitchcock Medical Center

efforts related to other diseases that have common risk factors in order to leverage available resources and simplify and harmonize risk reduction messages. The health care community also has an important role in advocating for policy changes and for funding to support treatment and necessary research related to lifestyle factors and cancer.

Individuals must seek out information about the risks of poor diet, inactivity, tobacco use, and environmental tobacco smoke exposure and make personal choices to protect their health and that of their families. Individuals also have the power to raise political awareness of the importance of these issues and to create and reinforce political will. For example, individuals must insist that schools provide healthy food for students and that workplaces and public places are smoke-free.

Making It Happen

The Need for Political Will

All of the issues discussed in this report have suffered to varying degrees from politicization that continues to derail or limit progress toward a healthier population that is less burdened by cancer. We cannot continue to fund tobacco- and obesity-related research, thinking it will solve the problems caused by cancer risk-promoting behaviors and products, and also acquiesce to the demands of the industries that encourage those behaviors and produce those products. Changes in Administration or the appointment of Cabinet secretaries should not cause shifting political winds that result in conflicting policies or policies that limit or undo previous progress toward improved public health.

The leadership of this nation must summon the political will to:

- Be responsible members of the global community and immediately ratify the Framework Convention for Tobacco Control.

- Unmask and resist the tactics of disease vectors (the tobacco, food, and beverage industries) that are at the core of so much of the cancer and other chronic diseases that are sickening and killing Americans by the hundreds of thousands each year.

- Fund tobacco control efforts at least at minimum CDC-recommended levels in each state. With large increases in the Master Settlement Agreement payments to states beginning in 2008, now is an opportune time for states to make this commitment.

- Authorize the Food and Drug Administration (FDA) to regulate tobacco product contents and tobacco product advertising. The Panel recognizes that current FDA resources and infrastructure are insufficient to fulfill this crucial role. Therefore, adequate resources must be appropriated upon granting FDA this authority.

- Accept the rapid reduction and eventual elimination of tobacco use and environmental tobacco smoke exposure as a moral obligation and not export the problem to developing nations.

- Coordinate U.S. agricultural subsidy and public health policy related to diet and nutrition to improve the food supply and help ensure that all people have access to affordable, healthy food.

- Require the elimination of unhealthy foods from school breakfast and lunch programs – government at all levels must cease being a purveyor of unhealthy foods that lead to disease and increased health care costs.

- Enable effective regulation of food advertising, particularly in conjunction with children's television programming and in all other media targeting children. Voluntary efforts by the food and restaurant industries are a step in the right direction, but do not go far enough and lack governmental oversight.

- Fund improvements to the built environment, including sidewalks, safe lighting, playground refurbishment and construction, and neighborhood design that will enable and encourage people to become more physically active.

The Need for Significant Culture Change

The evolution of cultural norms and the exercise of political will are interdependent processes. Political will is necessary to implement policies that contribute to health and lead to changes in normative cultural behaviors. At the same time, political will is molded by public demand, and public demand is driven in part by cultural norms. Experiences with state and local policy changes related to environmental tobacco smoke exposure and other tobacco issues (e.g., taxes, youth access, advertising bans) provide ample lessons that can be applied to help make regular physical activity and healthy food choices the norm rather than the exception.

Public attitudes must be modified through policy, persuasion, and access such that it becomes the norm to be personally committed to a healthy lifestyle, for healthy food options to be readily available and affordable for all, and for tobacco use and tobacco smoke exposure to be viewed as unacceptable. The participation of government, employers, health care providers, media, other thought leaders, and individuals will be important to catalyze and sustain social change in these crucial areas.

The Need to Shift Health Care Emphases toward Disease Prevention

Likewise, the culture of the health care and health insurance systems must shift to a markedly increased emphasis on disease prevention rather than disease treatment. The prevention of disease through lifestyle behavior changes must be appreciated, integrated, and supported financially within the health care and health insurance systems. The ability of the current health care system to keep pace with the rapidly escalating needs for cancer and other chronic disease treatment related to obesity and tobacco use is unsustainable.

The Need for More Unified Efforts among Disease-focused Public and Non-governmental Agencies

The American public continues to be barraged – and confused – by a plethora of health information and recommendations. Numerous Federal, state, and prestigious non-governmental agencies have issued recommendations and guidelines, launched public education campaigns, and established Web sites with information, personal health tracking tools, and other components designed to help individuals and targeted groups adopt healthier lifestyles. Yet relatively few people are even aware that these recommendations and Web sites exist, in part because their promotion generally is limited and scattershot in approach, and also because their messages are lost in the din of health information "noise."

By focusing on risk factors common to the major chronic diseases affecting the population (e.g., cancer, hypertension, heart disease, diabetes), health promotion messages can be simplified to better educate the public about behaviors that will reduce the risk of specific diseases and contribute to overall health and well-being. Coordinated, active dissemination efforts designed to reach diverse populations must include fully the segments of the population that lack computer access or do not get health information from this source. These groups include but are not limited to the poor, the elderly, people with physical and mental disabilities, those with limited literacy and/or health literacy, and recent immigrants.

It also is crucial for public and private sector organizations to optimize available resources by taking full advantage of existing infrastructure. Community services addressing diet, nutrition, physical activity, and tobacco control should be integrated into cohesive wellness-oriented efforts rather than departmentalized. To be most effective, a workforce of regional or local coordinators or "sales representatives" will be needed whose principal role is to promote healthy lifestyles at the community level. These actions will require fiscal commitments, but expenditures can be minimized by leveraging the resources of all participating stakeholders.

Continued Research Needs

Specific cross-cutting research needs remain. Among the most important of these is research on ***behavior change*** – both its dynamics and how to achieve it long term at both individual and population levels. A better understanding of the mechanisms that support individual behavior and culture change will inform related ***health services research*** (e.g., evaluation of existing and new physical activity and nutrition interventions, data collection, studies of the economic savings achieved by companies that implement workplace wellness programs). Similarly, behavioral research will inform and improve research and practice in ***health communications*** to the population in general, and to populations of special vulnerability, such as cancer survivors, youth, women, minorities, and immigrants. Finally, ***policy research*** is required to ascertain how policy can best stimulate and reinforce interventions to encourage lifestyle choices that reduce cancer risk.

Other discrete areas of research emphasis identified at the Panel's meetings are listed on pages xix-xx. *However, the Panel believes strongly that the need for specific types of research should not and must not preclude firm and rapid action to implement in all segments of our population cancer risk-reducing policies and interventions that have been shown to be effective in both the United States and around the world.*

President's
Cancer
Panel

Recommendations

Overarching Recommendations

Elected officials, policymakers, and institutions have a moral obligation to protect the public health; they must assert their collective political will to change policies contributing to the obesity epidemic and continued tobacco use, both of which result in increased cancer risk and incidence.

The health care community (i.e., researchers, providers, and advocates) must coordinate and integrate education and prevention messages related to diet, nutrition, physical activity, and tobacco use and exposure with other diseases (e.g., diabetes, heart disease) to make the most of available resources and to simplify and harmonize common risk reduction messages. The health care community also has an important role in advocating for policy changes and funding to support necessary research related to lifestyle factors and cancer.

Individuals – to the best of their ability – must assume personal responsibility for learning about cancer risks associated with obesity and tobacco use in order to make healthy lifestyle choices for themselves and their families. In addition, individuals have an obligation to be proactive through advocacy and voting support to ensure that elected officials and other policymakers understand and are responsive to the public's desire for policies and programs that will enable them to make healthier lifestyle choices.

Diet, Nutrition, and Physical Activity	Responsible Stakeholder(s) and Other Entities
1. Adopt policies and provide funding to improve the built environment to encourage physical activity. For example: • Address safety issues that discourage physical activity. • Plan new communities that encourage physical activity. • Retrofit existing communities to encourage physical activity (e.g., install sidewalks, improve community centers, parks, playgrounds).	• Congress • Department of Housing and Urban Development • State and county legislatures • City planners
2. Coordinate U.S. agricultural subsidy and public health policy related to diet and nutrition to improve the food supply and help ensure that all people have access to affordable, healthy food. Specifically: • Structure farm supports to incentivize/encourage increased production of fruits and vegetables; limit farm subsidies that promote the production of high fructose corn syrup for use in food. • Support healthier food choices by restructuring regulations governing acceptable food choices allowed by the Women, Infants, and Children Program, Headstart, and school lunch programs.	• Congress (via the Farm Bill reauthorization) • Department of Agriculture • Department of Health and Human Services • State and local governments

Diet, Nutrition, and Physical Activity	Responsible Stakeholder(s) and Other Entities
3. Improve access to affordable, healthy foods in urban communities; implement "fair food" policies similar to fair housing policies.	• Department of Agriculture • State governments
4. Regulate and monitor food advertising in media targeting children.	• Food and Drug Administration • Federal Trade Commission • State governments • Food and restaurant industries • Print, broadcast, and other media producers and outlets
5. Reinstate physical education at meaningful levels in grades K-12 and expand physical activity offerings to include individually-oriented activities (e.g., yoga, weight training) that could be maintained for life. Though not an ideal measure, include body mass index (BMI) measurement, as adapted for youth, as part of school physical fitness assessments and provide this information to parents. Parents also should receive information about the relationship of BMI to disease risk and how to decrease BMI through behavioral change.	• Department of Education • Department of Health and Human Services • State and local boards of education
6. Replace unhealthy food choices in school food service facilities and vending machines with healthful foods and beverages. Include information in elementary and secondary school health curricula about the meaning of energy balance and how to read and interpret food labels and other health information related to diet and nutrition.	• Department of Education • Department of Agriculture • State and local boards of education
7. Make nutrition information about restaurant foods readily available on menus and understandable to customers.	• Food and restaurant industries
8. Increase support and incentives for employee wellness (e.g., diet, fitness). Provide healthier choices in workplace food service facilities/vending machines and provide economic subsidies that encourage healthy food choices.	• Employers
9. Provide coverage for nutrition counseling and fitness promotion as part of all comprehensive health benefit packages as an accepted mechanism for reducing risk and preventing disease.	• Health insurance companies • Centers for Medicare and Medicaid Services • Veterans Administration • Civilian Health and Medical Program of the Uniformed Services • Indian Health Service
10. Measure BMI as part of routine physical exams and counsel patients about the meaning of this measurement. Educate patients about the necessity of balancing food intake and physical activity to avoid and reverse obesity.	• Primary care and other health care providers
11. Seek out opportunities to increase personal and family fitness and health.	• Individuals and families

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure	Responsible Stakeholder(s) and Other Entities
1. Ratify and fully implement the Framework Convention for Tobacco Control. Key provisions include: comprehensive bans on tobacco advertising, promotion, and sponsorship, larger and stronger warning labels on tobacco product packaging, provision of tobacco addiction treatment, disclosure of tobacco product ingredients, and public protection against environmental tobacco smoke exposure.	• President • Congress
2. Authorize the Food and Drug Administration (FDA) to strictly regulate tobacco products and product marketing. FDA must receive sufficient funding and personnel to carry out this crucial role.	• President • Congress
3. Increase the Federal excise tax on tobacco products.	• Congress
4. Require all Federal facilities to be smoke-free.	• Congress • Federal agencies
5. Reallocate existing National Cancer Institute, Centers for Disease Control and Prevention, and other Federal resources to better mirror the tobacco-related disease burden and capitalize on and opportunities for progress.	• Congress • Department of Health and Human Services (National Institutes of Health, Centers for Disease Control and Prevention, Health Resources and Services Administration, Substance Abuse and Mental Health Services Administration) • Veterans Administration
6. Add the conduct of meaningful tobacco-related activities to the evaluation criteria for NCI-designated Cancer Centers.	• National Cancer Institute
7. Reduce the influence of the tobacco industry: • U.S. political parties and individual candidates should refuse campaign contributions from the tobacco industry or its subsidiaries. • Prohibit recipients of National Cancer Institute grants and contracts from accepting money from tobacco companies or their subsidiaries. Other Federal agencies should consider similar requirements.	• All U.S. political parties • National Cancer Institute
8. Strengthen anti-tobacco efforts at the state and local levels: • Increase state commitment of Master Settlement Agreement funds and/or tobacco tax funds for tobacco control programs to at least the minimum level recommended by the Centers for Disease Control and Prevention for each state. • Pass smoke-free ordinances for all public and private workplaces and public spaces. • Encourage state governments to further increase tobacco excise taxes to discourage purchase of cigarettes and other tobacco products. • Require all public schools and universities to be 100 percent smoke-free.	• State and local governments

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure	Responsible Stakeholder(s) and Other Entities
• Require state-funded programs (e.g., Medicaid, corrections, mental health) to offer smoking cessation services. • Ensure that all state cancer control plans include a tobacco control component.	
9. Develop and provide evidence-based multimedia curricula and educational materials in grades K-12 on the dangers of tobacco use and tobacco smoke exposure and the role of the tobacco industry in promoting tobacco use. Encourage colleges and universities to disseminate tested anti-tobacco messages for the 18 to 24 year-old age group through campus radio and television stations, Web sites, and print publications.	• Department of Health and Human Services (National Institutes of Health, Centers for Disease Control and Prevention, Food and Drug Administration) • State and local boards of education • Non-governmental organizations
10. Cease including images of smoking in movies, television, music videos, video games, and other visual media with child, adolescent, and young adult audiences.	• All visual media producers
11. Prohibit smoking in and around the workplace. Support worker efforts to quit smoking; provide incentives for cessation.	• Employers
12. Make coverage of tobacco use cessation services and medications a standard benefit in all comprehensive health benefit packages.	• Health insurance companies • Centers for Medicare and Medicaid Services • Veterans Administration • Civilian Health and Medical Program of the Uniformed Services • Indian Health Service
13. Incorporate smoking cessation services into the comprehensive care of cancer patients, survivors, and their family members.	• Cancer centers • Academic and community hospitals and medical centers • Private oncology offices/practices • All publicly-funded clinics and health centers
14. Adopt the Agency for Healthcare Research and Quality *Guidelines for Clinicians Treating Tobacco Use and Dependence* as part of the standard of care for all health care providers.	• Primary and other health care providers
15. Quit smoking and use of any smokeless tobacco products. Prohibit smoking in the home and car. Protect children from exposure to smoking in movies and smoking role models. Patronize only smoke-free restaurants and other businesses.	• Individuals and families

Research Needs

Cross-Cutting

Conduct research on:

- Interrelationships of multiple lifestyle factors and the dynamics and mechanisms of achieving/maintaining behavior change in individuals and populations.
- Health services utilization, including data collection and studies of the economic savings achieved by companies that implement workplace wellness programs; evaluation of existing and new physical activity, nutrition, and tobacco prevention and cessation interventions.
- Health communications (e.g., to the population in general, and to populations of special vulnerability, such as cancer survivors, youth, racial/ethnic minorities, immigrants).
- The impact of poverty, gender, and race/ethnicity across the life span to support intervention development and reduce health disparities.
- Policy-related interventions that would improve the effectiveness of programmatic or therapeutic interventions.
- How current and emerging communication technologies (e.g.,V-chip) can be used to minimize media exposure to images of smoking and advertising for unhealthy foods.
- Data collection to document health status improvements and cost savings due to lifestyle behavioral interventions.

Diet, Nutrition, and Physical Activity

Expand research on:

- The influence of dietary elements, weight loss, and/or physical activity on cancer biomarkers, preneoplastic changes, and incidence of specific cancers, including biological mechanisms linking energy balance and cancer.
- "Fitness genes," other gene pathways, and biomarkers that influence the effect of physical activity on cancer risk and identify population subgroups that will benefit the most from increased activity to reduce cancer risk.
- Mechanisms of food addiction and possible parallels to other addictions.
- The role of energy balance in cancer survivorship (e.g., prognosis, recurrence, survival, comorbidities, and quality of life).
- Mechanisms involved in protective effects of physical activity on cancer recurrence and mortality and on improved function following cancer treatment; cardiac rehabilitation may serve as a model for resultant programs.
- The relationship between socioeconomic position and obesity.
- The impact of the built environment on physical activity.
- The role of high fructose corn syrup, food additives, and chemicals in obesity.
- Intervention studies to inform prediction of the impact of physical activity on cancer risk.
- Tools for measuring diet, physical activity, and obesity (e.g., BMI).

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure

Government and the non-profit and private sectors should collaborate as appropriate to design and conduct anti-tobacco campaigns, particularly targeting vulnerable populations (e.g., 18 to 24 year-olds, the poor, low literacy populations).

Require the collection of information on smoking status and exposure to environmental tobacco smoke on participants in all federally-sponsored clinical trials.

Key Federal research agencies/sponsors (e.g., National Cancer Institute; National Heart, Lung, and Blood Institute; National Institute on Drug Abuse; Centers for Disease Control and Prevention) addressing diseases caused by tobacco use and tobacco smoke exposure should have an intramural tobacco research program.

Sponsor research on:

- Communication interventions needed to further strengthen public attitudes that smoking is unacceptable.
- The dynamics and mechanisms of behavior change relevant to tobacco use prevention and cessation, including studies specific to particularly vulnerable populations such as the poor, ethnic/racial minorities, individuals with low literacy levels, persons with mental illness and/or addictions, active military and veterans, cancer survivors, and individuals with comorbid conditions.
- How current and emerging communications technologies can be used to reduce exposure to media images of smoking and other detrimental lifestyle behaviors.
- Biochemical mechanisms of nicotine addiction to inform the development of more effective treatment strategies.
- Methods of assessing the type, amounts, and toxicity of constituents in cigarettes and other tobacco products and measures to evaluate smoke chemistry, human toxicant exposure, harm, and addiction.
- Methods for quantifying individual smokers' risk of lung cancer based on combinations of genetic and environmental variables.
- Policy-related interventions that would improve the effectiveness of tobacco control interventions.
- The impact of changes in tobacco industry products and marketing strategies/tactics on tobacco use initiation and related cancer morbidity and mortality both in the U.S. and globally.

Preface

The President's Cancer Panel (PCP, the Panel) was established in 1971 by the National Cancer Act (P.L. 92-218). The Panel is charged to monitor and appraise the development and execution of the National Cancer Program and report directly to the President of the United States regarding barriers or impediments to the fullest and most rapid execution of the Program. Meeting not less than four times per year, the Panel reports its findings annually or more frequently as needed.

Over the past several years, the President's Cancer Panel has become increasingly concerned, as have many, about the growing evidence linking the risk for numerous cancers with various aspects of lifestyle. Specifically, research is demonstrating with ever greater clarity that unhealthy diet and lack of physical activity, often resulting in obesity, raises the risk for certain cancers, and that cancer risk can be reduced through changes in modifiable lifestyle behaviors. The evidence is irrefutable concerning the harm, both in cancer incidence and mortality and in other deadly diseases, caused by tobacco use in any form and by environmental tobacco smoke (ETS) exposure.

The Panel determined that a review of the scientific evidence and the status of public policy and programs addressing the relationships between lifestyle and cancer was warranted at this juncture. Although many factors affect cancer risk, such as sun exposure, environmental exposures, and viral infections, the Panel chose to focus on the potential for cancer risk reduction that could be achieved through changes in diet, nutrition, physical activity, and tobacco use and smoke exposure.

The Panel heard testimony from 45 representatives of Federal, state, and local government research and public health agencies; non-governmental organizations; medicine; academia; industry; and the advocacy community to address the following questions:

- **What do we know about the impact of diet, nutrition, physical activity, and tobacco on cancer risk? What research still is needed?**
- **What can governments, other organizations, communities, and individuals do to promote cancer risk-reducing lifestyle choices?**
- **What positive steps are being taken to address these issues?**

Four meetings were convened between September 2006 and February 2007. Two meetings focused on issues related to obesity, diet, nutrition, and physical activity, while the other two meetings examined issues related to tobacco use and ETS exposure. The meetings were held on the dates and at the locations listed below:

September 11, 2006	University of Minnesota Cancer Center Minneapolis, Minnesota
October 23, 2006	University of Kentucky Markey Cancer Center Lexington, Kentucky
December 5, 2006	Oregon Health & Science University Cancer Institute Portland, Oregon
February 12, 2007	University of Mississippi Medical Center Jackson, Mississippi

In addition to verbal testimony, each speaker provided as part of the formal meeting record a brief "white paper" expanding on his or her remarks. Invitees who could not attend the meetings were permitted to submit written testimony. The recommendations in this report reflect the Panel's conclusions based on all of the testimony received, as well as on additional information gathered prior to and following the meetings.

The remainder of this report includes:

- A summary of current statistics and key research findings related to established and emerging relationships between cancer and obesity, diet, nutrition, physical activity, tobacco use, and ETS exposure.
- A description of issues and barriers impeding progress toward healthy lifestyles to reduce cancer risk, and examples of positive steps being taken to better enable Americans to choose risk-reducing behaviors.
- The Panel's conclusions and recommendations, as well as identified research needs.

A roster of meeting participants, supplemental information on obesity measurement, and an index of acronyms and organizations are provided as appendices.

Part I

Lifestyle and Cancer

Chapter 1

Lifestyle and Cancer Risk – Current Approaches to Cancer Prevention

Many Americans say they fear cancer more than any other disease.[1] Approximately one in two men and one in three women will develop cancer in their lifetime.[2] Without question, these are sobering statistics, but population estimates project a worsening cancer burden in this country.

Cancer is a disease that most often affects older people, and the Census Bureau estimates that the number of Americans 65 years of age and older will double by 2030.[3] As the population ages, and greater numbers of people reach and exceed the average age at which cancer is diagnosed (approximately 67 years of age[4]), cancer incidence will increase and may double by 2050.[5] In 2007, an estimated 1,444,920 new cancer cases will be diagnosed in the United States;[6] by 2050, close to three million people per year may hear the dreaded news: "You have cancer."

More than 25 years ago, researchers calculated that as many as 30 percent of preventable cancer deaths are related to smoking, and as many as 35 percent are related to diet.[7] Thus, modifiable lifestyle factors might have prevented as many as two-thirds of the 560,000 cancer deaths expected to occur in 2007,[8] as well as a large number of new cancer cases. Yet relatively few resources have been devoted to learning how best to educate the public about the potential for preventing cancer through lifestyle choices and how to motivate and maintain long lasting behavior change. Further, our health care system is designed to treat disease rather than prevent it.

Research Emphases in Cancer Prevention and Control

Interest in cancer prevention and control research appears to be increasing as the toll of cancer and related health care costs grow, but funding still is quite limited compared with support for cancer detection and treatment research. For example, since Fiscal Year 1999, National Cancer Institute (NCI) funding for cancer prevention and control has stagnated at only 11 percent of the total budget.[9] NCI is not the only entity funding cancer prevention and control research; the National Heart, Lung, and Blood Institute, the National Institute on Drug Abuse, the Agency for Healthcare Research and Quality, the American Cancer Society, the Lance Armstrong Foundation, the Robert Wood Johnson Foundation, and others also sponsor a limited number of cancer prevention and tobacco control studies and related data collection.

Most of the federally-sponsored cancer prevention research underway or planned emphasizes exploring genetic and/or molecular biologic indicators or predictors (markers) of cancer, metabolic pathways, and possible interventions to interrupt the multi-step cancer development process before invasive disease occurs.[10] This research also emphasizes technology development to enable these interventions. The potential of preventive agents is being studied intensively, and has begun to produce positive results. For example, tamoxifen and raloxifene help prevent recurrences in women who have had breast cancer, and a prophylactic vaccine against the types of human papillomavirus most often associated with cervical cancer recently received Food and Drug Administration approval.

This work, however, ignores the macroenvironment and the physical, social, and cultural contexts within which food choices, opportunities for physical activity, and tobacco use and smoke exposure occur. Little cancer prevention and control research is behavioral or policy-oriented, although greater knowledge in both areas is essential to inform and improve primary and secondary prevention efforts. As one speaker noted, genomic medicine eventually will yield significant returns on investment and this area of research should continue to be supported vigorously, but those returns – in terms of a major impact on cancer incidence and mortality – may be as much as 50 years away.[11,12] In the more immediate term, the principal causes of lung and numerous other cancers are amenable to change through behavioral and policy/environmental interventions, which offer the best chance of substantially reducing the cancer burden.

Sick Care, Not Well Care

Recent studies[13,14] indicate that many people believe they have little ability to affect their cancer risk, despite clear evidence that lifestyle behaviors can reduce the chance of developing the disease. People with such fatalistic attitudes actually may be at higher risk of cancer than others because they are less likely to engage in various prevention behaviors.[15] Similarly, research shows that cancer survivors underestimate the importance of behavioral factors associated with increased cancer risk such as obesity and physical inactivity, while overestimating the importance of factors such as stress and environmental pollutants.[16]

Our health care system, however, continues to be strongly oriented to the provision of acute care. Most physicians are trained principally to treat disease, not to help people remain well. Moreover, the amount of time physicians usually spend with each patient is extremely limited due to productivity pressures (i.e., to see a given number of patients each day), causing office visits to focus primarily, if not entirely, on the presenting complaint. This situation affects how the provider decides what preventive interventions (if any) to implement.

As the Panel has noted in previous reports,[17,18] procedures to address episodes of acute illness or treat chronic conditions are covered by health insurance, but reimbursement is scarce or nonexistent for services (excluding cancer screening for early detection) to maintain wellness or prevent disease, such as counseling, education, outreach, and behavioral or psychosocial interventions. By one estimate, it would take 7.4 hours per day for a primary care physician/clinician (in a large HMO setting) to deliver all of the preventive services recommended by the U.S. Preventive Services Task Force to an average daily roster of patients.[19,20] These services tend to be noninvasive and "low-tech," but are time-intensive and often not reimbursed, particularly if administered by non-physician providers.

Recent changes in Medicare reimbursement for medical services reflect the lack of emphasis on disease prevention in the current health care system. According to an evaluation of the revised Medicare physician payment schedule,[21] the Centers for Medicare and Medicaid Services recognized that primary care and internal medicine office visits increasingly are devoted to treating and managing chronic disease, and it is generally in this setting that patient education and support for lifestyle behavior change occurs. However, reimbursement for office visits by new patients was reduced in the most recent iteration of the Medicare reimbursement schedule. Reimbursement for office visits by established patients increased nominally. These are troubling changes since most private health plan reimbursement policies and schedules quickly mirror Medicare payment rates. Medicare reimbursement policies also influence state Medicaid payment rates. The evaluation authors noted that "the absence of payment for activities such as coordinating care and educating patients means that these services are likely to be underprovided."[22]

…my impression of behavioral science is that most of it is directed at understanding the behavior of individuals and where we're lacking is understanding and knowing how to modify the behavior of institutions. How do we impact school systems? How do we impact work places? How do we impact state legislators so they have policy towards health on the top of their agenda in every community in every state and at a national level? I really think we need some greater focus on institutional behavior.

— Peter Greenwald, M.D., Dr.P.H.
National Cancer Institute

In the private sector, a major barrier to coverage for behavioral or other cancer risk-reducing interventions has been the short-term profit mentality of publicly-held private insurers and many corporations. Due to ongoing employee turnover and health plan "churn" (the continual movement of people from one health plan to another – often not by their choice), insurers and most employers have hesitated to invest in (and actively opposed legislative mandates for) such interventions because they doubted that they would be the ones to enjoy whatever health care cost savings would accrue.

Wellness Initiatives – Bridging the Gap, Promoting a Culture of Wellness

In growing numbers, larger employers and some state and local governments are attempting to counter rising health care costs, productivity losses, and the health care system's lack of emphasis on disease prevention by devising and implementing wellness programs. Some of these programs are offering a robust array of preventive services such as fitness, nutrition, and tobacco cessation counseling and assistance, and incentives for participating in the programs. The move toward employee wellness programs is being driven by the fact that private sector employers and states pay for much of the sick care provided in this country,

We are working hard to focus on our disparately affected populations, but that's a challenge. When our funding is constantly challenged, when what we do is constantly measured, reaching further into the community is a challenge for us.

— Anita Gaillard
Indiana Tobacco Prevention and Cessation Agency

either through employee health insurance plan premiums or Medicaid, respectively. Regardless of their motivation, these programs are promoting a culture of wellness and individual empowerment regarding personal health that has not previously existed in many segments of the population.

Some self-insured employers and municipalities have woven these services into their health plans; others are funding the services separately from their group health coverage. To protect the confidentiality of workers' health information, some employers are contracting with wellness management firms that operate the programs as a third party.

To receive premium discounts and other incentives, employees usually must agree to a health assessment and to developing a health action plan that is monitored by a health coach, nurse, or other program staff. The most successful programs appear to be those that involve all employees, not just those identified as having a specific health risk.[23]

This inclusive approach also is at the core of the CEO Cancer Gold Standard™ developed by the CEO Roundtable on Cancer, a coalition of business leaders and Chief Executive Officers from diverse industries who have pledged to apply the untapped power of business to fight cancer.[24] The CEO Cancer Gold Standard focuses on five critical areas – tobacco use, diet and nutrition, physical activity, screening and early detection, and access to quality treatment including clinical trials. In each area, Gold Standard-accredited organizations are required to maintain a culture that encourages healthy lifestyles in addition to providing services related to each area. Since April 2006, 13 companies (as of July 2007) have met the Gold Standard accreditation requirements.[25] A Gold Standard representative indicated that efforts over the next few years will focus on partnering with key cancer organizations to disseminate information about the Standard and encourage companies to adopt it.

A number of states (Michigan, Vermont, Rhode Island, California) have enacted or proposed measures that amend the insurance code or make other provisions to encourage insurers to offer wellness services to small and large businesses and help enable them to offer this option in their group health plans. Some of these programs offer reduced premiums and lower employee cost sharing as incentives. A number of states also are experimenting with providing broader wellness benefits (e.g., smoking cessation assistance, enrollment in weight management programs) to Medicaid recipients (see also p. 26).

Numerous health-oriented Web sites exist, including several sponsored by the Federal government (see pp. 21-23), but the extent to which they are utilized is unclear. A newly launched, privately-sponsored site,[26] is going further than existing sites to extend comprehensive wellness programs to individuals via the Internet. This site may prove appealing to people who wish to improve their health and need assistance and information to do so, but who may lack access to employer-based wellness services. As with most wellness programs, subscribers are asked to complete a health assessment. Unlike public wellness information Web sites, one-on-one advice, information, and referrals are provided by nurses and other health professionals both online and by telephone. The site also builds in a level of accountability that distinguishes it from publicly-sponsored sites: to remain members, individuals must be active participants, as measured by their use of a specified number of the diet, activity tracking, and other tools on the site. During the initial launch phase, membership is free, but a membership fee will be assessed in January 2008 for those wishing to remain members and for new subscribers.

The initiatives described above are positive steps, but many millions of Americans will continue to lack access to wellness services such as these, perhaps for many years. Promoting a culture of wellness may be most challenging among people in part-time and low paying jobs and the unemployed who lack employer health or Medicaid benefits, those without a usual source of care, individuals without computer access, those less educated and/or health literate, those living in neighborhoods in which it is unsafe to exercise outdoors and where fresh food access is limited, and individuals whose first language is not English. A number of local governments and community organizations, in some cases with Federal financial assistance, are attempting to reach these populations with culturally tailored fitness, nutrition, and other interventions. Examples of such programs are described in Chapters 2 through 5.

Few would disagree that the cancer and other disease-related morbidity, mortality, health care costs, and productivity losses associated with unhealthy lifestyle behaviors are escalating at an alarming rate. The following chapters discuss these trends and key research findings related to cancer risk and diet, nutrition, physical activity, and tobacco use and smoke exposure.

Part II

Reducing Cancer Risk Through Diet, Nutrition, and Physical Activity

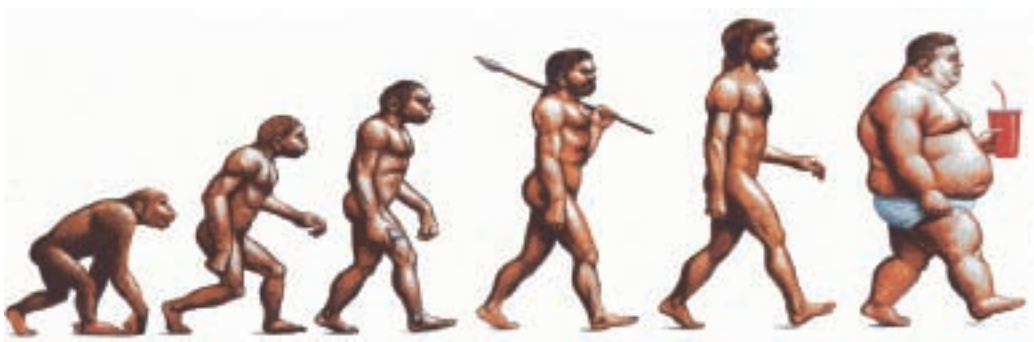
Chapter 2

Obesity, Diet, and Nutrition

The term, "energy balance," as applied to human health, typically refers to the integrated effects of diet, physical activity, and genetics on growth and body weight over an individual's lifetime.[27] Increasingly, scientists are becoming aware of the importance of understanding the effects of energy balance on cancer development and progression and on cancer survivors' quality of life post-treatment. Weight, body composition, physical activity, and diet affect numerous physiologic systems and therefore can alter the cancer process at many points.

There was general consensus among meeting participants that the obesity trend likely is due to a confluence of factors, not a single defining issue. As the Institute of Medicine (IOM) noted in its report on childhood obesity,[28] the notion of calories consumed versus calories expended seems straightforward, but action to prevent and reverse obesity must take into account the complex interactions of social, environmental, and policy contexts that affect individual behavior. This is as true for adults as for children. Moreover, important changes in predominant lifestyles and the American social landscape have coincided with the evolution of the obesity epidemic over the past 30 years.

A 2005 Centers for Disease Control and Prevention (CDC) study estimated that approximately 112,000 deaths are associated with obesity each year in the United States, making obesity the second leading contributor to premature death.[29] Other data analyses[30,31] have arrived at varying estimates of obesity-related mortality. The differences in these estimates may reflect variations in how representative a cohort is of the general population, how obesity is classified and mortality counted, and improvements in disease treatment. Nonetheless, as an overall public health problem, obesity due to unhealthy lifestyle may be challenging tobacco use in its population impact – certainly with respect to associated morbidity – and has led some to believe that it could result in shortened life expectancy in the relatively near future.[32,33]



Source: *The Economist*, December 13-19, 2003.

Obesity, Diet, Nutrition, and Cancer

In 2006, the American Cancer Society (ACS) issued guidelines on nutrition and physical activity for cancer prevention (Table 1). Evidence of the association between obesity, typically caused by unhealthy diet and lack of physical activity, and cancer risk grows stronger each year.

Table 1 **American Cancer Society (ACS) Guidelines on Nutrition and Physical Activity for Cancer Prevention**

ACS Recommendations for Individual Choices

1. Maintain a healthy weight throughout life.

- Balance caloric intake with physical activity.
- Avoid excess weight gain throughout the life cycle.
- Achieve and maintain a healthy weight if currently overweight or obese.

2. Adopt a physically active lifestyle.

- Adults: engage in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week. Forty-five to 60 minutes of intentional physical activity are preferable.
- Children and adolescents: engage in at least 60 minutes per day of moderate to vigorous physical activity at least 5 days per week.

3. Consume a healthy diet, with an emphasis on plant sources.

- Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
- Choose whole grains in preference to processed (refined) grains.
- Limit consumption of processed and red meats.

4. If you drink alcoholic beverages, limit consumption.

- Drink no more than one drink per day for women or two per day for men.

ACS Recommendations for Community Action

Public, private, and community organizations should work to create social and physical environments that support the adoption and maintenance of healthful nutrition and physical activity behaviors.

- Increase access to healthful foods in schools, worksites, and communities.
- Provide safe, enjoyable, and accessible environments for physical activity in schools, and for transportation and recreation in communities.

Source: Kushi LH, Byers T, Doyle C, et al. American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention: Reducing the Risk of Cancer with Healthy Food Choices and Physical Activity, *CA: A Cancer Journal for Clinicians* 2006;56:254-281.

Obesity Measurement

Overweight and obesity usually are assessed by determining an individual's body mass index (BMI),[34] a measure of weight relative to height (see Appendix C). BMI correlates reasonably well to direct measures of body fat, and is used to screen for weight categories associated with health problems.

For adults aged 20 years and older, BMI is interpreted using standard weight status categories (underweight, normal weight, overweight, obese) that are the same for all ages and for both men and women. BMI scores for children and adolescents must be plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking that correlates the score to one of four weight categories (underweight, healthy weight, at risk of overweight, and overweight).

BMI is not an ideal measure, but until a better scale is developed, it will continue to be used because it provides an estimate of body fatness and can be assessed quickly and inexpensively by clinicians or individuals.

Obesity Rates

Almost two-thirds of the U.S. population is overweight, and approximately half of those individuals are obese. Data from the CDC's Behavioral Risk Factor Surveillance Survey (BRFSS) indicate that the prevalence of obesity (self-reported BMI over 30) increased 24 percent between 2000 and 2005.[35] As measured by the National Health and Nutrition Examination Survey (NHANES) in 2003-2004, 28.5 percent of adults aged 20 to 39 years were obese, while 36.8 percent of those aged 40 to 59 years and 31 percent of adults aged 60 years and older were obese.[36] In addition, the prevalence of American adults who are 100 pounds or more over a healthy weight (morbid obesity) has increased from two percent (4.2 million people) in 2000 to about three percent of adults (6.8 million people) in 2005.[37] It has been estimated that if current trends persist, 74 percent of the population will be overweight or obese by 2010 and by 2016, more than half of the population is likely to be obese.[38]

The overall obesity rates mask disparities in obesity prevalence among various segments of the population.

Racial/Ethnic Minorities, Immigrants, and the Poor

Data from the 2005 BRFSS[39] reveal substantial differences in overweight/obesity rates among adult populations. Non-Hispanic African Americans (67.9 percent) and American Indians/Alaska Natives (65.5 percent) have the highest overweight/obesity rates, while Asian/Pacific Islanders have the lowest percentage (37.1) of overweight and obese adults. Hispanics and non-Hispanic whites have intermediate rates (59.6 and 57.8 percent, respectively). Among certain subgroups of these populations, obesity rates are even higher. The social acceptability of overweight varies among cultures and may influence prevalence. For example, while Caucasians in general continue to adhere to an exceedingly slim and seldom attainable ideal, African American and Latino cultures may consider heavier women attractive, although their extra pounds may not be healthy.

In communities hardest hit by poverty, where obesity rates are highest, families often don't have the opportunities they need to make healthy choices. They don't have grocery stores to stock affordable and appealing fresh foods, fruits, and vegetables. There aren't enough safe places for kids to play peacefully and out of harm's way and there aren't enough programs to help them be physically active every day.

— Dwayne Proctor, Ph.D., M.A.
Robert Wood Johnson Foundation

One study found that obesity is higher among Hispanic/Latino children than among other pediatric populations, a disparity that appears to develop early in life. By age three, 25 percent of Hispanic/Latino children are obese, compared with 18 percent of all children and 16 and 14 percent of black and white children, respectively.[40] The study authors conclude that the findings suggest the need for health-related interventions focusing on the period from conception to school entry.

Immigrants comprise 11.7 percent of the U.S. population (2003 Census) and are the fastest growing population segment.[41] They often come from countries with lower obesity rates than the U.S. Research indicates, however, that within 15 years, most immigrants experience obesity rates similar to native-born Americans.[42] The weight gain was associated with white, Latino, and Asian immigrants, but not foreign-born blacks. The study authors suggest that underlying reasons for the findings may include adoption of sedentary behavior, use of labor-saving devices, and adoption of poor diet patterns common in this country. They also suggest that clinicians may be paying less attention to diet and exercise among some immigrant groups, and that some immigrants may be less likely than native-born patients to discuss these issues with their doctors.

As is true with many indicators of health status, racial and ethnic differences in overweight and obesity are actually proxy measures of socioeconomic position, a composite of

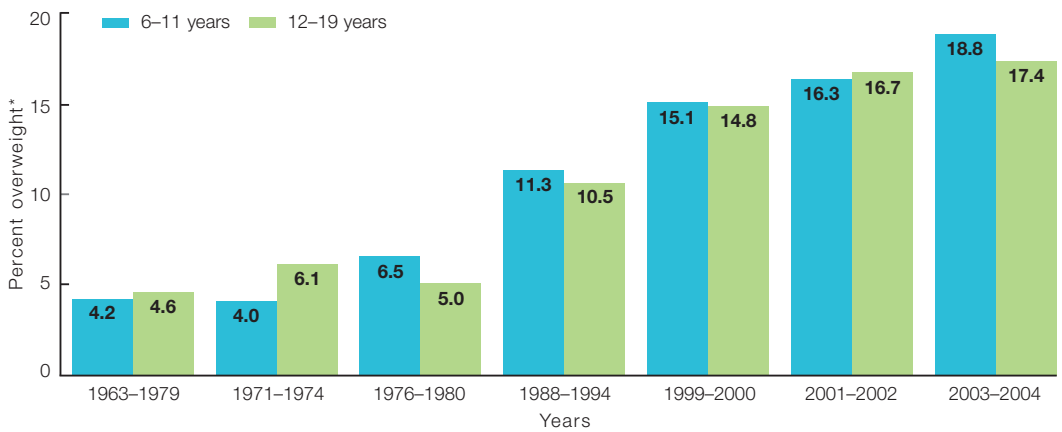
income, occupation, education, net worth, living conditions, health care access, and other factors. Obesity rates are higher among low income populations compared to those with more resources, and among those less educated compared to those with higher educational attainment. The poor are more likely to have limited access to healthy foods, rely on fast and convenience foods, live in neighborhoods in which it is unsafe to exercise outdoors, and have low literacy and/or health literacy that affects their access to health information. Audits of the location and accessibility of community supermarkets and fast food restaurants and access to healthy dietary choices have found that mixed race and high poverty white neighborhoods and all African American neighborhoods (regardless of income) were less likely than predominantly white higher income communities to have access to foods that enable individuals to make healthy choices.[43] A recent study of overweight prevalence trends among poor adolescents from 1971 to 2004 revealed a significant trend of increasing overweight among older (15 to 17 year-old) but not younger (12 to 14 year-old) teens. Factors associated with this newly recognized disparity were physical inactivity, high consumption of sweetened beverages, and skipping breakfast.[44]

Children and Adolescents

Healthy eating in childhood and adolescence is important for proper growth and development and can prevent health problems including obesity and obesity-related diseases. However, due to numerous factors including dietary patterns, the percentage of children and adolescents who are overweight or obese continues to rise (Figure 1). The prevalence of overweight among children aged six to 11 years more than doubled in the past 20 years, rising from seven percent in 1980 to 18.8 percent in 2004. The rate among adolescents aged 12 to 19 years more than tripled, from five percent to 17.1 percent.[45]

According to U.S. Department of Agriculture (USDA) data, in 1996 children aged two to 18 years consumed an average of 118 more calories per day than similar children did in 1978, which is the equivalent of 12 pounds of weight gain annually, if not compensated for through increased physical activity.[46]

Figure 1 **Percentage of U.S. Children and Adolescents Who Were Overweight, 1963 – 2004****



* ≥95th percentile for BMI (Body Mass Index) by age and sex based on 2000 CDC BMI-for-age growth charts

** Data for 1963–70 are from 1963–65 only for children (ages 6–11 years) and from 1966-70 only for adolescents (ages 12–17 years).

Source: National Center for Health Statistics, Centers for Disease Control and Prevention. "Physical Activity: School and Community Guidelines."

The prevalence of overweight in female children and adolescents increased from 13.8 percent in 1999-2000 to 16.0 percent in 2003-2004. Among male children and adolescents, overweight increased from 14.0 percent to 18.2 percent over the same period.[47] In addition to the immediate health risks of overweight and obesity in young people, the growing proportion of overweight youth is of concern because overweight and obese adolescents have up to an 80 percent risk of becoming obese adults.[48]

Cancer Survivors

Data from the National Health Interview Survey (NHIS) indicate that few cancer survivors, who are at particularly high risk for new cancers as well as recurrences, are adhering to recommended cancer control behaviors, including maintaining a healthy weight and being physically active.[49] However, little concrete guidance is available to survivors because only a handful of epidemiologic and clinical studies have directly addressed questions of whether food, nutrition, or physical activity can improve survival rates after a cancer diagnosis. According to a speaker, several studies of food intake, physical activity patterns, and use of complementary and alternative therapies among breast cancer survivors have been conducted or are underway; studies of the role of these lifestyle factors in prognosis of other cancers is virtually nonexistent.

Obesity and Cancer Risk

Among more than 900,000 U.S. adults who were cancer free at the beginning of a prospective study and subsequently were followed for 16 years, men with the highest BMI had cancer death rates 52 percent higher than normal weight men. The heaviest women in the study had cancer mortality rates 62 percent higher than their normal weight counterparts.[50] Obesity also raises the risk of recurrences and second cancers in cancer survivors.

The list of cancers associated with obesity continues to grow (Table 2). Some of the correlations between obesity and cancer risk, incidence, and prognosis are better established than others.

Table 2 **Established or Suspected Obesity-Related Cancers**

- Breast (postmenopausal)
- Prostate (advanced)
- Pancreas
- Esophagus (adenocarcinoma)
- Gastric Cardia (adenocarcinoma)
- Endometrium
- Colon and Rectum
- Liver
- Gallbladder
- Kidney (renal cell)
- Non-Hodgkin's Lymphoma
- Multiple Myeloma
- Leukemia
- Stomach (men)
- Ovary
- Uterus
- Cervix

Researchers are looking for the underlying mechanisms that may be responsible for or contribute to increased overall cancer risk among overweight and obese individuals. For example, body fat – previously thought to be relatively inert – now is understood to be an active endocrine organ that produces hormones and receives signals from other organs. These biochemical interactions may affect weight dysregulation and alter

biochemical pathways that may promote cancer development, including inflammatory processes, energy balance, lipoprotein metabolism, normal immune function, vascular and stromal interactions, and extracellular matrix components.[51] One speaker strongly emphasized the role of inflammatory processes in promoting cancer, noting that obesity promotes inflammation throughout the body through several hormonal pathways. The typical American diet is a significant contributor to inflammation due to its low omega-3 fatty acid content (but high levels of omega-6 fatty acids), low levels of anti-inflammatory phytochemicals due to low fruit and vegetable intake, and inadequate fiber content.[52]

According to CDC data, nearly one-tenth of the country's $2 trillion annual medical bill goes to treat chronic diseases related to obesity.[53] In addition to cancer, obesity increases the risk of diabetes, hypertension, heart disease, stroke, abnormal blood lipid levels, gallbladder disease, osteoarthritis, and liver cirrhosis.[54,55] Cancer care of obese patients with diabetes or other obesity-related comorbid disease often is more complicated than for patients without such conditions.

Obesity and Risk for Specific Cancers

- *Breast Cancer*

…[obesity] is not something which is only occurring in the young, only occurring in the old, or only occurring in minority populations. Every group in our country is showing exactly the same trend and essentially the same slope. So whatever it is that's causing it, it's happening to everybody and it's not a localized phenomenon.

— Robert Jeffery, Ph.D.
University of Minnesota

The relationship between obesity and breast cancer is one of the best understood to date. It is known that women who gain more than 20 pounds from age 18 to midlife double their risk of postmenopausal breast cancer compared with women whose weight remains stable.[56] At the same time, research indicates a modest reduction in breast cancer risk among overweight and obese premenopausal women, likely due to the tendency for young obese women to have anovulatory menstrual cycles and lower circulating progesterone and estradiol levels.[57] Breast cancer survivors who are overweight or obese have a higher risk of recurrence and lower survival compared with leaner women, regardless of menopausal status and after adjustment for disease stage and treatment. Those with a BMI of 40 or over have breast cancer death rates three times higher than very lean (BMI <20.5) women.[58]

- *Colorectal Cancer*

Obesity has been associated consistently with higher colorectal cancer risk in men and women, with somewhat higher risks in men. Central adiposity, which occurs more frequently among men than peripheral adiposity or general overweight, may be a reason for the gender difference in colorectal cancer risk. Research on the relationship between waist-to-hip ratio and colorectal cancer risk supports this hypothesis.[59]

- *Pancreatic Cancer*

The link between pancreatic cancer risk and obesity has become clear more recently. Several studies suggest an increased relative risk of 50 to 100 percent among men and women with high body mass. A speaker suggested, however, that earlier evidence showing lower or no added risk indicates the need for additional research to better quantify the magnitude of risk associated with this malignancy.[60]

- *Esophageal Cancer*

Adenocarcinoma of the esophagus in overweight older men (particularly Caucasians) is increasing steeply and is believed to be due indirectly to gastroesophageal reflux disease (GERD), which is associated with obesity. Left untreated, GERD can cause Barrett's esophagus, a precursor to esophageal cancer. However, studies also have shown a relationship between obesity and esophageal adenocarcinomas independent of GERD.[61]

- *Liver Cancer*

Obese people have higher rates of primary liver cancer than the non-obese; the basis of this relationship is being studied intensively. It is known that obesity can cause non-alcoholic liver cirrhosis, which in turn can lead to liver cancer. Other possible factors, including the interplay of diet, diabetes, and fat distribution in the body also are being studied. It is of considerable concern that worldwide liver cancer rates are rising along with obesity rates; should the association between obesity and liver cancer prove strong, the implications will be serious, since current liver cancer treatments are ineffective.[62]

Although obesity typically results from poor diet combined with low physical activity levels, each of these important lifestyle behaviors can add to cancer risk independently, as detailed below and in Chapter 3.

Diet, Nutrition, and Cancer Risk

Available evidence suggests that a diet generally high in fruits and vegetables and relatively low in meat and fat reduces the risk of certain cancers and other diseases. Because fruits and vegetables have low energy density (i.e., few calories relative to volume) eating them as part of a reduced-calorie diet can be beneficial for weight management.[63]

The U.S. Department of Health and Human Services' (HHS) *Healthy People 2010* objectives[64] for fruit and vegetable consumption are to:

- Increase to 75 percent the percentage of people over two years of age who eat at least two daily servings of fruit.

- Increase to 50 percent the proportion of people over two years of age who eat at least three daily servings of vegetables, with at least one-third of these being dark green or orange vegetables.

Table 3 Percentage of US Adults Consuming Recommended Number of Fruits and Vegetables, 2005

	% Eating Fruit (2+/day)	% Eating Vegetables (3+/day)
Gender		
Men	28.7	22.1
Women	36.4*	32.2*
Age (Yrs)		
18-24	30.1	20.9
25-34	29.5	24.3
35-44	27.9	26.2
45-54	30.5	28.3
55-64	33.4	29.5
65+	45.9*	33.8*
Race/Ethnicity		
Black, non-Hispanic	35.1	23.7
Hispanic	37.2*	20.4
White, non-Hispanic	31.2	28.6
Other	35.5	29.3*
Education		
Less than high school diploma	32.0	20.5
High school diploma	29.4	22.3
Some college	30.6	27.9
College graduate	37.4*	33.3*
Annual Income		
< $25,000	33.0*	23.0
$25,000-$49,000	31.5	26.0
>$50,000	32.4	30.3*
Weight		
Healthy	36.0*	28.9*
Overweight	32.0	26.0
Obese	28.1	26.3
Total	32.6	27.2

* Indicates subgroups with the highest percentages
Source: Behavioral Risk Factor Surveillance Survey, 2005.

However, the percentage of U.S. adults who daily consume the recommended number of fruits and vegetables remains far from these targets. Data from the 2005 BRFSS indicate that 32.6 percent of adults consumed fruit two or more times per day, and 27.2 percent ate vegetables three or more times per day. Fruit and vegetable consumption varied by age, gender, race/ethnicity, education, income, and body mass (Table 3).

Food preferences and eating patterns are established early in life, and recent data on teenagers' fruit and vegetable consumption are not encouraging. In 2005, only 20.1 percent of high school students reported eating fruits and vegetables (excluding fried potatoes and potato chips) five or more times daily during the previous seven days.[65]

These patterns reflect the heavy emphasis in the modern Western diet on protein, fats, and processed carbohydrate foods. Not eating a wide variety of plant species has been postulated to be an unappreciated possible risk factor for poor health and obesity, and perhaps specific cancers related to obesity. Historically, diets worldwide have consisted of about 10,000 plant species; today, just nine crops (wheat, rice, maize, barley, sorghum, potato, sweet potato, sugar cane, and soybean) provide over 75 percent of the dietary energy derived from plants.[66] In the U.S., the economics of farming efficiencies such as planting and harvesting mechanization, the ease of storing and transporting harvested crops – and farm subsidies (see pp. 23-24) – have resulted in a dramatic reduction in the number of plant species in the modern American diet. Grains (e.g., corn, soybeans, wheat, rice) account for a disproportionate percent of the calories consumed by Americans compared with fruits and vegetables.[67] These seed crops lack many nutrients found in plant leaves and fruits of various kinds. This almost certain dietary shortfall of the 50 or more essential compounds[68] found in diverse food types suggests that humans may be suffering from unrecognized nutrient deficiencies that, in combination with other factors, are affecting health.[69]

Some researchers suggest that population-wide vitamin D deficiency is an underappreciated cancer risk factor and that vitamin D may be highly protective against many cancers.[70] A number of foods (e.g., milk, margarine) are fortified with enough vitamin D to prevent rickets in children, but the amount provided, and the currently recommended daily dosage (from 200-600 International Units [IU] for adults, depending on age) appear to be insufficient to produce the putative anti-cancer effect. The primary source of vitamin D, however, is not dietary – the human body makes vitamin D in the skin in response to sun exposure. Thus, recommendations to stay out of the sun and use sunscreen to prevent skin cancer actually may be exacerbating vitamin D deficiencies and contributing to the higher cancer rates seen in most developed countries and those in northern latitudes compared with developing nations and those closer to the equator. Only 10 to 15 minutes per day of mid-day exposure is needed for lighter skinned individuals to produce approximately 10,000 IU of vitamin D. Since melanin in the skin acts as a sunscreen, darker skinned individuals may need considerably more sun exposure to manufacture the same amount of the vitamin.

Numerous observational studies of vitamin D levels in relation to cancer risk have been conducted. Although most showed a correlation between sufficient vitamin D status and lower cancer risk, the protective effect was observed only in specific subpopulations for different cancer sites.[71] For example, a four-year, population-based, double-blind, randomized trial found that among nearly 1,200 postmenopausal women, participants who received 1,100 IU of vitamin D (an amount sufficient to increase serum vitamin D levels) along with a calcium supplement had a 60 percent lower incidence of all cancers compared with the placebo group. The vitamin D effect was determined to be independent of any effect of calcium.[72] More research to verify vitamin D's potential anti-cancer effect is needed before any recommendations for sun exposure or dietary supplementation could be made, and any such advice should reflect relevant geographic, racial, and cultural factors. Of note, the National Institutes of Health sponsored a conference in May 2007 to assess the existing research evidence on vitamin D and cancer and identify future research needs; a follow-up conference is scheduled for September 2007.[73]

Diet, Nutrition, and Risk for Specific Cancers

Though nutrition research is not well funded, numerous studies have been conducted to try to identify specific dietary elements that may be related to increased cancer risk, or conversely, that may protect against specific cancers or cancer in general. For example, alcohol use in excess of two drinks per day (a drink is defined as 12 ounces of beer, five ounces of wine, or 1.5 ounces of 80-proof distilled spirits) for men and one drink per day for women is associated with cancer of the mouth, pharynx, larynx, esophagus, liver, and breast; it also is suspected of increasing risk for colon and rectal cancers. The combination of alcohol and tobacco increases the risk of some cancers far more than the effect of either substance alone.[74] Stomach, nasopharyngeal, and throat cancers are more common in countries where diets contain large amounts of foods preserved by salting and pickling.[75] Some epidemiologic studies suggest that vitamin D may have helpful effects on cancers of the colon, prostate, and breast, but these findings have not yet been tested in clinical trials.[76]

The effects of steroid hormones and other chemicals present in the food supply are being investigated to determine if they affect risk for specific cancers and/or obesity. This research is ongoing, but at least one nutrition expert cautions that considering individual dietary elements independent of the food in which it is contained, the total context of the individual's diet, and his or her lifestyle may lead to erroneous conclusions.[77] That concern notwithstanding, the following paragraphs highlight research findings related to dietary elements and specific cancers.

- *Colorectal Cancer*

Specific dietary elements associated with greater colorectal cancer risk include low fruit and vegetable intake, low calcium intake, and a diet high in red meats.[78] Animal studies and strong observational epidemiologic evidence have shown a preventive effect of increased dietary folic acid. However, in a recent study of people with a history of colorectal adenomas (known precursors to colorectal cancer), folic acid supplementation appeared to promote both the number and advancement of adenomas.[79] Since the study endpoint was adenoma formation and not cancer prevention, the authors believe the question of folate efficacy in colorectal cancer prevention remains unresolved.

- *Lung Cancer*

Numerous studies have attempted to assess the effects of specific antioxidant micronutrients and of fruit and/or vegetable consumption on lung cancer risk. A review of case-control and prospective studies related to each of these dietary elements found mixed results, with the most consistent suggestion of a protective effect with increasing levels of vegetable consumption.[80]

Studies of beta carotene (an antioxidant related to vitamin A) for prevention of lung and other cancers likewise yielded mixed results; however, in one study beta carotene actually increased lung cancer risk among smokers while having little or no effect on cancer risk in other study participants.[81]

- *Prostate Cancer*

Trans fatty acids, or *trans* fats, are hydrogenated plant oils that are known to increase heart disease risk by raising blood cholesterol levels. Recent evidence suggests a positive association between *trans* fat intake and increased prostate cancer risk; the association appears to be specific to organ-confined and non-aggressive tumors.[82] Some epidemiologic studies suggest that increasing levels of plasma lycopene (a carotene found in large amounts in tomatoes) may reduce prostate cancer risk. Other evidence suggests that high calcium intake[83,84] and overuse of multivitamin supplements[85] are linked with increased prostate cancer risk, particularly more advanced disease.

- *Breast Cancer*

Initial results of the Women's Intervention Nutrition Study suggested that a low fat diet could help prevent breast cancer recurrence in postmenopausal women who had been diagnosed with early-stage tumors. Interim data after five years of follow-up, however, indicate that a low fat diet may only be effective in preventing recurrence among women with estrogen receptor-negative (ER^-) cancers.[86] This observation remains to be verified, but could provide the basis of an effective intervention for women with ER^- tumors, who have a poorer prognosis than women with estrogen-dependent breast cancer.

Regular consumption of even a few alcoholic drinks per week is associated with an increased risk of breast cancer in women, particularly in those who do not get enough folate in their diet. Women with breast cancer are advised to avoid high levels of soy in their diets because of the phytoestrogens present in soy.[87]

Obesity, Diet, and Nutrition – Key Participants and Positive Steps

Addressing the problem of obesity and poor diet to reduce cancer risk requires the participation and collaboration of Federal, state, and local governments, non-governmental organizations and other partners, the food and beverage industries, the media, educators, insurers, health care providers, employers, and the efforts of individuals and families.

Government

Speakers described numerous activities at Federal agencies, within the legislative branch of the Federal government, and at state and local levels related to obesity, diet, and nutrition issues.

Federal Government

- *Federal Agencies*

The Federal government conducts a number of initiatives and has developed several sets of guidelines and recommendations addressing diet, nutrition, and obesity. Some of these initiatives are specific to one of these areas, while others take a broader wellness approach that includes physical activity. Federal initiatives specific only to physical activity are discussed on page 45.

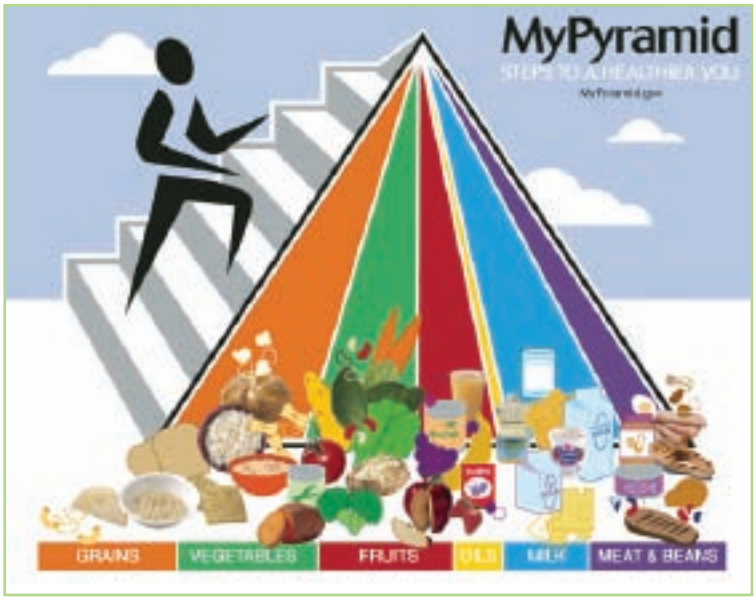
One Federal initiative, HealthierUS[88] promotes desirable activity levels and nutrition, provides online information for many age groups, and activity and diet tracking programs, along with other features. It also is linked to related efforts that focus on increasing physical activity, including the SmallStep Adult and Teen site, SmallStep Kids, the President's Challenge (a program of the President's Council on Physical Fitness and Sports), and HealthierFeds, a program to promote healthy lifestyles among Federal employees.

What Finland did…was pretty remarkable…. It wasn't just health education but there were policy changes made about the types of fats that were available to people, and messaging about physical activity and so forth…. I think that the U.S. could probably do it as well as or better than any other country once we put our minds to it.

— Tim Byers, M.D., M.P.H. University of Colorado Comprehensive Cancer Center

In 2005, as part of the HealthierUS initiative, HHS and USDA updated the *Dietary Guidelines for Americans*[89] and also established a Web site with information and tools to help people adopt healthier lifestyles, including diet and physical activity choices. The Food Pyramid, a graphic representation of the recommended proportions of an individual's diet that should be comprised of grain products, fruits and vegetables, animal protein, dairy products, fats and oils, and sugars also was revised in 2005 by USDA (Figure 2). Critics of the new graphic (MyPyramid) maintain that its vertical rather than horizontal design makes it harder to distinguish clearly between color-coded sections that are similar in size. This version of the pyramid also is intended to convey the importance of physical activity, a feature not included in previous versions. A Web site[90] exists to help people understand and use the pyramid to guide their food choices; the site includes a diet self-assessment, a food plan, a diet tracking tool, and a special section for children. It is unclear, however, to what extent the public is aware of this site (or other Federal Web sites offering diet, nutrition, or other health information), or if there are widely distributed print materials designed to reach audiences without computer access. In response to criticism that MyPyramid has little accessibility other than on the Web, USDA and HHS collaborated with grocery manufacturing and marketing organizations to develop the "Take a Peak" program that will be tested in approximately 2,000 grocery stores in 17 states in 2007.

Figure 2



Source: United States Department of Agriculture

The program will highlight foods and beverages that meet the Federal guidelines for healthy eating.[91]

At the National Cancer Institute (NCI), research on issues related to energy balance is distributed throughout the Institute. For example, NCI supports four Transdisciplinary Research on Energetics and Cancer (TREC) centers.[92] The TRECs are focusing on identifying biological mechanisms linking energy balance and cancer and on behavioral methods for preventing and treating obesity and sedentary habits. NCI supports clinical trials on diet and cancer, but currently funds no trials focusing on weight control or physical activity as they relate to cancer incidence and prognosis. To facilitate information sharing, avoid duplicative effort, and foster transdisciplinary research, NCI created an Energy Balance Working Group in 2002. The Working Group also collaborates with the trans-NIH Obesity Task Force, which was formed in 2003.

The *WeCan!* initiative is a campaign led by the National Heart, Lung, and Blood Institute in collaboration with NCI, the National Institute of Diabetes and Digestive and Kidney Diseases, and the National Institute of Child Health and Human Development.[93] Like a number of other Federal efforts, this initiative targets families, communities, health care providers, and schools with a Web site and activities designed to promote a culture of wellness through better food choices, physical activity, and reduced screen time (e.g., television, video games, computer, DVDs).

CDC supports cancer risk reduction behavioral interventions through its Comprehensive Cancer Control Programs in all states and some American Indian tribes and U.S. Territories. In 2005, CDC became the lead agency for the 5-A-Day program previously administered by NCI; the program now is funded through CDC's National Fruit and Vegetable Nutrition Program. An updated replacement for 5-A-Day, called Fruits and Veggies: More Matters, has been launched in collaboration with the Produce for Better Health Foundation.

In 28 states, CDC funds a multi-component program, the Nutrition and Physical Activity Program to Prevent Obesity and Other Chronic Diseases, that targets people across the life span. CDC's Steps to a HealthierUS program provides funding to 40 communities nationwide to implement evidence-based community interventions focused on physical activity, diet, and tobacco use. CDC also funds state education agencies in 23 states to implement multi-component school health programs that incorporate physical education and nutrition services.

- *Congress*

The word "obesity" appeared in more than 50 bills introduced in the 109th Congress.[94] Concern about soaring obesity levels and related disease already has prompted the introduction of several bills pending before the 110th Congress. These proposed measures are at different points in the legislative process; some may not come to a vote, and fierce opposition by the farm, food, and beverage industries to specific provisions of the various bills is likely.[95] As a whole, the measures appear to reflect a trend toward greater efforts to address the obesity issue through legislation and policy, strategies advocated by several speakers and increasingly supported by public health research findings. Examples of currently pending bills include:

About 70 percent of the population are overweight; 30 percent are obese. On any given day, half the people in the U.S. population are trying to do something to decrease their weight. But it isn't working….we need to look beyond the individual and more towards the environment and public health policy if we are to have a public health impact.

— Robert Jeffery, Ph.D. University of Minnesota

– *Reauthorization of the Farm Security and Rural Investment Act of 2002*[96] *(the Farm Bill).* Final provisions of the farm bill reauthorization will have far-reaching impacts on the food supply of the United States and its importance should not be underestimated. This law governs the structure and distribution of subsidies and other incentives to farmers, and the types of foods available to recipients of food stamps; those receiving Women, Infant, and Children (WIC) program benefits; federally-supported school breakfast and lunch programs; and other food assistance programs.

For example, fruit and vegetable growers historically have received virtually no Federal subsidies. According to one nutrition expert, USDA subsidies for fruits and vegetables amount to one tenth of one percent of each dollar spent for crop subsidies.[97] Subsidies to corn, soy, and wheat farmers, by contrast, have been extensive and among other effects, have influenced the abundant supply and extremely low cost of the high fructose corn syrup (HFCS) now ubiquitous in the American food supply. These crops also are the source of the hydrogenated oils used in prepackaged snacks, ready-to-eat meals, and other foods. Further, they are main components of feed for the grain-fed livestock predominant in the U.S. market, whose meat contains significantly more *trans* and saturated fatty acids than grass-fed livestock.[98]

A major effect of the subsidies has been to lower the cost of food made with these crops (including meat), creating an artificial price gap between these foods and fruits and vegetables. People (particularly lower income populations) can purchase more calories by buying foods made with subsidized crops, but in doing so increase their intake of fat, sugar, and refined carbohydrates. Farm industry representatives argue that removing subsidies would have little effect on the prices consumers pay for these foods. Anti-obesity advocates and some nutritionists, however, maintain that supporting fruit and vegetable growers would make their prices more competitive and enable more people to afford healthier food. Proposed changes to the farm bill (as of May 2007) would increase targeted funding to support specialty crop producers (i.e., farmers who receive at least half of their gross production value from the sale of fruits and vegetables), increase nutrition in food assistance programs (including school meals) through the purchase of fruits and vegetables, fund specialty crop research, fight trade barriers, and expand export markets.

Improving the viability of fruit and vegetable farming is crucial. The USDA estimates that if Americans changed their current fruit and vegetable consumption patterns to meet the 2005 *Dietary Guidelines for Americans,* acreage allocated for domestic production would have to increase from approximately 10 million acres to nearly 23 million acres.[99]

Food stamp recipients have relatively few restrictions on the foods they can purchase, but the current allotment of one dollar per person per meal is insufficient to enable recipients (nearly 26 million in 2005[100]) to purchase fresh fruits and vegetables and other healthy foods. Although proposed program changes appear to focus primarily on measures to simplify the program and strengthen program integrity, there also is provision for nutrition education for food stamp recipients and a competitive demonstration grant program to develop and test interventions to address obesity in low income populations.[101]

We have had an agricultural price support system deriving from the 1930s and 1940s when calorie malnutrition was a significant nutrition issue.

— Robert Jeffery, Ph.D. University of Minnesota

Unlike food stamp recipients, WIC program recipients have been prohibited from purchasing fruits and vegetables other than fruit juice, dried peas, and dried beans;[102] allowable foods emphasize meat, eggs, and dairy products. This structure reflects earlier assessments that women and children served by the program needed more protein and calcium in their diets. It now is recognized that this population's diet likely is deficient in nutrients found in fruits, vegetables, and whole grain products. Proposed revisions to WIC, based on guidelines recommended by the Institute of Medicine (IOM) in 2005,[103] would reduce the number of eggs allowed and increase allotments of fruits and vegetables for each person in the program. However, the proposed allotments have been criticized for providing only three quarters of the IOM recommended levels.[104]

Provisions of the farm bill also have a profound effect on school breakfast and lunch programs because a significant proportion of the food provided to schools comes from crops grown by subsidized agribusiness. These foods are not necessarily the most healthy choices for student nutrition (see also pp. xx).

– *Healthy Foods for Healthy Living Act (H.R. 45).* This bill would amend the Medicare and Medicaid provisions of the Social Security Act to cover additional primary and preventive services relating to obesity treatment and prevention, supervised exercise sessions, stress testing, lifestyle modification education, and nutrition education. It also would authorize the Secretary of Agriculture to make grants to community-based organizations and local redevelopment agencies operating in low income communities to: (1) assist in purchasing appropriate equipment or in hiring and training personnel to expand the inventory of fresh fruits and vegetables or other healthy food alternatives available for residents of a low income community, and (2) carry out related consumer education and outreach activities.

– *The Child Nutrition Promotion and School Lunch Protection Act (H.R. 1363).* This legislation would amend the Child Nutrition Act of 1966, requiring the USDA to update nutrition standards for school foods from vending machines, school stores, and *a la carte* foods in cafeterias. The new standards would apply throughout the school day and everywhere on school grounds. The current standards limit the sale of minimally nutritious items but only apply to cafeterias during meal times. This has allowed soda, candy, cookies, and sugary fruit-flavored drinks to be sold at other times in cafeterias and elsewhere in schools.

– *The Stop Obesity in Schools Act of 2007 (H.R. 1163).* This bill calls for the Secretary of Health and Human Services, in cooperation with state and local governments, Federal agencies, local educational agencies, health care providers, the research community, and

the private sector, to develop a national strategy to reduce childhood obesity in the United States. The plan would address short- and long-term solutions to the childhood obesity problem, identify how the Federal government can best work with states and others, and include measures to identify and overcome obstacles to the goal of reducing childhood obesity rates by 10 percent by 2011. The bill further authorizes grants to local education agencies to adopt wellness policies and anti-obesity initiatives, and to develop local and regional healthy living and wellness coordinating councils.

– *Expansion of the Federal Fresh Fruit and Vegetable Program and other programs (S. 919/ H.R. 1600/H.R. 1551).* These related bills would amend existing legislation to increase funding for programs to expand the availability of fresh fruits and vegetables in federally-supported school lunch programs, to support the transition of farm operations to meet organic farming requirements, to encourage the purchase of locally grown produce, and to revise school lunch and food stamp program guidelines to conform to the current HHS/USDA *Dietary Guidelines for Americans*.[105] Other proposed provisions would, for example, allow for the creation of a specialty crops economic and policy research institute that would study and provide advice on policy issues affecting the regional and national competitiveness of U.S. specialty crop production.

These and similar measures notwithstanding, there remains a serious conflict of interest in the food commodities system that supplies the National School Lunch Program – USDA has committed both to provide healthy meals for the nation's school children and to support the production of foods that contribute to obesity, heart disease, and cancer.[106] Moreover, according to a former HHS Secretary, no coordination exists between Federal agricultural policy and Federal health policy related to nutrition and obesity.[107]

The Physician's Committee for Responsible Medicine notes that USDA buys hundreds of millions of pounds of excess beef, pork, milk, and other high-fat meats and dairy products when prices of these commodities drop.[108] These foods are distributed to school districts for use in the school breakfast and lunch programs. School districts are allowed to contract with commercial food processors to convert these commodities into reprocessed, ready-to-use products, most of which are high in saturated fat and cholesterol.

State and Local Government

• *The Built Environment – Nutrition*

Well, I can walk to a corner store and I can get every variety of cigarettes on the market, a great variety of cigarettes. I can get a great variety of liquor….You can get every kind of potato chip imaginable but I cannot get a fresh tomato. I cannot get romaine lettuce. I can't even get bagged lettuce in my community.

— *LaDonna Redmond*
Institute for Community Resource Development

The nutrition environment – an important but understudied component of the built environment – is believed to contribute to the epidemic of obesity in children and adults both in the United States and worldwide.[109] Nutrition environments, which may be important influences on eating behavior and may help explain socioeconomic and racial/ethnic differences in behavior and disease disparities, have two components of particular interest: community nutrition environments and consumer nutrition environments.[110]

Community nutrition environments include the number, type, and distribution of food outlets (e.g., grocery stores, restaurants) in a community, excluding school cafeterias and food sources at worksites, health care facilities, churches, and other organizations. Aspects of the community nutrition environment affect food accessibility; for example, supermarkets are less common in lower income and minority neighborhoods, limiting access to healthy foods such as fruits and vegetables.

Consumer nutrition environments encompass what consumers encounter in and around a grocery store or restaurant, such as the availability of healthful food choices, price, promotions, product placement, and nutrition information. Price, food availability, and food quality are influential in consumers' food choices. In disadvantaged neighborhoods, healthy foods may be of poor quality or prohibitively expensive (Table 4).

Table 4

Cost Comparison: Regular Food Items vs. Healthier Options	
Regular Item	**Cost for Healthier Option**
Hot Dogs	+24% for lean franks
Ground Beef	+47% for lean meat
Chips	+31% for low fat (baked)
Juice	+53% for 100% juice

Source: Glanz K, Sallis JF, Saelens B, Frank L. Nutrition Environment Measures Survey in Stores (NEMS-S), development and evaluation, *American Journal of Preventive Medicine* 2007; 32(4):282-289.

A speaker indicated that more research is needed to understand the connections between nutrition environments and eating behavior, and better tools are needed to describe differences in consumer nutrition environments. Potential strategies that may lead to healthier eating patterns in low income and minority neighborhoods include establishing more supermarkets and farmers' markets in these neighborhoods and changing zoning and tax policies that affect the types and quality of food sold at neighborhood stores and restaurants. In addition, providing transportation to food sources and providing nutrition information to consumers at the point of purchase may lead to healthier eating.[111] Environmental and policy changes such as these typically are enacted at state and local levels.

- *State and Local Government Initiatives*

Funded by CDC's Steps to a HealthierUS initiative, the Boston Public Health Commission has implemented a community mobilization program (Boston Steps) aimed at motivating sustainable health-related behavior change in eight neighborhoods experiencing the highest disparities of target conditions. The program has several components, including nutrition and physical activity improvement. The nutrition component of the program includes culturally relevant nutrition training, education, and skills development to support behavioral change for maintaining a healthy diet. In addition, the program supports activities for improving the food environment: community mapping and partnership development to improve access to healthy foods in target communities, start-up of a farmer's market in a neighborhood commercial center, and a program to help customers identify healthy food options in local restaurants. The physical activity component of the program includes neighborhood group walking programs; neighborhood "walkability audits," with identified safety and other problems referred to the city's departments of transportation and neighborhood services; and accessible and affordable physical activity classes targeting specific groups (e.g., salsa dancing for Latino youth, tai-chi for Chinese elders, Cardio Caliente aerobics for Latina women, swimming classes for overweight asthmatic youth). Boston Steps also is working with the school system to improve school nutrition and wellness.

As one strategy to reduce obesity-related health costs, including cancer, a growing number of state Medicaid programs are allowing recipients to enroll in Weight Watchers™ programs. In a pilot program in Tennessee, 1,400 Medicaid recipients lost a combined total of more than 8,000 pounds over a six-month period. A major health insurer is implementing similar programs in 14 states where it provides Medicaid coverage to approximately 34 million people.[112]

In 2006, New York City instituted a ban on *trans* fats in restaurant food served within the city. The measure requires the elimination of most frying oils containing *trans* fats by July 2007 and elimination of *trans* fats in all food by July 2008.[113] A similar ban was passed in Philadelphia. In May 2007, Montgomery County, Maryland became the first county in the nation to ban *trans* fats in restaurants, supermarket bakeries, and other food service establishments.[114] Nearly 20 state legislatures have introduced bills to ban or limit the use of *trans* fats in restaurants or school cafeterias. These actions respond to clear evidence of the effect of *trans* fats on heart disease, but new evidence also indicates that *trans* fats may raise prostate cancer risk (see p. 19).

Non-governmental Organizations and Other Partners

Communication Issues

Multiple, sometimes conflicting, messages about what constitutes a good diet and proper nutrition are a major source of confusion to the public. Health information campaign messages specific to a particular disease may not be consistent with government-issued recommendations for overall health. As a result, people may tend to doubt or ignore entirely all of the messages to which they are exposed. The situation is exacerbated when there appears to be consensus in the scientific community on a dietary recommendation (e.g., high fiber diet to reduce colon cancer risk, beta carotene for lung cancer prevention, low fat diet to reduce breast cancer risk), only to have subsequent study findings contradict that recommendation.

Speakers underscored the importance of coordinated public health campaigns to simplify and harmonize public health messages about healthy lifestyle to reduce disease risk. For example, cancer, heart disease, and diabetes have common risk factors – obesity, low physical activity levels, and low fruit and vegetable intake. The Panel reported previously[115] on a collaboration of the American Cancer Society, American Heart Association, American Diabetes Association, and the Ad Council to unify messages regarding risk factors common to these three diseases. More collaborations of this kind are needed to clarify communication to the public and make the best use of available resources.

Efforts to Improve the Nutrition Environment

It's remarkable how common the nutritional risk factors are for diabetes, cardiovascular disease, and cancer….I think there's enormous potential for the message that there are three in one — at least three in one, maybe four or five in one — benefits to healthy choices in nutrition, physical activity, and food selection.

— Tim Byers, M.D., M.P.H. University of Colorado Comprehensive Cancer Center

The Panel heard testimony about grassroots efforts to improve the nutrition environment in urban areas in which access to fruits, vegetables, and whole grain foods typically is limited. For example, the Chicago Food Systems Collaborative established an urban farming center in a predominantly African American Chicago neighborhood that brought fresh foods to residents who had relied on a single chain supermarket and numerous *bodegas* and corner stores. The farming center became a catalyst for university and other interdisciplinary partnerships and grants that resulted in a revived local farmer's market, a school-based nutrition program, and a number of research projects aimed at understanding how to improve the nutrition environment. The cooperative also provided a mechanism for communicating with policy makers and legislators about improving community food infrastructure and establishing fair food policies that will enable all community members to have access to healthy food. Consistent with its emphasis on sustainability, the cooperative has a long-term goal to develop a community-owned grocery store with broad support and risk sharing by the financial, philanthropic, non-profit and government sectors.[116]

A similar, though less extensive Boston-area network of urban and suburban gardens provides fresh food to city farmers' markets and supplies produce to homeless and other needy residents. The program partners with local organizations to sponsor community cooking and nutrition classes using the crops grown in the community.

Approximately 1,500 community-supported agricultural (CSA) programs exist in the United States, in which consumers pay in advance for a share of the season's crops, with surplus produce going to farmers' markets or food banks. A CSA program at Washington State University has led to what will become the first Organic Agriculture major at an American university.

Other Partnerships

Other partnerships are underway or planned. For example, HHS has partnered with Discovery Networks U.S. to develop two DVDs – one to teach families how to incorporate healthy eating and physical activity into their daily lives, and another providing information to physicians to help them combat childhood obesity. The American Academy of Pediatrics, American Academy of Family Physicians, and other clinician groups assist in promoting and distributing the DVDs.

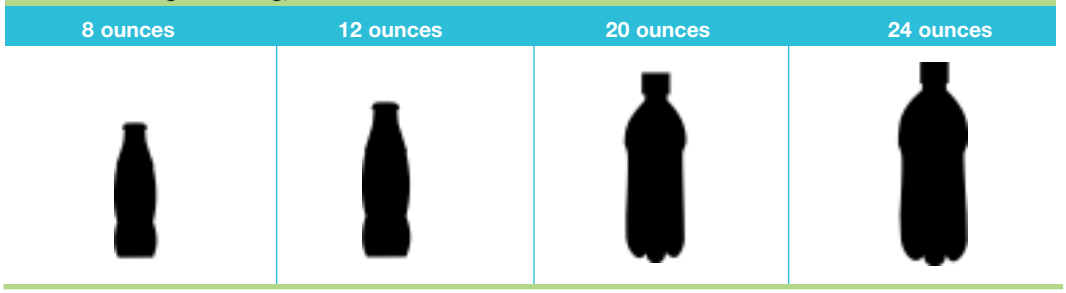
Food, Beverage, and Restaurant Industries

Several speakers described disturbing trends in food content, portion size, and marketing. In 2000, for example, 2,002 new candies, gums, snacks, and desserts were introduced into the American market, but only 192 new fruit or vegetable products.[117] These new products have been carefully engineered by food scientists to appeal to consumer desires for particular flavors and food textures.

The food and beverage industry is under pressure, however, to produce healthier food options as concern about obesity grows. Despite this pressure, one speaker noted, food industry executives know that, particularly with children, calling a product "healthy" is like "the kiss of death." In addition, new products advertised as being healthier than their predecessors often are not. For instance, cereals and baked items advertised as being made "with whole grain" may contain so little whole grain flour that the nutritional impact is negligible. Similarly, items with pictures of fruit on the packaging, creating the impression that the product contains fruit and is a healthy choice, may have little or no actual fruit content, but instead may contain fruit "essences" or extracts.[118]

As Figure 3 illustrates, portion sizes in the U.S. have increased dramatically, although in many cases the cost of the food has remained the same or even dropped per unit of measure. Sweetened soft drinks, a major source of "empty" calories in the diets of U.S. children and adults, are a prime example of this trend. The substitution of high fructose corn syrup for cane sugar in these products has made them so inexpensive that they virtually can be given away. In many restaurants, customers may have unlimited free refills of soft drinks.

Figure 3 **Soft Drink Single Serving, 1950 – 2002**



Source: Glanz K. Presentation, President's Cancer Panel Meeting, December 5, 2006.

In fact, Americans now consume more carbonated soft drinks (regular and diet) than any other beverage (Table 5). However, a 12-ounce serving of regular soft drink contains approximately 150 calories and close to 10 teaspoons of sugar; a 20-ounce serving contains 250 calories and 17 teaspoons of sugar.[119]

Table 5 **Total U.S. Beverage Consumption, 2005**

	%		%
Carbonated Soft Drinks (regular and diet)	28.3	Sports Drinks	2.3
Bottled Water	10.7	Tea	3.8
Milk	10.9	Wine	1.2
Coffee	9.0	Distilled Spirits	0.7
Beer	11.7	All Others**	15.3
Fruit Beverages*	4.7		

* Includes fruit beverages and fruit drinks; excludes powdered fruit drinks and vegetable juices
** All Others includes tap water, vegetable juice, powders and miscellaneous drinks.
Source: Beverage Marketing Corporation

Soft drink consumption among children increased dramatically in the early- to mid-1990s. Between 1977-1978 and 1994, soft drink consumption by adolescent boys nearly tripled, from seven to 22 ounces per day; 32 percent of adolescent girls and 52 percent of adolescent boys consume three or more eight-ounce servings of soda per day.[120] Children as young as seven months are drinking soda.[121] A study of more than 500 sixth and seventh grade children found a 60 percent increase in overweight (BMI at 85th percentile or higher for age) for each 12-ounce can of sugar-sweetened drink consumed daily.[122]

Portions served in the majority of restaurants are far larger than they were two decades ago; most people now consider them the norm and would consider the former portion sizes inadequate. They also have transferred these ideas about appropriate serving sizes to meals eaten at home.[123] Most restaurant portions exceed USDA and Food and Drug Administration (FDA) standards for serving sizes by a factor of two and as much as eight-fold; current portions at fast food chains often are two to five times larger than the original size.[124] Studies show that larger portions result in as much as 30 percent greater total energy (caloric) intake per meal.[125,126] According to national surveys, men on average consumed 168 more calories per day in 2000 than in 1971, and women consumed 335 more calories per day in 2000 than in 1971.[127]

Figure 4 **Portion Sizes – 20 Years Ago and Now**

Coffee		Bagel	
20 Years Ago	**Today**	**20 Years Ago**	**Today**
Coffee (with whole milk and sugar) 45 calories 8 ounces	Mocha Coffee (with steamed whole milk and mocha syrup) 350 calories 16 ounces	140 calories 3-inch diameter	350 calories 5-inch diameter
Calorie Difference: 305 calories		**Calorie Difference: 210 calories**	

Adapted from: National Heart, Lung, and Blood Institute Obesity Education Initiative, Portion Distortion I and II – Interactive Quiz

But many people do not realize the amount of calories in current portion sizes. As Figure 4 shows, the calorie count of a typical cup of coffee and bagel has increased from a total of 185 (45+140) calories 20 years ago to 700 (350+350) calories now. The difference of 515 calories comprises a quarter of the daily 2,000 calorie intake generally recommended for the average adult.

Standard plate sizes also have increased to accommodate larger portions, both in restaurants and in many homes. A standard dinner plate used to be nine inches in diameter; most dinner plates today are 11 to 12 inches in diameter (Figure 5),[128] and some restaurants even serve entrées on small platters. In a recent study, subjects (85 food and nutrition experts) were given bowls and scoops with which to serve themselves ice cream; half received smaller bowls and scoops, the others larger ones. Those with the larger bowls and scoops took 31 percent larger portions and all of the subjects except three finished all of the ice cream they had served themselves.[129] The results confirm earlier studies showing that the visual illusion caused by tableware is one of several important cues that affect eating behavior.

Increases in portion sizes may be compounded by innate weaknesses in the human appetite control system, which some researchers have characterized as an imperfect and easily disrupted system.[130] Their research suggests that our bodies do not sense the caloric density of foods (e.g., six ounces of cake versus six ounces of carrots) and do not automatically compensate by eating less the rest of the day. This leads to "passive overconsumption." The investigators further suggest that regular consumption of fast food may contribute to obesity in part because these meals tend to be from 65 to 100 percent more calorie-dense than most other meals. Data from two continuing surveys of food consumption indicate that on a typical day, almost one-third of children and teens eat at a fast food restaurant.[131] These individuals consume almost 200 more calories than those who do not eat a fast food meal. In addition, those eating fast food consume more calories per gram of food, nine more grams of fat, 24 more grams of carbohydrate, and 26 more grams of added sugar.

Figure 5 **Change in Plate Sizes**

Standard Plate	"Great" Plate
9 inches (23 cm)	12 inches (30 cm)

Although fast food restaurant chains are moving away from terms like "super-sizing" due to negative publicity, they still offer opportunities for customers to purchase significantly larger amounts of food for minimal additional cost by offering "combo meals" (bundling the sandwich/entrée, French fries, and soft drink for one price) or "value menus," whereby *a la carte* items are priced more cheaply than on the regular menu, encouraging the individual to buy and consume more food for the same cost he or she would have spent for a smaller meal. Similarly, restaurant pricing structures encourage overeating when the cost per unit of a food or beverage drops as the portion size increases; the customer has no financial motivation to choose the smaller portion. In these ways, the restaurant builds a loyal customer base and still makes a profit because the food is produced so inexpensively.

We interviewed 41 senior executives. These are menu development executives and marketing executives at top restaurant chains....They are about sales and profit. They are not about healthy and believe the demand for healthy food is limited.... they said, "Marketing healthy foods is the kiss of death," and "It's like putting lipstick on a pig."

— Karen Glanz, Ph.D., M.P.H. Emory University

One fast food chain recently has begun putting nutrition information on children's meals. The move, accompanied by heavy promotional advertising, is an attempt to persuade parents that the food is not "junk." However, to obtain the nutrition information prior to making a food selection at the restaurant, customers must request it from a counter clerk. The promotional advertising also targets the mothers who bring their children to the restaurant with nutrition information about the salads offered by the chain.

Some restaurants garner customer support by publicly rewarding overeating. For example, individuals who can consume an enormous hamburger or steak may have their photo taken and posted on the restaurant wall. In such settings, particularly among young people, the ability to eat huge portions becomes a badge of honor.

Bars and restaurants commonly hold "happy hours" to capitalize on the desire for after- work socializing and increase business volume during the early evening. To entice customers, these establishments often offer reduced-price drinks and provide free or very low cost foods that usually are unhealthy, calorie-dense choices. In that milieu, customers may be minimally aware of the amount of food and drink they consume.

Media

The media have far-reaching influences on the evolution of cultural normative behaviors both in the United States and worldwide. Media images convey powerful messages as to what is desirable or appropriate behavior. As the types and sophistication of media expand and become available to larger segments of the population, the impact of the information people receive through these sources is concentrated. The media, therefore, have an important role in shaping public attitudes toward the relative desirability of healthy versus unhealthy eating, recreational physical activity versus sedentary recreation, and other behaviors. For example, competitive eating contests are a recent phenomenon

on television whose primary audience is young people. At the same time, Internet sites exist that promote anorexia, mostly among young girls.[132]

Food and beverage product promotion is dependent upon the cooperation of the media. In the broadcast media, the food, restaurant, and beverage industries are major purchasers of advertising time, bombarding the public with food and soft drink ads around the clock. The industry also invests heavily in product placement on television shows and in movies, as well as in print media targeting various age groups. Product endorsement by celebrities and other popular figures is another key feature of food and beverage marketing that is used to target selected markets.

Food Marketing to Children

Speakers were unanimous in their conclusions that food and beverage marketing to children is particularly egregious and, combined with the sedentary influence of media use, is a considerable factor in escalating obesity rates in children and teens. Food marketing to children often employs likeable mascots (e.g., Ronald McDonald, Tony the Tiger, Trix Rabbit)[133] and joint marketing of food with film or television entertainment vehicles ("tie-ins") that require a food purchase in order to obtain a movie hero figure or other toy. Typically, several toys promoting a given film or television show are offered over a period of weeks or months; but a separate meal must be purchased to obtain each toy in the set. Children are encouraged to "collect them all." Such symbiotic arrangements simultaneously promote both consumption of unhealthy foods and ticket sales or TV audience share. However, it is notable that in 2006, the Disney Company, a major producer of children's entertainment, did not renew its cross-promotional agreement with a major fast food chain, apparently to distance itself from the chain's widespread association with junk food.[134] Disney appears to have contracted instead with a major sandwich chain with a reputation for offering healthier options. Although a tie-in arrangement still exists, the chain has begun offering children's meals that include low fat milk and apples and has established a child-oriented fitness Web site (other chains are taking similar steps). The tie-in still includes toys with a child's meal purchase, and children also can get a coupon for a free download of music from a Disney film.

…State legislatures have stepped up to the plate. They've stepped up to the plate to protect the food companies from lawsuits. They've done almost nothing to protect kids from the food companies. I'd say nothing.

— Richard Daynard, Ph.D., J.D. Northeastern University School of Law

In collaboration with a university human nutrition program, Disney also has developed nutritional standards for foods that will be sold in its theme parks and plans to eliminate *trans* fats from all food served at the theme parks by the end of 2008. Disney has not, however, established guidelines for food advertising on the company's television networks.[135]

Food advertisers also are using newer technologies to reach young audiences. For example, "blast" e-mail product promotions offer several free cases of soft drink for taking a survey, and in some cases, participating in related product promotions. These promotions are clearly aimed at young people and enable product marketing firms to gather information about target consumers' habits and preferences. This promotional scheme now is being adapted to the latest text, Internet, video, and other capabilities of new cell phone technologies. "Viral marketing" techniques, which facilitate and encourage people to pass along a marketing message, are ideally suited to technology-oriented youth markets.

At this time, there is no Federal oversight of food advertising to children, although the food industry has developed a set of voluntary standards. By contrast, in November 2006 the British government banned advertising for high fat, salt, and sugar foods in programming targeting children under 16 and also prohibits the use of licensed characters, celebrities, promotional offers, and health claims in food advertising to children.[136]

A December 2005 IOM report[137] maintains that if the U.S. food industry will not voluntarily shift its child-oriented television advertising toward healthier foods, then Congress should mandate these changes, an approach endorsed by some lawmakers. According to the report, approximately $10 billion per year is spent on food and beverage marketing to children and the majority of this sum is spent to promote unhealthy products. The IOM committee that produced the report found strong evidence that among children aged two to 11, TV advertising influences food and beverage preferences, purchase requests, and consumption. Moderate evidence indicated that advertising influences the usual dietary intake of the youngest children; this association weakened in older children. However, the report indicated that exposure to TV advertising is associated strongly with adiposity in children aged six to 11 and teenagers aged 12 to 18. This evidence, though strong, was not conclusive as to cause and effect. The report provided several key recommendations, outlined in Table 6, with which the President's Cancer Panel concurs.

Table 6 **Food Marketing to Children and Youth: Threat or Opportunity?**

Institute of Medicine, 2005, Selected Recommendations (Adapted)

• The food and beverage industries should shift their creativity and resources to develop a wider array of products that are nutritious, appealing, and affordable.
• Food, beverage, and restaurant companies, as well as the entertainment and marketing industries, should expand, strengthen, and enforce their standards for marketing practices. Working with health officials and consumer groups, these industries should develop an industry-wide rating system and labeling that consistently and effectively conveys the nutritional quality of foods and beverages. Advertising guidelines of the industry-funded Children's Advertising Review Unit should be expanded and applied to newer forms of marketing, such as Internet and wireless phone advertising and product placement.
• The media and entertainment industries should incorporate storylines that promote healthful eating into programs, films, and games. The government should consider the use of awards and tax incentives that encourage companies to develop and promote healthier products for young people.
• A long-term, multifaceted national campaign should be initiated by the government in partnership with the private sector to educate families and children about making healthy food and beverage choices. This campaign should employ the full range of promotional and marketing tools and should be supported by both public funds and contributions from the food, beverage, and restaurant industries.
• The U.S. Department of Health and Human Services (HHS), in consultation with other Federal agencies, should designate an agency to monitor the nation's progress in promoting more healthful diets. The HHS Secretary should report to Congress within two years on the progress that has been made and additional actions that are needed.

These recommendations correspond closely to those made at a public workshop sponsored by the Federal Trade Commission (FTC) and HHS to consider what the private sector can and should do to help lower childhood obesity rates. The workshop was held in July 2005, prior to publication of the IOM report, but its proceedings were not published until April 2006.[138]

To provide a benchmark against which to measure industry improvements in food advertising to children and teens, in March 2007 the Kaiser Family Foundation (Kaiser) published the results of a study[139] that analyzed over 8,800 food ads broadcast during more than 1,600 hours of television content on the 13 television networks most popular with youth. Of all of the food ads targeting children and teens, 34 percent were for candy and snacks, 28 percent were for cereal, and 10 percent were for fast food. Four percent of the ads were for dairy products and one percent were for fruit juices. There were no ads for fruits or vegetables targeting this audience.

...home economics has disappeared also from the curriculum so people do not know how to cook or how to even handle prepared foods. I wouldn't be so upset if it was "a man, a can, and a plan" that we were teaching in home economics, but we do need to have some type of education so that we have educated consumers in the marketplace.

— David Heber, M.D., Ph.D.
University of California,
Los Angeles

The study also found that children aged eight to 12 years saw the most food ads on TV – an average of 21 ads per day, or more than 7,600 per year. This finding was considered particularly important since these children are just beginning to become independent consumers. Teenagers saw slightly fewer ads (about 17 per day/6,000 per year) and children aged two to seven (who are more likely than other children to watch networks with limited or no advertising, such as PBS) saw the fewest food ads – 12 per day, or 4,400 per year.

In stark contrast, the study also measured children's exposure to public service messages on fitness or nutrition: children two to seven and those eight to 12 saw one such message every two to three days (164 and 158 per year, respectively), while teens saw on average only one such message per week, about 47 per year. The Kaiser study did not address other forms of advertising to children, but noted that 20 percent of the food ads analyzed included a "push" to a Web site.

In June 2007, the FTC published a study[140] that explored issues similar to those addressed in the Kaiser study. Although FTC used slightly different age groupings and food product categories that accounted for some differences in results by age group, its findings overall were consistent with those of the Kaiser study.

Educational System

As the prevalence of child and adolescent obesity has escalated, school nutrition and the overall food environment in schools has come under increased scrutiny. For example, teachers from preschool through high school commonly reward students for desired behaviors with candy, snack foods, class pizza parties, and the like. This practice is being questioned by some parents who see it as undermining their attempts to develop healthy eating patterns in their children.

Similarly, school contracts with soft drink and junk food vendors are commonplace and have been seen as a necessary evil to augment inadequate school budgets. Yet one study suggests that schools actually do not make much money from these contracts; most of the revenue (typically children's own money) goes to the food and beverage companies.[141] A growing number of school districts are beginning to limit student access to vending machines, to include healthier foods and beverages in machines, and to limit the sale of items designated as "foods of minimal nutritional value" (FMNVs) that compete with other cafeteria food offerings. Likewise, some schools are beginning to move away from food-based fundraising activities (e.g., candy and bake sales) to other types of fundraisers that either do not involve food at all or offer healthy food (e.g., citrus fruit sales).

Public school cafeteria offerings, however, are often little better than FMNVs. The majority of food selections in most public school cafeterias (including *a la carte* items) are highly processed, with high levels of salt, fat, sugar, and chemical additives.[142] Many K-12 school systems do little or no actual cooking; they rely on food service companies to supply foods that are inexpensive and easy to reheat. School food service budgets are limited; some rely at least in part on government surplus foods for their federally-reimbursable school breakfast and lunch programs[143] (see also pp. 23-25).

The IOM[144] has recommended that governments and schools develop and apply nutritional standards for all foods and beverages sold in schools that compete with federally reimbursed meals, including products sold in school stores and vending machines or for fundraising. Additionally, the IOM recommended that school-based promotional efforts should focus on products that support healthful diets. These recommendations were followed by an April 2007 report[145] in which the IOM specifies a two-tiered nutrition standard (one applicable to all students, the other for after school snacks available to high school students) for foods and beverages provided in schools.

…I talked to a nutritionist in Kansas about a school lunch program that they did...[in] a high school where there were lousy lunches like there are in lots of high schools across the country, and they offered a healthy choice option.... [T]he kids liked the healthy food....But they said, "We have one question. Why did you do this study?" And she said, "Well, because healthy foods are better for you and we wanted to see how that would go in your cafeteria." They said, "Why did you include the other food? Why would you serve us unhealthy food?"

— Tim Byers, M.D., M.P.H.
University of Colorado
Comprehensive Cancer Center

As part of the Child Nutrition and WIC Reauthorization Act of 2004,[146] all school systems that participate in the Federal school lunch program are required to have a local school wellness policy in place by the start of the 2007-2008 school year. The wellness policies are to include goals for nutrition education, physical activity, and other school-based activities designed to promote student wellness. Moreover, reimbursable meals must conform to Federal nutrition guidelines; these guidelines may soon be updated, and one or more individuals in each school system are to be charged with implementing the wellness policy.

This legislation also enables the Federal government to provide technical assistance to schools in developing and implementing their wellness policies. Such assistance may take the form of educational materials and examples of successful school wellness initiatives. For example, *Making It Happen! School Nutrition Success Stories*,[147] a joint publication of the CDC and USDA Food and Nutrition Service supported by the U.S. Department of Education documents 32 innovative examples of how the nutritional environment can be improved in grades K-12. The Food Research and Action Center, a non-profit organization funded by several foundations and a number of food manufacturers, has developed a guide for school systems to use in developing their wellness policies.[148]

"Two Angry Moms," spurred by their professional and personal experiences, are taking another approach to raising awareness about the current state of school nutrition and ways of improving it. They are compiling a video documentary and developing a Web site showcasing successes in improving school cafeteria food without increasing costs.[149]

It also is of note that some colleges and universities are using their student food service as a marketing tool to attract students; some feature all-you-can-eat buffet stations in the dining halls. This approach may exacerbate the weight gain commonly experienced by students during the first year of college (the so-called "freshman 15") and may make it more difficult

to return to a healthy weight thereafter. Even as they provide the lure of unlimited amounts of food to students, however, some universities are offering healthier choices (e.g., salad bars) in the dining halls and are attempting to educate students about making healthy food choices.[150] One study suggests that the environmental stimuli contributing to college student weight gain may provide a useful model for testing techniques to reduce or reverse the epidemic of obesity observed in the general population.[151]

Health Insurance System

The links between cancer, diet, and obesity have not been accepted sufficiently by the health insurance industry to motivate widespread coverage for health-promoting/cancer prevention services such as nutrition counseling or obesity-related treatment services. Some exceptions exist; for example, three state Blue Cross/Blue Shield plans have begun offering members certain weight management programs at a 50 percent discount. In the realm of public insurance, little coverage exists for nutrition-related services or counseling, though as noted earlier, some state Medicaid programs now are offering selected recipients (e.g., those whose BMI is over a specified level) the option of participating in Weight Watchers™ programs.

Many people consider obese people, like those with diseases caused by tobacco use, to be responsible for their condition. Smoking cessation treatment, however, is more likely to be available for tobacco users, since tobacco is known to be addictive, and the health-related and financial costs of tobacco use are well understood. The equivalent of evidence-based smoking cessation treatment (counseling and medication) is seldom available to help prevent or reverse obesity. Yet a speaker emphasized that it is very difficult for most people to voluntarily change energy imbalance and that most cannot maintain a healthy weight on their own.[152]

Obesity itself typically is not a covered medical condition. An individual must develop an established obesity-related condition (e.g., diabetes, hypertension, heart disease, hypercholesteremia, cancer) to receive reimbursed treatment. However, the treatment generally only covers services to control the obesity-related disease, but not to address its underlying cause. Bariatric (e.g., gastric bypass, lap band) surgery for the treatment of morbid obesity (i.e., more than 100 pounds above normal weight) may be covered in specified instances; Medicare recently added such coverage.

Large employers with self-funded employee health plans can select what services will be covered (in addition to Federal and state mandated services). For instance, in an effort to contain health care costs, some large private and public employers (e.g., Johnson & Johnson; King County, Washington) are offering substantial cash incentives or health insurance premium discounts to employees who take a health assessment and participate in a wellness program. Services available may include nutrition and physical activity programs, health risk appraisals, disease management, lifestyle management, and personal health coach programs. But evidence suggests that incentives alone are not enough to raise and maintain substantial participation in wellness programs; effective communication from management is a key element for success.[153]

…I do believe that the public health messages we have about weight are somewhat ambiguous. We tend to recommend eating healthier foods but not tell people to eat less. We tend for some reason to shy away from the suggestion that people weigh themselves. When we wanted to get them to control their blood pressure and cholesterol we told them to measure it all the time, but we're not doing that with weight.

— Robert Jeffery, Ph.D.
University of Minnesota

Smaller employers have fewer options for incorporating wellness/self-management programs into their health benefits package, since they typically must shop among set

packages of benefits/services offered by various insurers. These benefit packages are unlikely to include nutrition counseling or other obesity prevention/management services. Small employers generally can only negotiate regarding copayments and reimbursement levels.

For employers of any size, however, measuring the direct (e.g., lower health care costs) and indirect (e.g., higher worker productivity) benefits of preventive health coverage is difficult, and many employers are waiting for stronger evidence of relatively near-term benefit before adding these services to their benefit packages. The concern is that some of the savings from improved health will not accrue to the employer currently paying for self-management programs.[154]

Health Care System

The overall acute care orientation of the health system is a significant factor in the limited attention given to nutrition and diet. For example, the services of a nutritionist or dietitian seldom are reimbursed outside of a specialized cardiac rehabilitation or diabetes management program. Many people now know – through health provider education, media, or other information sources – that obesity is a risk factor for heart disease and diabetes, but many still are unaware that obesity increases the risk for many cancers.

Physician counseling about diet or weight management, if it is provided at all, tends to be quite limited and non-specific, yet experiences with cancer screening demonstrate that a physician's recommendation is a powerful motivator. Meeting speakers noted physicians' concerns that overweight and obese patients may switch physicians or avoid doctors entirely if they feel pressured to address diet and obesity issues. These concerns notwithstanding, speakers emphasized that physicians and other health care providers should routinely assess the willingness of overweight and obese patients to discuss weight loss and accept information on nutrition and portion control. Further, speakers underscored the importance of helping patients understand the meaning of energy balance and BMI, the necessity of reducing caloric intake in order to lose weight, and the increased risk for many cancers due to obesity.

In addition, research has shown that weight awareness (as measured by how often people weigh themselves) is one of the strongest correlates of successful weight control. In the United States, people tend to weigh themselves infrequently. Studies have demonstrated that in normal weight populations, people who weigh themselves daily on average weigh about seven pounds less than those who do not weigh themselves at all. In obese populations, the difference between regular-weighers and never-weighers is about 22 pounds. Changes in weight awareness over time also are associated with positive effects on body weight. In a study in which two groups were encouraged to increase the frequency with which they weighed themselves, those who did so daily or weekly were far more effective in losing weight or preventing weight gain compared with those who chose to weigh themselves less often.[155] These findings suggest that the physician's recommendation to increase weight awareness can be a powerful tool in helping patients lose and control weight.

Workplace/Employers

With long commutes, getting children off to school, and other home responsibilities, many workers rely on worksite food service facilities when available. Most employees eat at least one meal per day at work; some regularly have two meals at the workplace. Many workplace cafeteria and concession stand offerings do not support healthy eating

There's a fundamental problem with a vending machine. That is, when you look at a vending machine you only can see the front part of a product. So how are you going to make the right choice of what product you want to pick, because obviously you can't turn it over and look at the nutritional panel…

— Alvaro Garza
Snack Essentials

habits; foods available in these facilities typically include sugary baked items, high-fat and carbohydrate-rich foods, and highly processed snack foods. Some worksite food service facilities are moving toward the inclusion of more salads and fruits, but fast-paced work environments and those that allow employees very limited meal and break times tend to encourage consumption of quick, processed, or other unhealthy foods to minimize time not spent on job duties. In addition, some employers may subsidize the cost of cafeteria food to discourage workers from leaving the job site during work hours. Speakers suggested that employers could encourage healthier eating by subsidizing the cost of healthy food and raising the prices of less healthy foods. Research has shown that even with inexpensive food, people are very responsive to shifts in food prices, and will dramatically increase their purchases of healthier (i.e., less calorie-dense) food items with appropriate price incentives.[156]

Vending machine food and beverage offerings likewise tend to be unhealthy, but the Panel learned about a Texas company, Snack Essentials, that is attempting to change the food selections in vending machines in corporate, government, and school facilities by educating established vending companies and those who make purchasing decisions and providing healthier options at competitive prices. The company also offers vending machine selections catering to special diets (e.g., gluten-free, peanut-free, low glycemic index), and places nutrition information about vending products on the machine so that purchasers can make informed choices at the point of purchase.

Individuals and Families

Some parents have little information on nutrition and so are unable or unlikely to prepare healthy meals or teach healthy eating practices to their children. Many live in neighborhoods with little access to fresh food; if it is available, fresh food may be unaffordable. Parents with hectic schedules have little time to cook, and family members' schedules have made the family dinner a relative rarity. "On-the-run" eating, however, encourages poor food choices and reduces awareness of calories consumed.

Providing snacks after children's team sporting events, Scout meetings, and other extracurricular activities has become the norm, but the foods provided often are unhealthy, encouraging poor food choices and establishing a mindset regarding food as a reward. Similarly, it is a common and generally accepted practice for parents of preschool and elementary school children to bake cookies or cupcakes for classroom celebrations of children's birthdays. Over the course of a school year, such "special occasions" may occur 30 or more times in each class. Anecdotal evidence suggests that some parents are beginning to object to the food served at these celebrations and are taking steps such as limiting these events to once a month, changing the type of food offered, or having a celebration that does not involve food.

A speaker noted that children who receive nutrition and fitness education may convey this information to their parents. In some cases, this interaction has led to significant changes in family eating and other health behaviors.

In sum, consistent with findings in the literature,[157] speakers outlined the need for multi-pronged nutritional interventions that increase individual awareness and also reach the family, community, and society as a whole. Barriers to healthy eating must be removed and greater resources should be provided for vulnerable populations. In addition, support is needed for people who are making healthy changes, and population-level nutrition policies are required.

…we are trying to infect our kids in our childcare sites with healthy habits so that they take those habits back home and begin to teach parents about the importance of health and wellness.

— Jonathan Lever, Ed.M., J.D.
YMCA of the USA

Chapter 3

Physical Activity

The importance of physical activity in cancer prevention, independent of diet and obesity, is becoming better understood. This chapter highlights current knowledge about physical activity levels of Americans, activity measurement limitations, evidence for the impact of physical activity on risk for specific cancers, key issues in improving activity levels to reduce cancer risk, and examples of activities underway to address this aspect of cancer prevention.

Physical Activity and Cancer

Physical Activity Levels

According to 2005 Behavioral Risk Factor Surveillance Survey (BRFSS) data,[158] 24.4 percent of adults engage in no leisure time physical activity. Less than half engage in 30 minutes or more of moderate activity five or more days per week, or 20 minutes or more of vigorous physical activity three or more days per week, as recommended by the Centers for Disease Control and Prevention (CDC).[159]

At least 60 minutes of accumulated moderate physical activity most days of the week, preferably daily, is recommended for children and teens.[160] Inactivity during childhood and adolescence is of particular concern because it increases the likelihood of being inactive as an adult; less active adults are at greater risk of developing diabetes and dying from colon cancer, heart disease, and high blood pressure.[161] The 1996 National Longitudinal Study of Adolescent Health[162] indicated that the proportion of inactive boys and girls increases during adolescence. By age 18 to 22 years, only 26 percent of males and 12 percent of females engage in moderate or strenuous activity at least five times per week. The study data further showed that 39 percent of males and 58 percent of females either do no activity or participate in physical activity no more than twice per week. Inactivity also varies by ethnicity, with a smaller decrease by late adolescence/early adulthood among whites compared with other racial/ethnic groups.

A speaker suggested that participation in organized leisure physical activity is less of an influence on weight gain, loss, or stability than overall level of activity during the course of a day (referred to as non-exercise activity thermogenesis, or NEAT).[163] NEAT represents energy expenditure in excess of basal metabolic rate (the energy required for core body functions while at rest), which accounts for about 60 percent of daily energy expenditure in a sedentary individual. NEAT also does not include energy expended in digestion, absorption, and fuel storage (thermal effect of food). According to the speaker, NEAT can vary by as much as 2,000 calories per day. Therefore, individuals who wish to avoid or reverse weight gain should, in addition to increasing participation in structured leisure time exercise, endeavor to become more generally and consistently active.

...society is much more sedentary. We're not walking. It's not part of our way of life....We drive to work. We work in front of our PCs. We drive home and we sit in front of our TVs.

— Peter Greenwald, M.D., Dr.P.H.
National Cancer Institute

Physical Activity Measurement

Existing approaches to measuring physical activity (e.g., personal interviews, mailed surveys, activity levels derived from occupation or other group membership and/or historical information) vary considerably in their ability to accurately capture duration, frequency, and intensity of physical activity, particularly regarding historical data on activity levels that are not self-reported. Available measures also do not adequately reflect the seasonality of specific physical activities, changing opportunities for engaging in physical activity, or activity level changes associated with aging.

Improving physical activity measurement methods and tools is essential to advance this area of cancer prevention research. At this time, it is unclear what types of activity may be most beneficial, as well as the optimal intensity, frequency, and duration of such activities. In addition, better understanding is needed about the most important period(s) in life during which to measure the benefit of physical activity on overall cancer risk and risk for specific malignancies.

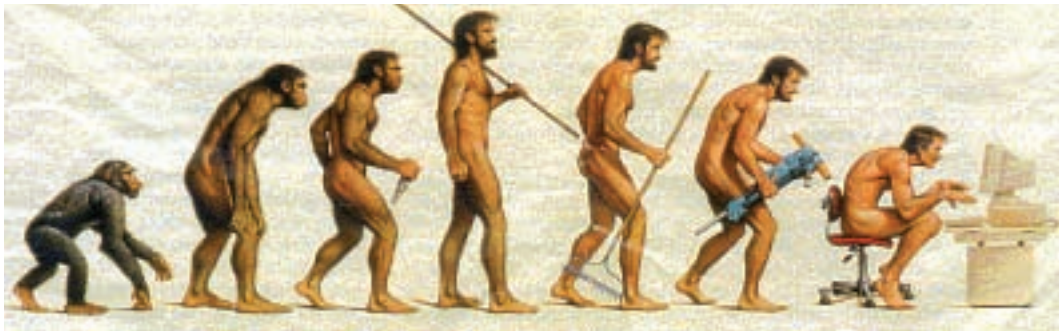


Image courtesy of Bruce Hollis

Physical Activity and Risk for Specific Cancers

Mechanisms that have been considered as possible mediators of the relationship between physical activity and specific cancers include immune regulation, inflammation, antioxidant defense, insulin sensitivity, growth factor production, DNA repair, and hormone production.[164,165] The ways in which physical activity alters these mechanisms to exert a protective effect on cancer incidence, recurrence, or prognosis are not fully understood. Though most research to date has focused on the efficacy of physical activity in cancer prevention, accumulating evidence also demonstrates that exercise influences other aspects of the cancer experience, including cancer detection, coping ability, rehabilitation, and survival.[166]

Risk for Specific Cancers

In 2001, the International Agency for Research on Cancer (IARC) conducted an assessment of the relationship between cancer and two modifiable cancer risk factors, inactivity and obesity.[167] The review considered the evidence available for cancers of the colon, breast, endometrium, ovary, prostate, lung, testis, and kidney. The evidence that physical activity influences colon cancer risk was considered to be convincing. The reviewers also found considerable evidence of a 20 to 40 percent lower breast cancer risk among the most active women. The existing evidence for the other cancers was considered too limited or conflicting to determine a risk relationship with physical activity. Additional research conducted since the IARC review has provided further insights into the role of physical activity in reducing the risk of specific cancers.

- *Colon Cancer*

Lack of physical activity is a well-established risk factor for colon cancer in both women and men, but accumulating evidence indicates that physical activity may be perhaps the most important lifestyle factor associated with this disease.[168,169] Even after taking into account factors such as age, body size, use of aspirin, dietary intake, sun exposure, and family history of colorectal cancer, findings of substantially reduced colon cancer risk among men and women with high, and to a lesser extent, moderate physical activity levels have been consistent. Some studies suggest that higher levels of physical activity also may be protective against rectal cancer.[170] Increased gastrointestinal transit time is hypothesized to be a mechanism involved in the effect of physical activity on colon and perhaps rectal cancer risk.[171]

A speaker indicated that the available evidence as a whole suggests that people who are sedentary have a 60 percent to two-fold greater risk of developing colon cancer compared with active individuals, and that 13 to 14 percent of colon cancer in the population could be attributed to physical inactivity. The findings further suggest that the combination of intensity, duration, and frequency of activity are all key elements in risk reduction. Lower colon cancer risk was achieved from performing approximately 3.5 to four hours of vigorous activity weekly, but from seven to 35 hours of moderate activity weekly would be needed to achieve the same protective effect.[172]

- *Breast Cancer*

High cumulative lifetime exposure to estrogen is an established risk factor in breast and endometrial cancers.[173] Factors that affect a woman's lifetime exposure to ovarian hormones by increasing the number of ovulatory menstrual cycles include early age at menarche, late age at first term pregnancy or no pregnancy, and late age at menopause. Use of hormone therapy during and/or after menopause also raises lifetime estrogen exposure, as does postmenopausal obesity or large weight gain during adulthood due to estrogen production by adipose tissue.[174] Childhood obesity also may influence breast cancer risk by increasing lifetime exposure to ovarian hormones; researchers found that higher BMI in girls as young as three and a large increase in BMI between age three and the first grade are associated with earlier puberty.[175]

There are more than 40 studies in the literature now, nearly all of which show some reduction in [breast cancer] risk with physical activity. We see it among pre- and post-menopausal women. We see it for both recreational and occupational activity. And we see the effects observed across different populations.

— Leslie Bernstein, Ph.D.
University of Southern California Norris Comprehensive Cancer Center

Though differing in the populations studied and in experimental design, numerous studies of girls and women of all ages have been relatively consistent in demonstrating substantially reduced risks of invasive (as much as 50 percent lower) and *in situ* (up to 40 percent lower) breast cancer among those with the highest levels of long-term physical activity compared to women with long-term moderate and low activity levels. Physical activity was shown to reduce cancer risk in both black and white women, with those doing the most exercise over their lifetimes having about 20 percent lower risk than inactive women.[176] According to a speaker, other studies of recreational level physical activity and activity at specific periods of life also have shown some reduction in breast cancer risk. Physical activity appears to increase the number of anovulatory menstrual cycles, thereby reducing estrogen production and cumulative lifetime estrogen exposure.

…despite the known risk of physical inactivity, more than half of U.S. adults do not meet current physical activity recommendations and nearly one-quarter remain completely sedentary.

— Kerri Winters-Stone, Ph.D. Oregon Health & Science University

A large cohort study of female teachers and school administrators assessing lifetime recreational exercise activity and strenuous activity at different periods of life has produced similar results regarding reduced breast cancer risk.[177] This study is particularly notable, however, in that the protection offered by a lifetime history of recreational physical activity was restricted to estrogen receptor-negative (ER^-) breast cancers, with the most active women having a 50 percent lower risk than the least active women. If confirmed in future studies, these results may help add an important preventive intervention for this more aggressive subtype of breast cancer, for which treatment options currently are limited.

In addition, research is needed to determine the optimal types, duration, intensity, and frequency of physical activity, and the period(s) of life in which physical activity is most beneficial for different subgroups of women to best reduce breast cancer risk, including risk of recurrence. Research also is needed to learn how to more effectively motivate and maintain behavior change with respect to physical activity. Population-based interventions should focus on women and girls to impact lifetime estrogen exposure.[178]

- *Endometrial Cancer*

As noted above, endometrial cancer is strongly associated with obesity. Several studies have shown an increased risk for this cancer with inactivity, and additional studies confirming these findings are accumulating.[179] Women engaged in the highest levels of physical activity have about a 20 to 40 percent lower risk than sedentary women. The effect of physical activity may be independent of weight change or weight maintenance.[180]

- *Prostate Cancer*

About half of the studies of prostate cancer and physical activity show a reduced risk among physically active men,[181] yet other studies find no effect and a small number found increased risk. These results are difficult to interpret with confidence, however, since the impact of physical activity on prostate cancer may vary by age, the time period covered by the physical activity history, the intensity of physical activity, and the disease outcome (e.g., tumor grade, mortality). Two recently published cohort studies showed no overall impact on prostate cancer risk, but did show reduced risk for advanced disease[182,183] and fatal prostate cancer.[184]

- *Lung Cancer*

Studies of the impact of physical activity on lung cancer risk have been mixed, with most showing a weak to modest protective effect of physical activity in both smokers and nonsmokers. A meta-analysis of seven cohort and three case-control studies showed lower lung cancer risk among individuals rated highly active (30 percent) or moderately active (13 percent) compared with inactive individuals; the reduced risk was found in both men (25 percent) and women (38 percent).[185]

- *Ovarian Cancer*

Studies of ovarian cancer and physical activity also have had mixed results, with some showing no association, and others showing some reduction in risk.[186,187]

Physical Activity – Key Participants and Positive Steps

Government

Federal Government

Established 50 years ago, the President's Council on Physical Fitness and Sports[188] (the Council) was the locus for Federal efforts to promote physical activity and fitness. Assessments given to elementary and middle school children, developed and promoted by the Council, were widely used and accepted as a minimum measure of students' physical fitness. In recent years, the Council's influence has perhaps been diluted by fitness recommendations of other organizations and the overall decline of physical education in schools as emphasis on academics has increased. The Council's current fitness test, which includes BMI measurement, is completely voluntary; individual schools or school districts decide whether they will use the fitness test. At present, the fitness test is administered to 4.2 million children aged six to 17 in schools across the country. Under an umbrella program, the President's Challenge,[189] the Council maintains a Web site that provides information and a variety of programs for individuals of all ages, groups, schools, and others. The Challenge Web site includes a BMI calculator, activity logs, and an awards program for people or groups who work toward and achieve a higher level of fitness, regardless of their initial fitness level. The site also includes pages for educators and others planning to implement a fitness initiative, listings of Federal, state, and other resources, and non-governmental health and fitness organizations. The Council is supported entirely by award sales and receives no Federal funding.

…at an individual level and a community level, everyone… can do something. You can talk to your local school board. You can go join a gym. You can join a spinning class. You can join any kind of activity group you want. You can even join some commercial weight loss programs — whatever you want to do….I'm for all of it because all this grassroots action is what's ultimately going to move the country, because politics is the art of the possible.

— David Heber, M.D., Ph.D. University of California, Los Angeles

HHS is developing Physical Activity Guidelines for Americans, scheduled to be released in late 2008.[190] The guidelines will summarize current knowledge about activity and health and are intended to help create a culture of wellness in America. The guidelines will support one of the four pillars of the HealthierUS initiative: physical activity, good diet, healthy choices, and preventive screening. As noted above, HealthierUS was launched in 2002 in response to the nation's escalating obesity and chronic disease crises.

At the same time, VERB,™ a successful HHS campaign promoting greater participation in physical activity by preteens, is being dismantled as a result of CDC budget cuts.[191] CDC is trying to document the research and lessons learned from VERB – which portrayed exercise as "cool" at the ages when outdoor play typically declines sharply – so that it may inform similar programs local groups might launch.

State and Local Governments

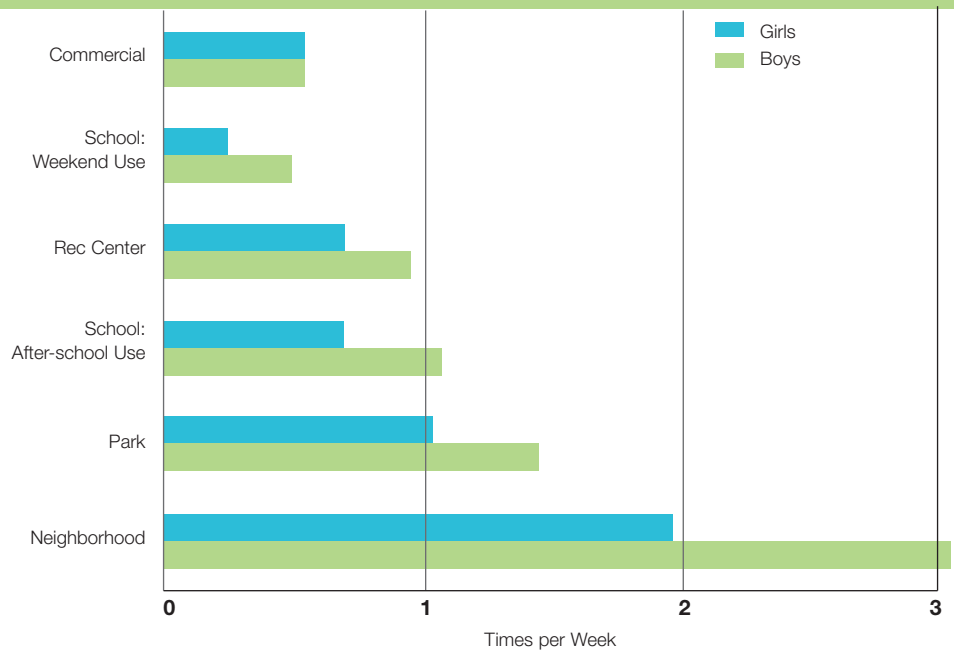
- *The Built Environment – Physical Activity*

Decisions about the design and maintenance of the communities where people live and play typically are made at state and local levels. Speakers underscored the important influence of the built environment on the likelihood that people will adopt and maintain an active lifestyle. Research on adults has found a direct relationship between the convenience of places to walk and the proportion of adults meeting current activity recommendations.[192] In many neighborhoods, lack of sidewalks, inadequate lighting, and other safety concerns are significant disincentives to outdoor physical activity. Many neighborhoods lack playgrounds and other recreational facilities; in others, available facilities need substantial refurbishment to be both safe and attractive.

A 2001 study conducted with ethnically diverse students from 24 middle schools assessed the frequency of teens' use of community facilities for leisure time physical activity (Figure 6). These data highlight the importance of activity-friendly neighborhoods and parks to teen activity levels. Similarly, a 2006 research study found that adolescent girls living in close proximity (within a half-mile) to public parks are more physically active than girls who do not have such easy access to these facilities.[193]

A speaker discussed the impact of community design on active transportation (e.g., walking, biking) and overall physical activity levels. Many city residents are accustomed to having stores and service providers (e.g., dry cleaner, drug store) within easy walking distance, and many do not own cars. As suburbs continue to radiate further from city centers, residential communities are being placed far from employment centers and shopping hubs, necessitating auto travel to commute to jobs and accomplish grocery shopping, trips to the post office, and other routine tasks. This arrangement responds to the desires of many suburban dwellers (including some who have fled the cities) for a bucolic residential ambiance. It also is affected by perceived land use efficiencies and local zoning laws. In addition, unlike the "walkable" grid design of most cities (Figure 7, left panel), the design of most suburban communities tends to discourage social interaction and movement beyond one's own cul-de-sac (Figure 7, right panel). Further, many suburban neighborhoods have been designed without sidewalks to minimize the visual disruption of green expanses. As a result, children cannot safely play or ride bicycles without concern for auto traffic; adults likewise must walk and cycle in the street. Houses may be spaced so far apart that smaller children must be driven to play with friends. All of these changes to unwalkable environments reduce typical daily physical activity levels. Some studies have found associations between neighborhood walkability – or commuting distance – and obesity as measured by body mass index.[194] Moreover, research is beginning to document connections between the built environment and sedentary behaviors. Children who lack safe places to play near their homes, for example, may spend more time being inactive indoors.

Figure 6 **Use of Physical Activity Facilities by Teens**



N=1678 parent reports; 24 middle schools
Source: Hoefer WR, McKenzie TL, et al. Parent provision of transportation for adolescent physical activity, *American Journal of Preventive Medicine* 2001; 21(1):48-51.

Figure 7

Community Structure and Physical Activity

Centers for Disease Control and Prevention and the Robert Wood Johnson Foundation

Source: Glanz K. Presentation, President's Cancer Panel meeting, December 5, 2006.

Some suburban residents have come to appreciate the limitations of this type of community environment. In response, a small number of new communities are being constructed based on modified traditional city or small town designs, with shopping and other amenities within walking distance from residences, sidewalks, and shopping streets on which auto traffic is prohibited.

- *State and Local Initiatives*

Numerous states and localities are launching programs and environmental improvements to increase physical activity among residents, usually as part of broader wellness initiatives. For example, Portland, Oregon and Boulder, Colorado are among a small number of cities that are crisscrossed by a system of bike paths that encourage people to walk and bike to work and to other destinations in the city. This approach to the built environment enables residents to weave physical activity into their daily lives. The City of Portland also provides financial incentives to its employees for biking to work a majority of the time.

CDC provides full or partial support for a number of programs to increase physical activity. In Winston-Salem, North Carolina, the Healthwise program, funded by a charitable trust, and the state health department's WISEWOMAN program, encourage program clients to become more physically active.[195] Women in the program also receive counseling about healthy diets, smoking cessation, and stress management. Community partners have collaborated to enable women to purchase Young Women's Christian Association (YWCA) memberships for a nominal monthly fee. An individualized physical activity plan is developed for each client, who must agree to exercise at least twice a week for six months. The program has attracted women to the WISEWOMAN program and removed cost and access barriers that were keeping underserved women from being more physically active. Organizational partnerships have increased the likelihood that these services will be sustained in the community.

Although Colorado has one of the lowest overweight and obesity rates in the nation, obesity among adults increased by 141 percent from 1990 to 2002; nearly half of the state's adults now are overweight or obese. To help address the problem, the Colorado Physical Activity and Nutrition Program developed a Worksite Resource Kit to provide employers of all sizes with resources to implement worksite wellness initiatives.[196]

In addition to physical activity interventions, the program also focuses on healthful eating, health education, and worksite environment characteristics. Participating organizations also can receive mini-grants to fund physical activity events, stairway improvements, and other relevant projects.

In central Washington, Healthy Communities Moses Lake encourages physical activity and good nutrition behaviors through environmental and policy change.[197] The City of Moses Lake and surrounding Grant County have adopted an overall Healthy Communities action plan. The city is replacing a railroad track that runs through the downtown area with a biking and walking path, and the county will create walking and biking trails alongside irrigation canals. New city and county zoning ordinances require wider sidewalks that will increase pedestrian and cyclist accessibility.

Non-governmental Organizations and Other Partners

The current situation is basically a physical inactivity epidemic. Health problems are up. Medical costs are up. [Physical education] classes are down. So it's counterintuitive in many ways that as these health problems are increasing, physical education in schools is decreasing, and in some cases dramatically.

— Kenneth Reed, Ed.D., M.S. PE4life

Numerous non-governmental organizations are involved in promoting physical activity, in some cases in collaboration with Federal and state agencies. These efforts may be national or local in focus, and often are part of a broader wellness campaign. Several examples are described below.

The Robert Wood Johnson Foundation (RWJF) has worked for years to increase routine physical activity among people of all ages by promoting policy and environmental changes that foster activity-friendly communities. Three years ago, it focused on efforts to prevent childhood obesity and thereby curtail the incidence of cancer and other chronic diseases experienced by obese adults. Through targeted funding, particularly in low income populations where obstacles to healthy living and obesity rates are highest, RWJF is focusing on: (1) building the evidence base regarding policy and environmental changes that increase physical activity among children, (2) testing and evaluating innovative approaches and disseminating promising models, and (3) educating leaders and investing in advocacy. Adding to its previous investments in this area, in April 2007 RWJF committed $500 million over the next five years to reducing childhood obesity.[198]

The YMCA is in the process of reinventing its relationship with the communities it serves. A YMCA representative noted that the 2,600 YMCAs in the United States have more than 20.2 million members of all ages, and more than 70 million households are located within three miles of a YMCA facility. Through a program initiated in 2004, Activate America, the organization is targeting people it characterizes as "health seekers," individuals of all ages and fitness levels who are trying to improve their health and who may have been frustrated in their past efforts, usually by a diverse mix of personal and environmental factors. The YMCA counts cancer survivors and those at risk for cancer within the ranks of health seekers. More than 50 YMCAs have taken part in a two-year pilot test in which YMCA staff have reoriented their initial approach to potential new members to learn each person's specific needs. This approach has allowed YMCA to expand from an organization that caters primarily to committed exercisers to one that also meets individuals' needs for small group support, mind-body programs, and family activities. The YMCA also has become active in advocating for healthy food choices in schools, supporting efforts to increase fruit and vegetable availability in inner cities, and has changed its own vending and other food offerings to "make the right choice the easy choice." In 2007, the Activate America program will move into a rapid dissemination phase. Program development has been accomplished in partnership with physicians, nutritionists, and chronic disease organizations such as the American Cancer Society. YMCA has teamed with two major universities to assist in evaluating the impact of this initiative.

PE4life is a national non-profit advocacy organization committed to inspiring active healthy lifestyles through quality school physical education programs in grades K-12. It focuses on teaching children a wide range of physical activities that they can continue to participate in after they leave school. Importantly, the program puts children in competition with themselves rather than others and enables them to measure personal improvement using heart monitors and by maintaining their own computerized fitness profile. Interactive video games in which children ride bicycles connected to video consoles and dance-oriented video games are incorporated into the program. PE4life expands existing physical education programs so that they are part of each school day. Since 2000, the program has used its PE4life Academies to train nearly 900 educators from 140 school districts in 33 states to enable them to provide the program on their own. To date, the program has reached almost 1.5 million students and significant expansion is planned.

A partnership of the National Head Start Association, the Sports, Play, and Active Recreation for Kids (SPARK) program, and Nike, Inc. established the NikeGO Head Start initiative to bring physical education activities to preschool children in the Head Start program. In the program's first year, 127 locations received grant support, with expansion to almost 200 locations planned in 2007. SPARK assisted in developing the curriculum and trains the Head Start providers; Nike provides all of the needed equipment. The initiative is the newest component of the NikeGO program that also serves children in grades K-5 and American Indian children living on reservations. The program is expected to continue to grow and evolve to meet the needs of specific populations. Examples of other physical activity programs shown to be effective and readily adoptable in diverse settings are the CATCH for Improved Physical Activity and Diet in Elementary School Children[199] and the Senior Center Exercise Program for Older Adults.[200]

KaBOOM!, a national non-profit organization dedicated to ensuring that all children have a place to play within walking distance of their homes, and The Home Depot are collaborating to provide grants of $5,000 to community-based groups to enable them to refurbish community playing fields. Grant funds can be used toward the purchase of materials, equipment, and supplies that will ensure the effective use and longevity of the field.[201]

A growing number of non-profit and advocacy organizations are using physical activity events as fundraisers. Among the better known of these are the Susan G. Komen Race for the Cure, the Lance Armstrong Foundation's LIVE**STRONG**™ Challenge, the Leukemia & Lymphoma Society's Team in Training events, and the Avon Walk for Breast Cancer. In addition to raising awareness and funds for the organization's particular mission, these events – cycling, walk/runs, triathalons, double-dutch rope jumping competitions, and more – all encourage physical activity. In some cases, previously inactive people decide to use one of these charity events as an impetus to adopt a more active lifestyle.

Educational System

The decline of physical education in schools unfortunately has coincided with unhealthy changes in family eating patterns (e.g., increase in percentage of restaurant meals eaten, eating "on-the-run"), increased sedentary leisure activities, and other changes in common behavior patterns. For example, whereas nearly half of children previously walked or biked to school, today an estimated nine out of 10 children are driven to school.[202,203]

Diminished participation in physical education is one of several factors contributing to increasing obesity rates among children and teens. According to CDC, less than 10 percent of younger children have daily physical education in school.[204] Many elementary schools

have formal physical education classes only once a week. Formerly unstructured recess has become restricted in terms of the types of activities allowed, seemingly to ease teachers' outdoor supervisory responsibilities and limit the possibility of injuries.

School-based fitness assessments have become minimal or nonexistent in many school districts and few, if any, measure obesity as part of a fitness assessment. A notable exception is found in Arkansas, where children's BMI is computed and the score is sent home to parents with information explaining what the BMI score means. An analysis of program data showed that the statewide childhood obesity rate not only ceased rising, but even declined by the third year of the program.[205] In early 2007, however, driven by a conservative political faction in the state opposed to government intervention in matters it views as personal, a law was passed weakening the BMI program such that body mass is measured and communicated to parents only every two years from kindergarten through 10th grade rather than annually. School superintendents also had been unhappy with the original legislation, which they viewed as an unfunded mandate because additional funding did not accompany the legislation. Further, the legislature passed a bill substantially reducing the amount of physical education provided in schools; the rationale for the law was that schools needed more instructional time to meet academic requirements of the No Child Left Behind regulations. As of January 2007, other states that require BMI measurement and parental notification include California, Illinois, New York, Pennsylvania, Tennessee, and West Virginia.[206]

…repetition is important. If you expect people to develop healthy habits, then they need to participate in [physical] activities on a daily basis.

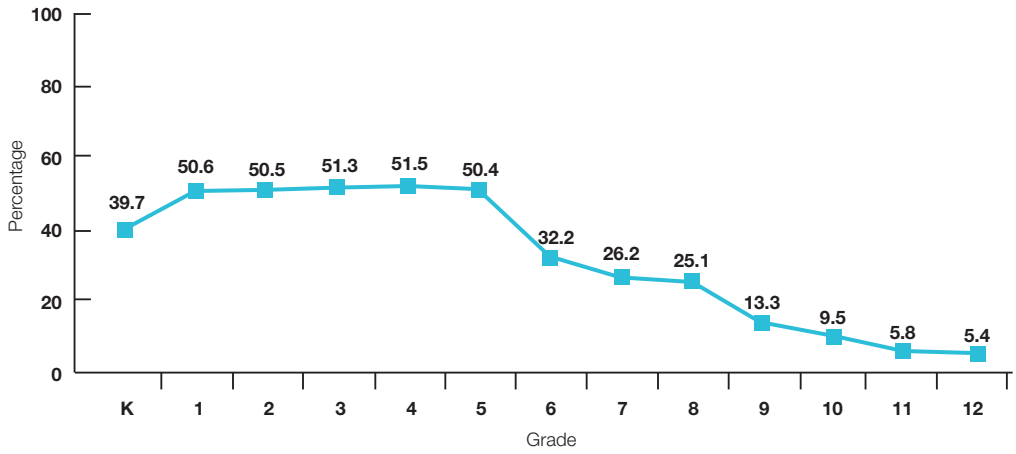
— Danielle Killpack Nike, Inc.

As Figure 8 illustrates, the percentage of schools that require physical education barely exceeds 50 percent and drops precipitously after elementary school. The 2005 CDC Youth Risk Behavior Surveillance Study[207] found that the percentage of high school students who attended daily physical education classes decreased from 42 percent in 1991 to 25 percent in 1995, improving somewhat to 33 percent in 2005 (Figure 9). Moreover, physical education class sizes often are large and students actually may participate for only a few minutes of each class, spending most of the time sitting on the sidelines waiting for their turn to play. Among schools that require physical education, almost 42 percent operate at the average maximum allowable student-to-teacher ratio – 28:1 for elementary schools, 31:1 for middle/junior high schools, and 33:1 for senior high schools.[208]

In 1997, based on an extensive review of research and practice, and developed in collaboration with experts from Federal and state agencies, universities, volunteer organizations, and professional associations, CDC published *Guidelines for Schools to Promote Lifelong Physical Activity.*[209] The guidelines state that physical activity programs for young people are most likely to be effective when they: (1) emphasize enjoyable participation in physical activities that are easily done throughout life, (2) offer a diverse range of noncompetitive and competitive activities appropriate for different ages and abilities, (3) give young people the skills and confidence they need to be physically active, and (4) promote physical activity through all components of a coordinated school health program and develop links between school and community programs. The guidelines include numerous recommendations for ensuring quality physical activity programs.

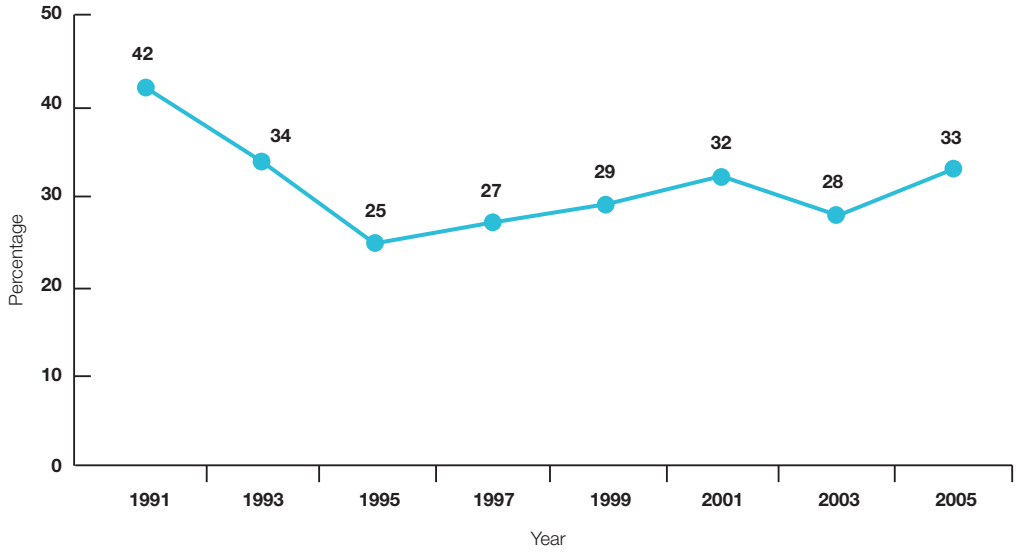
Yet a perception seems to persist in much of middle and high school physical education that students fall into two broad groups: athletes and non-athletes. Students with average or less than average ability often are not encouraged to stay physically active or provided resources that would help them do so. Middle school typically is the point at which the most athletically talented students progress to competitive school teams or out-of-school competitive leagues while the remainder often stop participating in physical activity altogether. A speaker suggested that some students' perception – that participating in

Figure 8 **Percentage of Schools that Require Physical Education, by Grade**



Source: Centers for Disease Control and Prevention. School Health Policies and Programs Study, 2000.

Figure 9 **Percentage of High School Students Who Attended Physical Education Classes Daily, 1991 – 2005**



Source: National Center for Health Statistics, Centers for Disease Control and Prevention. "Physical Activity: School and Community Guidelines."

physical education is essentially a mark of failure to earn a place on the competitive teams – may be one reason physical activity declines so dramatically at this time. As noted above, middle school also is the point at which required physical education drops off dramatically. Most school districts offer few if any alternatives to the traditional team sports in physical education classes, although the potential exists to offer individually-oriented activities (e.g., yoga, tai-chi, weight training, low impact aerobics) that require little or no special equipment and that students could maintain throughout life.

Some positive changes appear to be occurring in the traditional paradigm. For example, some schools are beginning to promote the goal of increased individual fitness regardless of a student's baseline fitness level. This approach is in sharp contrast to the traditional idea that one must achieve a specified minimum proficiency to be considered successful. Speakers described other school-based efforts, such as PE4life, which emphasizes individual noncompetitive physical activity and starting early to build lifelong physical activity habits.

Similarly, physical education programs in West Virginia, California, Missouri, Hawaii, and other states have begun to include a highly popular video game that requires players to dance in increasingly more complicated and strenuous patterns while standing on a special plastic mat. Players can dance by themselves, with a partner, or in competition. A multiyear study of the game[210] found significant benefits for overweight children who played the game regularly, including improved blood pressure and endothelial function (which reflects the arteries' ability to deliver oxygen), and overall fitness. In West Virginia, where rates of obesity, hypertension, and diabetes are among the highest in the nation, the game will be installed in all public schools by 2008, funded through a partnership among West Virginia's Department of Education, its Public Employees Insurance Agency, and West Virginia University. The game already is used in most of the state's 185 middle schools. A similar statewide program is being planned in Hawaii.[211]

In Florida, which never has had a mandated physical education law, the governor has proposed a measure that would require elementary school students to participate in physical education classes for 150 minutes per week. The goal is for all students to have mandatory physical education classes by 2012.[212] Although limited research suggests that physically fit students score better on standardized tests,[213] the proposal is opposed by some state educators. They cite pressure for students to pass state proficiency examinations in core subjects to meet requirements of the No Child Left Behind Act (also used to determine school and teacher bonuses) and the lack of funding support accompanying the proposed measure.

Media

Several speakers cited the contribution of media entertainment to sedentary lifestyles that are a major factor in climbing obesity rates. According to one estimate, children aged eight to 18 years spend an average of 6.5 hours per day either in front of a screen (e.g., television, video console, non-homework related computer use such as Internet, movies, email, instant messaging) or listening to music.[214]

Data on adult use of media entertainment are scarce, but in one study examining relationships between adult sedentary behavior and prevalence of the metabolic syndrome (defined as a cluster of symptoms including abdominal obesity, high triglyceride level, low high-density cholesterol level, high blood pressure, and hyperglycemia[215]), nearly 72 percent of study participants reported using media entertainment (e.g., television, videos, computer use outside of work) an average of two or more hours per day. In this same study population, 44 percent reported engaging in no physical activity.[216]

Particularly considering the average levels of exposure to various media, the ability of media coverage to shape public opinion and reinforce various behaviors cannot be underestimated. Perceptions of fitness and physical activity as normative and desirable behaviors provide one such example. It has been postulated that limited coverage of women's college and professional team and individual sports on television and in the print media may be a factor affecting the participation of girls and women in physical activity. More than half of women surveyed in a 2001 Markle Foundation-sponsored Oxygen Media poll acknowledged a positive effect on their personal self-esteem gained by seeing successful female athletes.[217] But a study by the Amateur Athletic Foundation of Los Angeles, for example, reported that in 2004 women's sports received only 6.3 percent of airtime on early evening and late-night television sports news, less than in 1999, when women received 8.7 percent of sports coverage.[218] When they are covered at all, women's sports tend to be broadcast at inconvenient times and by smaller networks or cable channels. Likewise, coverage of women's sports – with the exception of high profile tennis and

track events – tends to be relegated to the back pages of newspaper sport sections and magazines. Between January 1997 and February 2007, only 34 (seven percent) of 508 issues of *Sports Illustrated* have featured women on the cover. Of those 34 covers, 10 were models for the magazine's annual swimsuit issue; another five showed women as part of a larger feature story about some aspect of sports (e.g., ticket prices, fans).[219]

Workplace/Employers

Though still not commonplace, some employers are trying to encourage recreational physical activity among employees. These efforts usually are part of a broader wellness program that may target obesity, diabetes and hypertension control, and other health issues. The motivation typically is to induce employees to improve their health in order to lower health insurance costs. In some cases, employers are installing workout facilities and showers on the worksite; others offer employees free or reduced gym membership fees. Employers also are encouraging walking clubs, weight loss team contests, and other activities.

In addition, a small number of employers are experimenting with altering work environments to promote physical activity. For example, traditional desks have been replaced with tall desks that allow employees to stand while working. In other experiments, treadmills or stationary bicycles with workstations attached or positioned in front of them replaced traditional desks (Figure 10).[220]

Figure 10

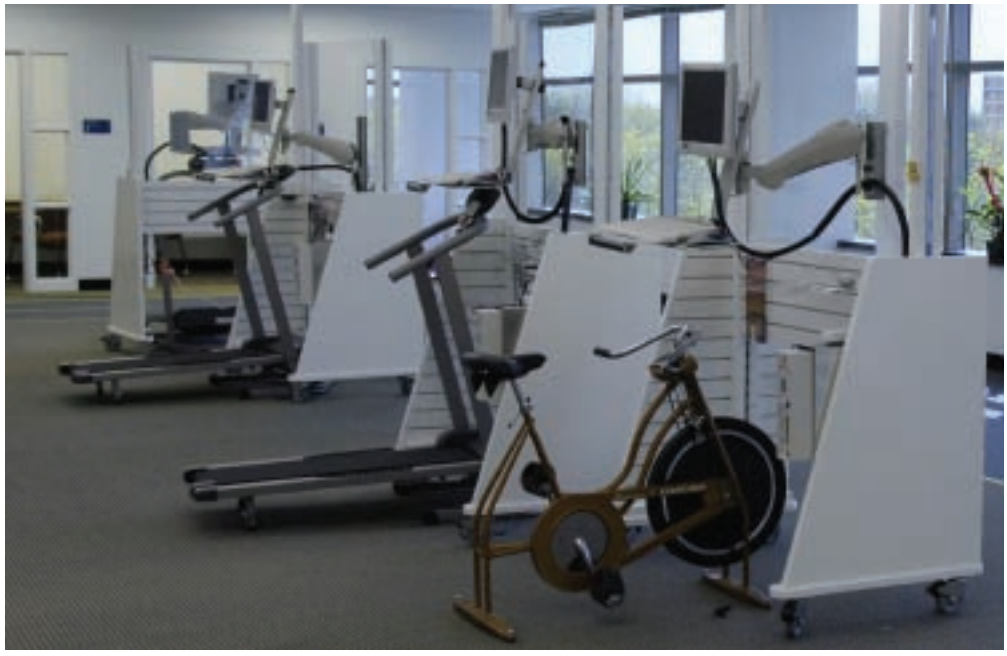


Image courtesy of James Levine

Very limited evidence suggests that these more active environments have a positive impact on productivity. Similarly, one speaker described a school-based experiment in which students had "standing desks" with wheels, wireless notebook computers, and MP3 players that were used for educational activities (Figure 11).[221] Both students and teachers responded positively to the change, but formal analysis of the experiment is ongoing. Longer-term studies will be needed to determine if these modified work and school environments have an impact on adult or childhood obesity.

Figure 11

Image courtesy of James Levine

Health Care and Insurance Systems

As is true regarding diet and nutrition counseling, most primary care providers do not routinely counsel patients about the importance of physical activity and the level of activity needed to lose weight and maintain a healthy weight. Like nutrition counseling, physical activity counseling seldom is reimbursed unless it is in the context of cardiac rehabilitation or physician-prescribed physical therapy. Large, self-insured health plans are more likely to include coverage or discounts for gym memberships or insurance premium reductions for employees who participate in wellness programs with physical activity components.

The Medicare program does not provide for physical activity counseling or interventions for preventive purposes. Some beneficiaries with diabetes can receive education and counseling on exercise/physical activity as part of an outpatient diabetes self-management training benefit, and physical activity counseling may be included as a one-time component of physical exams provided to new beneficiaries. CMS staff indicated that in addition, some physical activity services could be provided if they were considered treatment rather than prevention for a medical condition caused or aggravated by obesity.[222] Obesity itself, however, remains an uncovered condition.[223]

Image courtesy of Tim Byers

State Medicaid programs have considerable autonomy in determining what services are covered. According to CMS staff, several states have implemented disease management programs, but detailed information on the conditions covered or the inclusion of physical activity education and counseling in these benefits was unavailable.[224]

Individuals and Families

Physical activity is not a routine part of most Americans' lives. Individuals and families will need to find and create opportunities to become more active. Even small changes benefit health – for example, taking a walk during lunch, parking further away from the grocery store, taking the stairs instead of the elevator, using hand weights, or following an exercise video at home. Many more structured and unstructured options exist for including more movement in daily routines. In addition, individuals can advocate for themselves and their families for changes to make neighborhoods more exercise-friendly for adults and children, and for meaningful physical education in schools.

Part III

Reducing Cancer Risk by Eliminating Tobacco Use and Exposure

Chapter 4

Tobacco Use Prevention and Treatment

The only known way to reduce tobacco-caused death and disease is the prevention and cessation of tobacco use and environmental tobacco smoke (ETS) exposure. A speaker noted that if the population ceased smoking, this single behavior change would be tantamount to a vaccine against one-third of cancer deaths. Indeed, the tobacco industry was characterized as a vector of disease and death that could no more be ignored in seeking solutions to the tobacco problem than mosquitoes could be ignored in seeking to eradicate malaria.

Tobacco Use and Cancer

Tobacco use caused an estimated 100 million deaths worldwide during the 20th century; most of these deaths occurred in developed countries where smoking became popular in the 1920s through 1940s. Tobacco use is the number one cause of preventable death in the United States.[225] It now is the second leading cause of death in the world, causing four to five million deaths annually. It is estimated that if current tobacco use trends continue, by 2020 approximately 10 million tobacco-related deaths will occur each year, with more than a billion tobacco-related deaths in the 21st century.[226]

Cigarettes kill more than 400,000 Americans every year – more deaths than from AIDS, alcohol, car accidents, murders, suicides, drugs, and fires, combined.[227] Half of all long-term smokers – particularly those who began smoking as teens – will eventually die prematurely from a disease caused by tobacco; half of these people will die in middle age, losing on average 20 to 25 years of life expectancy.[228,229] More than 12 million premature deaths attributable to smoking have occurred in the United States since publication of the first U.S. Surgeon General's report on smoking and health in 1964.[230] Of these, 4.1 million have been due to cancer.[231]

Tobacco use has been established unequivocally as a causative or contributory agent in the development of a growing list of cancers (Table 7). At least 30 percent of cancer deaths and 87 percent of lung cancer deaths are attributable to smoking. The risk of developing lung cancer is about 23 times higher in male smokers and 13 times higher in female smokers compared with lifelong nonsmokers.[232] The disparity in lung cancer risk between male and female smokers largely reflects differences in smoking patterns.[233]

Overall five-year lung cancer survival (all stages combined) is 16 percent. This rate has improved by only three percent since 1970.[234] In addition to the cancer mortality and morbidity associated with tobacco use, smoking is a major cause of heart and cerebrovascular disease, chronic bronchitis, and emphysema; it also is associated with gastric ulcers.[235]

There are 4,700 chemicals in cigarette smoke, 250 of which cause cancer or are otherwise toxic. Fourteen million Americans have died from tobacco use since the first Surgeon General's report in 1964 — about 440,000 a year. These are premature, avoidable deaths.

— Gary Giovino, Ph.D., M.S. State University of New York at Buffalo

Table 7 **Cancers in Which Tobacco is a Causative or Contributory Agent**

Lung	Larynx
Trachea	Paranasal Sinuses
Bronchus	Stomach
Esophagus	Bladder
Oral Cavity	Kidney
Lip	Pancreas
Nasopharynx	Uterine Cervix
Nasal Cavity	Acute Myeloid Leukemia

Cigarette smoke contains approximately 4,000 chemicals (e.g., cyanide, formaldehyde, benzene, arsenic, DDT, methanol, acetylene, ammonia), including 69 known carcinogens as well as poisonous gases including nitrogen oxide and carbon monoxide.[236,237]

Susceptibility to tobacco carcinogens and subsequent cancer development is believed to be affected by numerous factors, including but not limited to familial genetic predisposition, other genetic alterations, DNA repair capacity, differences in carcinogen metabolism, defects in cell signaling pathways, cell/environment interactions, and chronic inflammatory processes.[238]

Nicotine Addiction

Nicotine in tobacco causes addiction, and the pharmacologic and behavioral processes that determine nicotine addiction are similar to those that determine addiction to drugs such as cocaine and heroin.[239] Nicotine stimulates brain reward pathways and increases dopamine in the nucleus accumbens. Commonly known as the brain's pleasure center, it is the key brain site for motivation and reward where virtually all drugs of abuse act to reinforce drug use.[240] It is estimated that the tobacco use exposure required to become nicotine-addicted is the equivalent of lifetime use of at least 100 cigarettes, an approximate measure of how much exposure is needed for brain receptors to be "trained" to desire the drug.[241,242]

One of the things we know about addiction and tobacco is that cigarettes are among the most addicting of drugs, by many different measures. If we look at the risk of developing addiction following any use, it is higher for cigarettes than it is for cocaine or opiods or alcohol.

— Jack Henningfield, Ph.D.
Pinney Associates

Nicotine effects in the brain reinforce behavior, alter mood, and create a need that did not exist prior to the drug exposure. Repeated exposure of the brain to the cocktail of nicotine and other substances in tobacco products leads to changes in structure and function that increasingly are understood to pose formidable biological barriers to cessation. The reversibility of nicotine receptor up-regulation in chronic smokers is unclear.[243] In addition, nicotine addiction has a strong psychological aspect, as smoking often is linked with social activities.[244] Combined, these factors can make smoking cessation extremely difficult, yet more than 60 percent of smokers attempt to quit without treatment support.

Menthol flavored cigarettes comprise about one-fourth of all cigarettes sold in the United States. Because the menthol produces a cooling sensation in the throat, decreases the cough reflex, and masks the dry throat feeling smokers often experience, menthol cigarette smokers tend to inhale more deeply and hold the smoke in longer.[245] A recent study[246] indicates that people who smoke menthol cigarettes are less likely to try to quit

…when you add medication to a counseling-based treatment, you essentially double outcomes, regardless of the intensity of those counseling services.

— Thomas Payne, Ph.D. University of Mississippi Medical Center

and are less likely to be successful when they do try. This may explain in part why African American smokers, about 70 percent of whom smoke menthol cigarettes, have disproportionately higher rates of smoking-related cancers and other diseases, even though they generally smoke less than the national average. The study proposed that menthol smokers switch to non-menthol cigarettes before trying to quit to improve their chances of success.

Currently available over-the-counter and prescription smoking cessation aids are listed in Table 8. Current Population Survey data for 2003[247] indicate that about a quarter of individuals making quit attempts used over-the-counter nicotine replacement products, and about 10 percent of those attempting to quit smoking used prescription pharmacotherapies. According to these data, African Americans were only half as likely to use pharmacotherapy as whites; factors contributing to this difference may include out-of-pocket costs, lack of knowledge about the range of therapies available, and lack of insurance coverage.

Table 8 **Tobacco Cessation Medications Available in 2006**

Currently Available:	**In Development:**
Nicotine Replacement Therapies (NRTs):	Rimonabant
• Gum	Vaccines
• Lozenge	New NRTs
• Patch	New indications for existing drugs
• Nasal spray	
• Oral Inhaler	
Bupropion (Antidepressant)	
Varenicline (Nicotinic)	

Source: Henningfield J. Presentation, President's Cancer Panel meeting, February 12, 2007.

Tobacco Use Prevalence

Healthy People 2010[248] includes 21 objectives addressing tobacco use and environmental tobacco smoke exposure. Among the objectives related to adult tobacco users are:

- Reduce the prevalence of cigarette smoking to 12 percent.
- Lower cigar smoking prevalence to 1.2 percent.
- Reduce smokeless tobacco use to 0.4 percent.
- Increase cessation attempts among adult smokers to 75 percent per year.

Centers for Disease Control and Prevention (CDC) analyses of data from the 2005 National Health Interview Survey (NHIS) indicate that progress toward all of these objectives is lagging. In 2005, 20.9 percent of U.S. adults (18 years of age and older) were current cigarette smokers, approximately 2.2 percent were current cigar smokers, 2.3 percent used smokeless tobacco, and 42.5 percent of current cigarette smokers had attempted to quit smoking for at least one day in the 12 months prior to the survey.[249]

According to the NHIS data, current smoking remains higher among men (23.9 percent) than among women (18.1 percent). Smoking prevalence varies considerably among racial/ethnic groups. American Indians and Alaska Natives have the highest smoking prevalence of any racial/ethnic group (32 percent), followed by non-Hispanic whites (21.9 percent) and non-Hispanic blacks (21.5 percent). Prevalence is lowest among Hispanics (16.2 percent) and Asians (13.3 percent).

Smoking prevalence generally decreases with increasing education level: adults with a General Educational Development diploma and those with nine to 11 years of education have higher than average smoking prevalence rates (43.2 percent and 32.6 percent, respectively). Among age groups, adults aged 18 to 24 years and 25 to 44 years have the highest prevalence rates. Smoking prevalence is higher among adults living below the poverty level compared with those at or above the poverty level. Encouragingly, a number of population subgroups have met or surpassed the 2010 smoking prevalence target: Hispanic and Asian women, men and women with undergraduate degrees (10.7 percent), men and women with graduate degrees (7.1 percent), and both women and men aged 65 years or older.

The NHIS results also indicate that the current rates of decline in smoking prevalence and other tobacco use and for quit attempts are insufficient to meet the established *Healthy People 2010* objectives. Moreover, the data suggest that the recent eight-year decline in overall smoking prevalence among adults may have stalled.[250] These findings are corroborated by data from the CDC's 2004 Youth Tobacco Survey.[251] Factors influencing this situation may include smaller annual increases in retail cigarette prices and reduced funding for comprehensive state tobacco control programs from 2002 and 2005,[252] the latter resulting in insufficient implementation of effective interventions to decrease initiation and increase cessation (see also pp. 79-84).

Populations of Special Concern

Several population groups are particularly vulnerable to tobacco initiation, continued use, and consequent diseases caused by tobacco use.

Youth

The younger people are when they begin to smoke, the more likely they are to be adult smokers. Over 80 percent of adult smokers became addicted to tobacco at or before the age of 18 years.[253,254] Every day, approximately 4,000 children under age 18 experiment with cigarettes for the first time; another 1,500 become regular smokers. Of those who become regular smokers, about half eventually will die from a disease caused by tobacco use.[255,256,257]

The effects of tobacco use on youth[258] include:

- Respiratory symptoms (e.g., cough, shortness of breath) and illnesses
- Reduced physical fitness
- Poorer lung growth and function
- Poorer overall health

Nicotine-addicted adolescents report withdrawal symptoms similar to those reported by adults. They typically underestimate the tenacity of nicotine addiction and overestimate their ability to stop smoking when they choose. Many attempt to quit, but most relapse after a relatively short period of abstinence.[259]

Ten years ago people said we didn't know how to reduce tobacco use among children. Teenagers are impenetrable, we were told. Nothing we could do would ever make a difference — wrong….Well-funded, well-constructed, comprehensive tobacco prevention programs aimed at children have worked in every single state across demographic lines, across socioeconomic lines, north, south, east, west, and in the middle of the country, rich states, poor states, red states, blue states. The only place they haven't worked is where they haven't been done. That's the real lesson.

— Matthew Myers, J.D. Campaign for Tobacco-Free Kids

The 1994 Surgeon General's report[260] identifies numerous risk factors for youth smoking initiation (Table 9); many also are predictive of relapse among young smokers who attempt to quit. Most of these factors have been recognized for some time; more recently, depression, propensity for risk-taking, and exposure to images of smoking in movies have been identified as additional risk factors for youth tobacco use. A deeper understanding of the independent influence and interaction of these factors is important to guide adolescent smoking prevention and intervention programs. For example, a speaker noted that when parents quit smoking, their children are far less likely to start smoking and twice as likely to make a quit attempt if they already are smokers. Moreover, education and prevention efforts aimed at youth lead many young people to motivate their parents to quit smoking.

Table 9 **Youth Smoking Risk Factors**

Sociodemographic Factors
- Low socioeconomic status
- Developmental stage
- Male gender (smokeless tobacco)

Environmental Factors
- Accessibility
- Advertising
- Parental use
- Sibling use
- Peer use
- Other social support for behavior
- Perception of smoking as a normative behavior
- Exposure to smoking in movies

Behavioral Factors
- Poor academic achievement
- Propensity for risk-taking
- Other problem behaviors
- Lack of constructive behaviors
- Limited behavioral skills
- Intention to smoke
- Experimentation

Personal Factors
- Low perceived risk
- Perceived functional meaning (i.e., achievement of goal)
- Expected desirable consequences
- Self-esteem/self-image
- Self-efficacy
- Personality factors
- Psychological well-being
- Depression

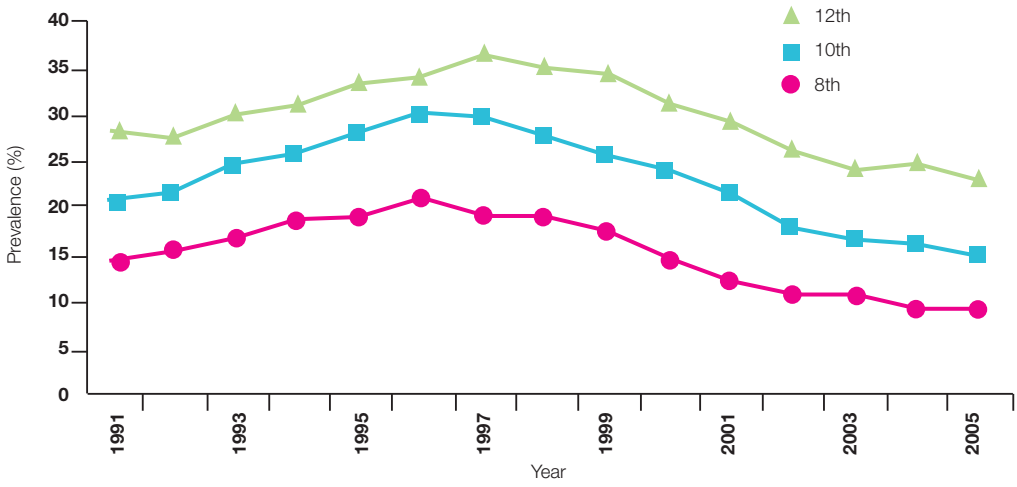
Adapted from *Preventing Tobacco Use Among Young People: A Report of the Surgeon General,* 1994.

According to data from the Monitoring the Future survey,[261] smoking prevalence (defined as smoking at least once in the last month) among 8th, 10th, and 12th grade students declined following record high rates during 1997-98. However, it appears that the decline, particularly among 8th and 12th grade students, may be flattening in the most recent years for which data are available (Figure 12).

Among the many influences on this change is likely the introduction of a host of new tobacco products designed to appeal to young people, including:

- Flavored cigarettes and cigars. These are available in candy, fruit, mint, chocolate, bubble gum, and other flavors. Their packaging and promotion are particularly appealing to adolescents. In a recent survey of 3,500 teens aged 13 to 17 years, five percent reported trying a flavored cigarette, and more than a quarter of these teens said the flavored cigarette tasted better than a regular cigarette.[262] Other evidence indicates that the flavoring makes smoking more acceptable and may provide a vehicle for more easily establishing regular smoking in this vulnerable population.[263]

Figure 12 **Trends in 30-day Prevalence* of Any Use of Cigarettes, by Grade, 1991 – 2005**



* Smoking at least once per month
Source: Monitoring the Future, 2006.

Figure 13
Bidis

- Bidis. Bidis are flavored tobacco wrapped in dried tendu or temburni leaves (Asian plant species), often tied with a colorful string (Figure 13). They are imported from India and other Southeast Asian countries. Bidis may have higher concentrations of nicotine, tar, and carbon monoxide than conventional cigarettes.[264] In addition, because the leaf wrappers do not burn well, the smoker must draw more often and more deeply on the bidi in order to keep it lit. Bidis are promoted as "alternative" cigarettes that are less harmful than conventional cigarettes.

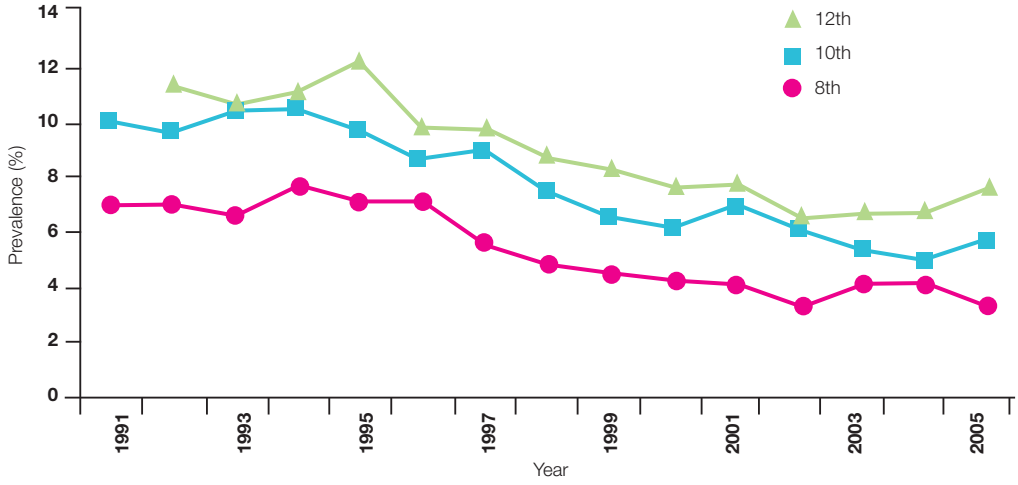
- Kreteks. Kreteks are clove-spiced cigarettes that also may have other flavors added.[265] These cigarettes have been shown to produce twice the amount of tar, nicotine, and carbon monoxide as conventional cigarettes. In addition, the shredded cloves contain a mild anesthetic that permits deeper inhalation. Little toxicologic research has been conducted to determine the effect of inhaling the smoke from the burning flavorings or clove-based anesthetic.[266] Like bidis, kreteks are promoted as being safer than conventional cigarettes.

Figure 14
Hookah

In addition, young people are being attracted to hookah (waterpipe) smoking (Figure 14), which is being cast as a group social activity (often after meals); a growing number of bars and cafes throughout the West, including in American cities, are offering hookah smoking. Studies indicate that hookah smokers inhale significant amounts of carbon monoxide. Further, little is known about the effects of smoking the molasses and other flavorings (up to 70 percent of total contents) added to the tobacco used in hookahs.[267,268]

Use of smokeless tobacco (ST) products by youth has declined since the record high rates during the mid-1990s. Alarmingly, however, in 2004-2005 rates of use by 10th and 12th graders climbed (Figure 15), possibly reflecting the introduction of numerous new ST products specifically targeting youth. Use of smokeless products is strongly associated with smoking initiation. A 2003 study found that teens using ST at the beginning of the study were three times more likely to be smokers four years later, compared with those that had not used ST.[269] More recently, a study of nearly 2,300 7th and 9th graders that controlled for known smoking initiation risk factors found that ST use was independently associated with a more than 2.5-fold higher risk of smoking two years later.[270]

Figure 15 **Trends in 30-day Prevalence* of Any Use of Smokeless Tobacco, by Grade, 1991 – 2005**

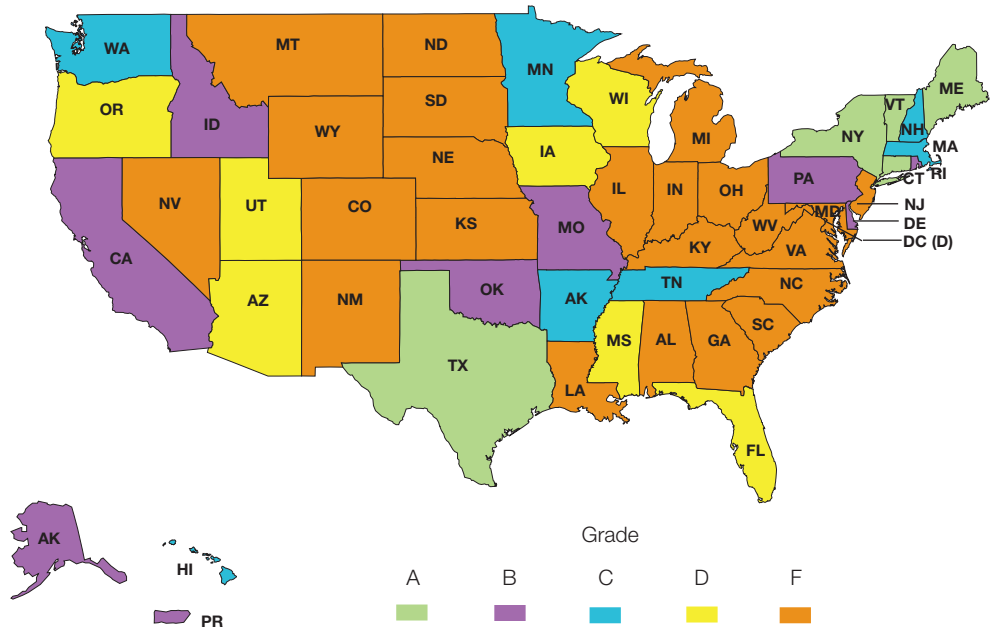


* Smoking at least once per month
Source: Monitoring the Future, 2006.

Studies such as these point to the urgent need to discourage ST use by teens. Success in restricting youth access to tobacco products varies considerably from state to state due to differences in emphasis and the effectiveness of state-level programs. In many jurisdictions, teens find only minimal barriers to purchasing tobacco. Enforcement may be lax due to lack of manpower, and fines on store owners, when levied, often are not a sufficient deterrent. The American Lung Association evaluates state-level efforts to restrict youth access to tobacco and issues an annual "report card" by state.[271] The grade assigned takes into account: minimum age for legal sale, product packaging, clerk intervention, photo identification checking, access to vending machines, free distribution of tobacco products, graduated penalty structure, random inspections, and statewide enforcement. As shown on the map in Figure 16, in 2006 five states rated an A, eight states and Puerto Rico received a B, seven states received a C, seven states and the District of Columbia received a D, and 23 states received an F.

However, a somewhat more positive picture of youth access prevention is drawn from Federal data. The U.S. Department of Health and Human Services (HHS) Substance Abuse and Mental Health Services Administration administers the Synar Amendment, which requires states to have laws in place prohibiting the sale and distribution of tobacco products to minors (under 18 years of age), and to enforce those laws.[272] Enforcement is conducted primarily via random, unannounced inspections of a representative sample of retailers. The goal is for all states to achieve a maximum sales-to-minors rate of not greater than 20 percent. The states report violation rates annually. As of FY 2005, only Kansas and the District of Columbia had failed to meet the 20 percent target, while 21 states had achieved violation rates under ten percent.[273]

Figure 16 **Youth Tobacco Access "Report Card"**



Source: American Lung Association, State of Tobacco Control 2006.

Youth access to tobacco also is affected by Internet sales of tobacco products. Hundreds of Internet sellers in the U.S. and abroad sell to American customers, circumventing excise taxes and youth access laws. States are nearly powerless to regulate interstate commerce or products that are delivered through the U.S. postal system. Similarly, the states are limited severely in their ability to take action against Internet sellers based overseas or on American Indian tribal lands.

Women

Tobacco use by women escalated markedly from the 1930s into the mid-1960s, declined slowly until 1990, and then began to rise again.[274] The enormous increases in smoking among women have been due largely to highly targeted tobacco company advertising and images of celebrity smoking in film and other media that portray cigarette smoking as a symbol of attractiveness, sophistication, independence, and liberation from convention. As a result, rates of tobacco-related cancers among women have soared. Since 1950, women's death rates from lung cancer have increased 600 percent.[275] In 1987, lung cancer surpassed breast cancer as the leading cause of cancer death among women in the United States.[276] Smoking is most common among women in the 18 to 44 year-old age group – about 22 percent. Women who smoke also increase their risk of cervical cancer and the host of non-cancer tobacco-related diseases also suffered by men. Unlike men, women who smoke also increase their risk of osteoporosis, menstrual problems, reduced fertility, premature menopause, rheumatoid arthritis, and cataracts.[277,278]

Globally, cultural constraints have kept the level of female tobacco use low in developing countries (around nine percent). With rapid cultural and economic changes, this rate already is beginning to rise, and lung cancer and other tobacco-associated cancers certainly will rise as well.[279]

Pregnant women who smoke risk danger both to themselves and their fetuses.[280] Smokers have a higher risk of birth complications, miscarriages, and stillbirths. Smoking is linked to an increased risk of preterm delivery and infant death. Research also suggests that infants of mothers who smoke during or after pregnancy are two to three times more likely to die from sudden infant death syndrome than babies born to nonsmoking mothers. Smoking during pregnancy slows fetal growth and is responsible for at least 20 percent of low birth weight infants and the infant health problems associated with underweight. Chemicals in tobacco smoke, including carcinogens, also are passed on to a baby through breast milk.

The percentage of pregnant women who smoke has fallen from between 15 and 20 percent to around 10 percent in 2004.[281,282] It is possible, however, that because of the social stigma associated with smoking during pregnancy, its prevalence may be underreported. A substantially greater number of pregnant smokers report that their physicians advised them to quit, and the percentage of health plans with tobacco cessation strategies related to pregnancy increased from 45 percent in 1997 to 68.3 percent in 2003.[283]

A study by the National Heart, Lung, and Blood Institute (NHLBI) shows that for both black and white girls, concerns about weight and the desire to be thin at ages 11 and 12 increase the risk that a girl will become a daily smoker by the time she is 18 or 19.[284] Once addicted, women may have a more difficult time quitting than men.[285] Although women overall have lower cessation rates than men, young women aged 12 to 24 years are more likely to report that they are able to limit their smoking than are boys and men in the same age group.[286] Many women are afraid to quit smoking for fear of gaining weight. On average, women gain about five pounds after quitting, an amount that can be controlled through diet and exercise.[287]

In 2004, the National Cancer Institute (NCI) published recommendations for a national research agenda on women, tobacco, and cancer.[288] The recommendations span basic science, intervention development, health care delivery, and the partnerships, evaluation, and surveillance needed to realize these recommendations to reduce cancers caused by tobacco use in women.

Racial/Ethnic Minorities and the Poor

Poverty is a measure of socioeconomic deprivation, the hallmarks of which include low education and literacy levels, inadequate housing, greater exposure to environmental toxins, high-risk health behaviors, and reduced access to health care. Lung cancer incidence and mortality rates are consistently higher in low income census tracts compared with higher income tracts, though there are variations among men and women and racial/ethnic groups.[289] Lack of access to prompt diagnosis and adequate treatment are factors in the higher mortality rates from cancers caused by tobacco in racial/ethnic/cultural minorities, who are disproportionately represented among the poor. As smoking rates fall among more affluent and more educated segments of the population, tobacco addiction increasingly is a disease of the poor and a major contributor to health disparities not limited to cancer.

The poor are more likely to begin smoking,[290] more likely to be current smokers (29.9 percent of adults living below poverty level versus 20.5 percent of adults at or above poverty level in 2005),[291] and less likely to quit smoking.[292] According to a speaker, unequal access to evidence-based

cessation treatment likely is a major factor in low quit rates among the poor; studies show that many smokers with Medicaid benefits are unaware that coverage is available for cessation pharmacotherapies, and Medicaid programs that offer these treatments may fail to inform clients about this coverage.[293] In addition, few studies have investigated the effectiveness of pharmacologic or behavioral cessation interventions for the poor[294] and evidence of their efficacy has been both scarce and uneven. Research is needed to tailor interventions for the poor and for other diverse populations based on a better understanding of the role of tobacco use in different racial/ethnic/cultural groups and genders across the life span.

Tobacco use burdens the poor in addition to many other challenges they face, causing disproportionate lung cancer, malnutrition, and economic hardship among American families.

— Pebbles Fagan, Ph.D., M.P.H.
National Cancer Institute

A speaker suggested that reducing tobacco use among the poor should be viewed as an anti-poverty program. Money spent on tobacco in poor families consumes a relatively larger percentage of income than in more affluent families. These are funds that might otherwise be used to purchase food, clothing, shelter, education, health care, and other basic needs.[295] Moreover, tobacco addiction can cause poverty in households when smokers become ill from tobacco-related disease and other family members miss work, lose jobs, and spend time and resources (e.g., family savings, additional transportation and child care costs, out-of-pocket health costs) caring for the person who is sick.[296] Thus, tobacco and poverty are a vicious cycle, since tobacco leads to poor health, which in turn leads to greater poverty.

Cancer Survivors

Smoking among cancer survivors (including individuals diagnosed with, being treated for, and surviving cancer) is an underappreciated and understudied problem. Though smoking prevalence in this population is approximately equivalent to people with no history of cancer,[297] mounting evidence confirms the adverse effects of continued smoking on cancer treatment outcomes regardless of treatment modality. Surgical patients who smoke tend to experience increased complications from general anesthesia, higher risk of severe pulmonary complications, and detrimental effects on wound healing. Those undergoing radiation therapy have reduced treatment efficacy and increased toxicity and side effects, including oral mucositis, loss of taste, pneumonitis, bone and tissue death, and poor voice quality. Chemotherapy patients who continue to smoke have been found to experience greater treatment toxicity and side effects, immune suppression, fatigue, weight loss, pulmonary and cardiac toxicity, and increased incidence of infection. Continued smoking after cancer treatment increases risk for comorbidities, an especially relevant concern for individuals diagnosed with early-stage disease who are likely to become long-term survivors.[298] Continued smoking after diagnosis and treatment is most common among young adult cancer survivors (18 to 40 years old).[299]

A speaker noted the particular importance of preventing smoking initiation among urvivors of pediatric cancers. This population may sustain important developmental disturbances (e.g., growth, other physiologic processes) relative to their peers. They also may have other subclinical injury (e.g., respiratory, cardiac) from the illness or its treatment that may increase their vulnerability later in life to specific disease conditions that are exacerbated by tobacco use.[300]

Some physician- and nurse-delivered tobacco use cessation interventions have shown promise in achieving sustained quit rates in specific patient populations. Early intervention (i.e., within three months of diagnosis) appears to be key to success.[301,302]

Persons with Mental Illness

A speaker indicated that U.S. adults with mental illnesses and/or addictions consume 44 percent of all of the cigarettes smoked in the U.S. annually.[303] Approximately 60 percent of people with psychiatric illnesses are smokers, compared with about 21 percent of the general population, and studies have shown that the average life span of people with mental illness is 25 years shorter than the general population; lung cancer, emphysema, and cardiovascular disease are common causes of death in this population.[304]

In addition, a speaker noted that smoking is encouraged in many mental health facilities, where cigarettes are given to patients as rewards for desired behaviors. Limited studies suggest that nicotine may to some degree relieve psychiatric symptoms for some patients.[305] However, tobacco smoke (not nicotine) increases the metabolism of some psychiatric medications, resulting in lower medication blood levels and the need for higher doses to achieve therapeutic effect.[306] With a high proportion of smokers in inpatient settings, exposure to environmental tobacco smoke is an added issue for this group and for mental health facility staff, who also have higher than average smoking rates.[307]

Smoking behavior is believed to be difficult to change in individuals with mental illnesses, and the primary emphasis in their care tends to be their specific mental illness rather than their physical health. As a result, few tobacco use cessation interventions have been tailored to their needs. A speaker underscored the need to educate mental health treatment professionals about cancer and other disease risks among people with mental illness and to integrate smoking cessation interventions into mental health and addictions treatment.

Active Military and Veterans

Smoking prevalence among the approximately 1.4 million U.S. active military personnel was estimated at 33.8 percent in 2002.[308] This rate substantially exceeds both the civilian rate (20.0 percent in 2005) and the U.S. Department of Defense goal of 20 percent or less.[309] Smoking prevalence among veterans is nearly identical to that of active military personnel.[310] According to a speaker, the various branches of the military have different smoking policies. For example, in the Navy, smoking is allowed immediately after the forced abstinence of basic training. In the Army, smoking is permitted after the first 21 weeks of service. The Air Force prohibits smoking during military occupational specialty training, which occurs after basic training. Relapse after these periods of forced abstinence is high.

Limited evidence suggests that military service itself may be a risk factor for tobacco use initiation and for continued smoking among established smokers who enter the service.[311] The higher smoking prevalence among military personnel has been attributed to several factors, including socioeconomic differences, group living conditions, stress, boredom, the association of work breaks with smoking opportunities, a lack of recreational activities, and the availability of cheap cigarettes.[312]

A review of tobacco industry internal documents reveals that the tobacco industry has long considered the military a fertile field for tobacco sales, since it largely is comprised of people near the typical age of smoking uptake who enter an institution with high smoking prevalence.[313] In addition, those recruited by the military tend to be members of some of the industry's prime target groups (e.g., young adults, high school educated, lower income, minorities).

Ambivalence has been the hallmark of the military's position on tobacco. The military pays a steep price for the treatment of tobacco-related illnesses among active military members and veterans, and the Veterans Health Administration (VHA) has an established national smoking and tobacco use cessation program (VHA Directive 2003-042) consistent with evidence-based VA-DoD Tobacco Use Cessation Clinical Practice Guidelines.[314] Veterans facilities are smoke-free except in designated areas (VHA Directive 2003-035). Yet until relatively recently, the military gave cigarettes to service persons free of charge; it now sells tobacco products through its resale system (i.e., commissaries and exchanges) at a discount. Generally, tobacco use has been viewed as a "right" and low prices as a "benefit," since access to the commissaries is part of the military compensation package.[315] Exploiting the military's ambivalence, the tobacco industry successfully obstructed efforts to raise the price of cigarettes at military facilities until 1996, when a modest price increase (still well below prices charged to civilians) was established.[316]

…the low-tar cigarette, unfortunately, is one of the biggest scams of the 20th century because they put little holes in the filter, vent holes that beat the government machine but smokers would block those vent holes and take in just as much smoke. So low-tar cigarettes are just as dangerous as full-flavored cigarettes…

— Gary Giovino, Ph.D., M.S. State University of New York at Buffalo

Lesbian, Gay, Bisexual, and Transgender (LGBT) Populations

Smoking among LGBT populations is twice that of the heterosexual population (46 percent among gay men and 48 percent for adult lesbians), and smoking rates of LGBT youth – who tend to start smoking earlier than most teens – are as high as those of adults. These individuals pay a high price for their addiction; for example, lesbians who use tobacco face risks of breast cancer, colorectal cancer, and other cancers five times higher than those of other women.[317] Previously secret industry documents reveal that particularly over the past decade, tobacco companies have turned their sights on LGBT youth as a target market, in part because the industry recognizes that targeted marketing provides social validation to and builds brand loyalty in these populations.[318]

Tobacco Use Prevention and Treatment — Key Participants and Positive Steps

A 2006 National Institutes of Health (NIH) State-of-the-Science consensus conference, Tobacco Use: Prevention, Cessation, and Control[319] concluded that evidence-based methods exist to reduce initiation and facilitate cessation (e.g., tobacco tax increases, smoke-free environments, anti-smoking campaigns and education) and to treat tobacco users (pharmacologic and behavioral interventions) and should be more broadly disseminated.

As is true concerning poor diet and nutrition, lack of physical activity, and increased cancer risk, numerous stakeholders are involved in the current tobacco problem in the United States and worldwide; these same stakeholders have important roles to play to prevent smoking initiation and ensure the availability of effective smoking cessation services to all who need them.

Government

There is much that governments – Federal, state, and local – can do to discourage tobacco use initiation and encourage cessation.

Federal Government

- *Framework Convention on Tobacco Control (FCTC)*

…the Framework Convention on Tobacco Control….truly provides a road map for the United States and the world to reduce tobacco use.… The President of the United States hasn't even sent it to the Senate for consideration. We have gone from being a world leader to not even being in the room. There is no way that we can justify that.

— Matthew Myers, J.D. Campaign for Tobacco-Free Kids

To address the worldwide tobacco problem, the 192 Member States of the World Health Assembly, World Health Organization, unanimously adopted the FCTC[320] on May 21, 2003. The FCTC is the first global public health treaty. It contains specific provisions to control both the global supply and demand for tobacco through regulation of: tobacco product contents, packaging, labeling, advertising, promotion, sponsorship, taxation, smuggling, youth access to tobacco, exposure to environmental tobacco smoke, and environmental and agricultural impacts. Nations that ratify the treaty commit to strengthening national legislation pertaining to these areas, enacting tobacco control policies, and cooperating internationally to reduce global tobacco consumption consistent with the specifications and timelines contained in the treaty.[321]

In November 2004, the treaty was ratified by the requisite 40 countries and was thereby in force as a legally binding accord for all ratifying states in February 2005. As of June 2007, 148 parties had ratified the treaty. Although it is too soon to see evidence of the treaty's impact on tobacco use prevalence or ETS exposure, it has been estimated that nations will need as much as five years to enact evidence-based measures, and another three to five years to see solid trends in prevalence.[322] Dozens of the ratifying countries already have implemented, or are developing, new tobacco control laws and policies.[323] For example, many countries have warning labels that are larger and more graphic than those on U.S. cigarette packages (Figure 17).

The United States signed the FCTC in May 2004, but the President has yet to send the treaty to the Senate for consideration, where a two-thirds majority vote is required for ratification. Even absent ratification, by signing the FCTC, the U.S. is obligated not to undermine the goals of the treaty.

- *Regulation of Tobacco Products and Marketing in the United States*

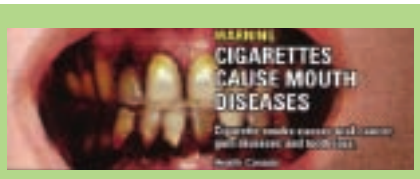
Currently, no Federal agency provides meaningful oversight of tobacco products for purposes of public health. The Federal Trade Commission (FTC) has jurisdiction over tobacco advertising, but only as it relates to trade issues. The Bureau of Alcohol, Tobacco, and Firearms has regulatory authority over tobacco products, but only related to applicable taxes.

The Institute of Medicine (IOM) repeatedly has recommended regulation to discourage tobacco product use and reduce its associated morbidity and mortality.[324,325] Support for regulation has been strong in the public health community and has grown more broadly as millions of tobacco industry documents have been made public showing, among other revelations, that tobacco product contents have been purposely manipulated to maximize their addictive potential and ease of use.

Over the past five decades, numerous tobacco products have been introduced claiming to be less harmful than existing products. For example, filtered cigarettes were first introduced in the 1950s. Beginning in the 1960s, tobacco companies introduced a host of new cigarettes (e.g., "light," "low-tar," "ultra-light") purported to deliver less tar to the user. Design changes in these new products intended to skew results in standard machine-smoking tests included small ventilation holes close to the end of the filter to dilute the smoke. In real life use, however, smokers often cover the vents with lips or fingers, thereby inhaling a higher dose of nicotine. Though many smokers believe that products labeled as light or low-tar are less

harmful than other cigarettes, research has demonstrated that the risk of lung cancer and other tobacco-caused disease is no different in smokers of these cigarettes compared with smokers of brands not making such claims. Not only do light or low-tar cigarettes have no health benefit, they also may cause smokers to defer quit attempts because they think they have chosen a less harmful product.[326,327]

Figure 17 Anti-Tobacco Warnings in Other Countries



Canada (2001)

Thailand (2005)

Venezuela (2005)

Brazil (2002)

Singapore (2004)

Massachusetts law requires cigarette manufacturers to provide data on tobacco product contents. A January 2007 study[328] by the Massachusetts Department of Public Health on trends in smoke nicotine yield and cigarette design characteristics provides important evidence of continuing tobacco product manipulation. The study revealed steady but previously undisclosed increases in nicotine dosage between 1997 and 2005 due to changes in cigarette design, additives, and nicotine content. Ninety-two of 116 brands tested had higher nicotine yields in 2004 than in 1998, including those labeled "light" or "ultra-light." Some brands had nicotine level increases of 12 to 30 percent; these were brands especially popular with high school smokers and African Americans.

In recent years, to satisfy the public's desire for potentially less harmful tobacco products and avoid litigation, tobacco companies have introduced a number of "potential reduced exposure products," or PREPs. These include products with genetically modified tobacco and modified curing processes, different filters, and chemical additives. Further, the variety of smokeless tobacco products is growing rapidly (see also pp. 88, 99); these are advertised as being less harmful than cigarettes because they do not expose the lungs of the user or others to tobacco smoke.

No regulatory oversight exists to determine if the direct or implied claims of reduced exposure or reduced health risks of these products are accurate or misleading to consumers, or if their introduction to the marketplace does harm. Many believe the Food and Drug Administration (FDA) is the most appropriate agency to assume this role. Identical bipartisan bills[329] introduced in the 110th Congress would grant FDA the authority to regulate tobacco product contents and advertising. As written, the pending bills are somewhat controversial, and revisions can be expected before any version of the legislation is put to a vote.

The need for tobacco product and marketing regulation was described powerfully and in extraordinary detail in the August 2006 final opinion[330] in the U.S. Department of Justice's lawsuit against the major tobacco companies. The suit, filed under the Racketeer Influenced and Corrupt Organizations (RICO) Act,[331] a statute first created to prosecute organized crime, also has been used to pursue conspirators engaged in fraud related to otherwise legal products and services.[332] The tobacco companies were found liable for racketeering and for purposefully – over a period of more than 50 years – deceiving the

How do warnings work? Well, they work basically by educating people. I think today it's pretty safe to say most people have heard that smoking causes lung cancer. So a warning on that probably isn't going to do too much, but if you pick something like impotence, you know, there is a reason the Marlboro man was always riding away on his horse by himself.

— K. Michael Cummings, Ph.D., M.P.H. Roswell Park Cancer Institute

public, the Government, and the public health community about the health hazards of their products in order to sustain their economic viability, and without regard for the suffering and death brought about by their success. Of particular note in the nearly 1,700-page decision document was presiding Judge Gladys Kessler's observation that:

"In a democracy, it is the body elected by the people, namely Congress, that should step up to the plate and address national issues with such enormous economic, public health, commercial, and social ramifications, rather than the courts which are limited to deciding only the particular case presented to them in litigation."[333]

- *Tobacco Industry Subsidies in the United States*

Until recently, tobacco farm subsidies were governed by Depression-era policies that were established to protect the economic stability of tobacco farmers during the 1930s. At that time, each farmer was assigned a quota – essentially a license to grow and sell tobacco that also stipulated how much tobacco (expressed in poundage) a farmer could produce. In exchange for growing only a specified amount of tobacco, the government guaranteed farmers a minimum price per pound, making up the difference if tobacco prices dropped below the minimum, and/or buying the tobacco from the farmer and then selling it to tobacco product manufacturers. Tobacco quotas, therefore, have significant monetary value and can be sold or inherited.

In recent years, tobacco growers have faced many challenges, including a shift by U.S. manufacturers to producing cigarettes abroad and decreased use of U.S. grown tobacco in cigarettes produced for domestic consumption. Concerned about the future economic outlook for tobacco-growing rural communities, farmers, agricultural leaders, and policymakers in tobacco states sought a "buyout" of the tobacco quotas. A "buyout" was sought because the quota program placed U.S. farmers at a competitive price disadvantage against foreign grown tobacco leaf. Health advocates were involved in the policy debates in an effort to influence the future of tobacco farming, stabilize rural farm communities, and link the "buyout" legislation to providing the FDA with regulatory authority over tobacco.

The Fair and Equitable Tobacco Reform Act of 2004 (P.L. 108-357) ended the tobacco quota program and established the Tobacco Transition Payment Program (TTTP).[334] The program provides annual payments for 10 years (2005-2014) to eligible tobacco quota holders and producers to enable them to transition to the free market (e.g., without price supports), to farming other crops, or to establishing themselves in other occupations. The payments are funded through assessments of approximately $10 billion on tobacco product manufacturers and importers.[335]

By eliminating the caps on how much tobacco individual farmers can grow and eliminating the minimum prices that must be paid for U.S. grown tobacco, the buyout reduced U.S. tobacco prices and made U.S. leaf more price competitive. These changes prompted many tobacco farmers to leave the business. However, the removal of restrictions on where tobacco can be grown will likely increase the size of the remaining U.S. tobacco farms, make their operations more efficient, and increase the competitiveness of U.S. grown tobacco.[336] While the Act may improve the economic situation of some tobacco farmers and some tobacco-growing communities, it was an unfortunate missed opportunity to provide FDA with authority to regulate tobacco products and improve public health.

• *Tobacco Export and Trade*

For the reasons noted above, U.S. tobacco companies have for the last several decades been importing larger percentages of the tobacco leaf they need to produce cigarettes and other tobacco products for consumption in the U.S. Additionally, they have been moving tobacco growing and product manufacturing overseas. It has been estimated that by 2010, more than 85 percent of the world's tobacco will be grown in developing countries.[337] Not coincidentally, consumption of cigarettes has been increasing rapidly in developing nations, while decreasing in the United States and most high income countries.[338]

The U.S. Department of Agriculture (USDA) has been prohibited since 1993 from promoting the sale or export of tobacco products. In 1998, Congress expanded the ban on U.S. government aid to tobacco interests through passage of the Doggett Amendment,[339] which prohibits U.S. embassies from promoting tobacco in trade negotiations. However, the amendment also contains a statement that provides an exception to this policy if a country is deemed to apply different restrictions on tobacco product marketing depending on the products' country of origin. This statement has been used by the tobacco industry to label other countries' policies as discriminatory and prompt U.S. government intervention to protect U.S. trade rights to the detriment of public health concerns.[340]

…between the year 2020 and 2025 [the number of deaths from tobacco] will increase to 10 million deaths per year. In addition…the distribution of those deaths will move from being approximately equally distributed between high, low, and middle income countries to predominantly being in the developing world.

— Michele Bloch, M.D., Ph.D.
National Cancer Institute

While the goal of trade agreements is to reduce barriers to trade, lower prices of goods, and increase the availability of goods, tobacco is unlike other consumer products because its use is always harmful, and because of the magnitude of harm it causes globally.[341] Thus, from a public health perspective, the goals of trade agreements are inappropriate for tobacco products. Public health concerns should take precedence over commercial interests in tobacco trade. Evidence shows that trade liberalization in which tobacco and tobacco products are not excluded stimulates tobacco use, especially in low and middle income countries.[342] Ideally, all trade agreements should specifically and clearly exclude tobacco and tobacco products. These actions would build on earlier efforts to ensure that – consistent with FCTC principles and objectives – U.S. trade policies and agreements neither open the door to expanded tobacco product marketing and lower tobacco product prices nor interfere with any efforts to prevent and reduce tobacco use and its many harms and costs.[343,344]

• *Federal Tobacco Excise Tax*

The Federal tobacco excise tax, currently 39 cents per pack of cigarettes, has not been increased in nearly a decade. Increasing this tax would not only contribute to reducing smoking initiation and prevalence, but potentially would be an important source of revenue for federally-funded tobacco use prevention and control efforts. An increase in the Federal tax would augment the effect of state excise tax increases, which have been shown to reduce smoking initiation and prevalence markedly (particularly among youth) and thereby would help to reduce states' burden of payment for treatment of diseases caused by tobacco among their populations. In 2004, a National Action Plan for Tobacco Cessation, published by the Subcommittee on Cessation of the Interagency Committee on Smoking and Health recommended increasing the Federal excise tax by two dollars to $2.39.[345] The IOM likewise has called for an increase in this tax.[346]

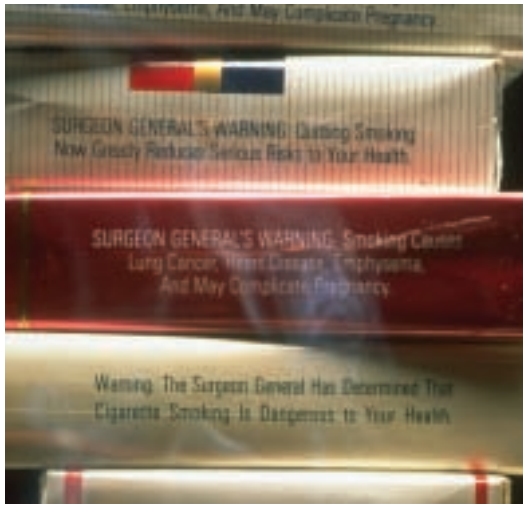
- *Tobacco Control Research*

Speakers maintained that the Federal commitment to tobacco control research, outlined below, has been out of balance with the burden of disease caused by tobacco use.

– *National Cancer Institute*
NCI currently has no intramural tobacco research program, although during the 1950s, NCI scientists conducted some of the early epidemiologic studies linking cigarette smoking and cancer and pioneered development of statistical methods for interpreting such data. During the 1970s, NCI carried out an ongoing, organized research program to study tobacco product design and ingredients and their relationship to health. NCI now participates in collaborative tobacco intervention research with other Federal agencies, such as Program Announcements for investigator-initiated (R01) research and exploratory/developmental (R21) grants for testing tobacco products promoted as being less harmful. Other grants focus on youth smoking cessation, state and community programs and policies, tobacco industry documents, and reducing tobacco use in low and middle income nations. In addition, NCI Transdisciplinary Tobacco Use Research Centers (co-funded with the National Institute on Drug Abuse) are the locus of a number of intervention and other tobacco research studies. NCI funds a limited amount of community-based participatory research, some of which focuses on tobacco control in discrete populations. Since 1991, NCI has produced the Smoking and Tobacco Control Monograph series.

Speakers noted, however, that at NCI-designated Comprehensive Cancer Centers, the Institute's most visible presence in the community, the limited tobacco-related cancer prevention, control, and population research now conducted focuses heavily on basic and clinical science studies related to genetic, environmental, and (to a limited extent) behavioral factors relevant to individuals but does not address studies of population-level policy interventions to reduce cancer incidence and mortality. Core facilities and other resources needed to support tobacco policy and program research are largely absent. A speaker also pointed out that the cancer centers are a major source of leaders for advisory boards and study sections that broadly influence research program development at NCI; limited tobacco research programs at NCI thus reflect in part the limited input from tobacco control researchers. For example, the American Stop Smoking Intervention Study (ASSIST),[347] a 17-state initiative conducted from 1992 to 1997, was successful in reducing smoking prevalence in the participating states, but no follow-on effort was launched.

Speakers further suggested that increased tobacco control emphasis at NCI (using existing but redirected resources) would provide scientific evidence that would strengthen policy-related interventions to change social norms regarding tobacco use. A stronger emphasis on tobacco control also would improve cessation techniques and medications, bolster research on vulnerable populations (e.g., young adults, light and intermittent smokers, the poor), and support a follow-on to the ASSIST program.



– *Other NIH Institutes and Centers*
The National Institute on Drug Abuse (NIDA) supports research on the epidemiology, etiology, prevention, and treatment of tobacco use and nicotine addiction. NIDA's tobacco research extends to diverse and high risk populations such as pregnant women, adolescents, and adults with comorbid conditions, including mental illness. NIDA scientists are working to identify the biological, environmental, social, and cultural factors that contribute to nicotine addiction with the goal of developing medications, behavioral interventions, and educational tools for preventing and treating nicotine addiction.

Since 2002, the Fogarty International Center, in collaboration with NCI and several other NIH Institutes, has led the International Tobacco and Health Research and Capacity Building Program, which supports transdisciplinary research to address the disease burden caused by tobacco consumption in low and middle income nations.

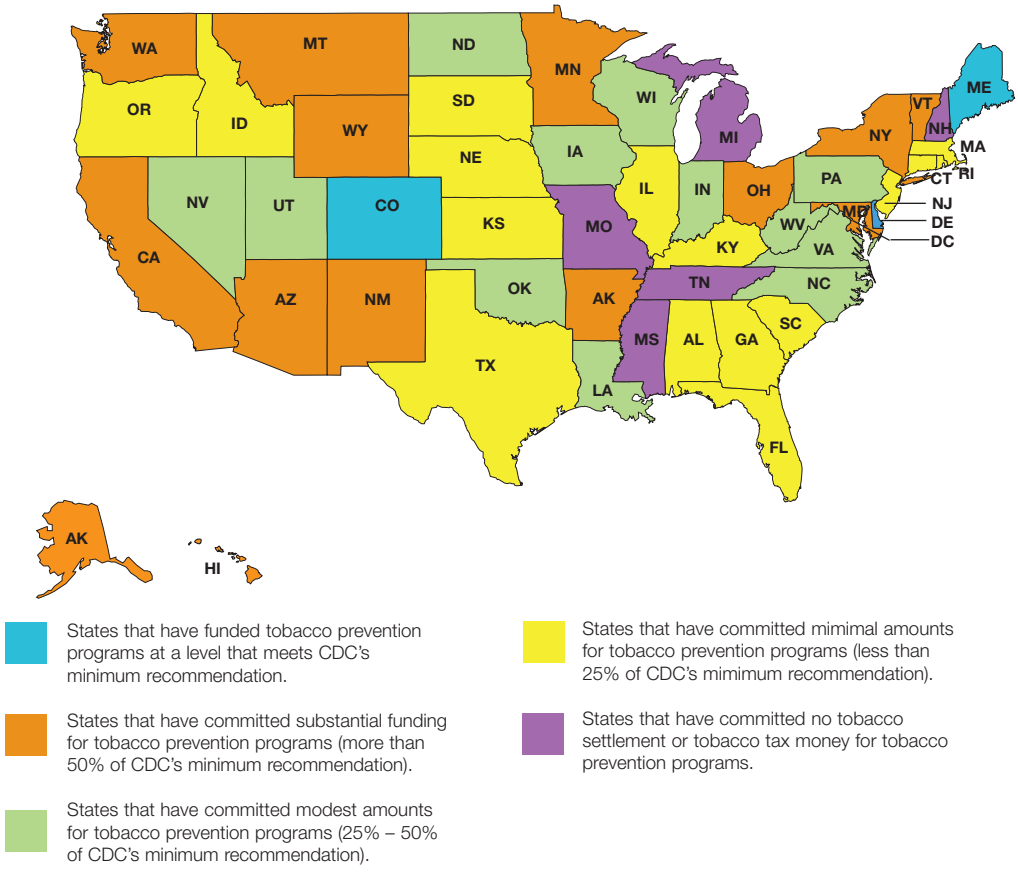
Despite the importance of tobacco use as a risk factor for lung and cardiovascular disease, NHLBI has no tobacco-focused intramural research effort. NHLBI funds some tobacco-related extramural research; of 7,250 extramural NHLBI grants listed in the CRISP[348] database in July 2007, 1.1 percent included the word "tobacco" in the description. These grants do not appear to be directly cancer-related, although some focus on implementing evidence-based tobacco control programs in health care and other settings.

NIH's signature Roadmap for Medical Research,[349] which focuses on research capacity building, does not include any explicit tobacco-related or behavioral health initiatives; it is unclear to what extent tobacco control may be embedded in some of the existing or planned Roadmap initiatives.

– *Other HHS Components*
CDC's tobacco control research focuses on determining how best to disseminate research on effective population-based interventions for preventing tobacco use initiation among youth and young adults, increasing cessation among adults and youth, and eliminating exposure to secondhand smoke. Other areas of research include quantifying the health and economic impacts of tobacco use, process and outcome evaluation research, identifying disparities in tobacco use and tobacco-related diseases, and investigating how tobacco products' chemical additives, constituents, and design affect their toxicity, carcinogenicity, and addictiveness. CDC synthesizes and translates research into practice and partners with local, state, national, and international agencies to communicate research findings to the public health community, policymakers, and the public. However, a speaker observed that despite the toll of disease and death caused by tobacco, only a small fraction of CDC's budget is devoted to tobacco control.[350] Increased emphasis on tobacco control would support a robust national quit line network and better leverage state program efforts. It was further noted that CDC's current and 21st century health protection goals, contained in the agency's annual report,[351] do not mention tobacco.

The Agency for Healthcare Quality and Research led the development of a Public Health Service clinical practice guideline published in June 2002[352] to assist clinicians, tobacco dependence treatment specialists, health care administrators, insurers, and purchasers in delivering and supporting effective tobacco use and dependence treatments.

Figure 18 **Funding for Tobacco Prevention**



Source: Campaign for Tobacco-Free Kids, et al. *A Broken Promise to Our Children: The 1998 State Tobacco Settlement Eight Years Later,* December 2006.

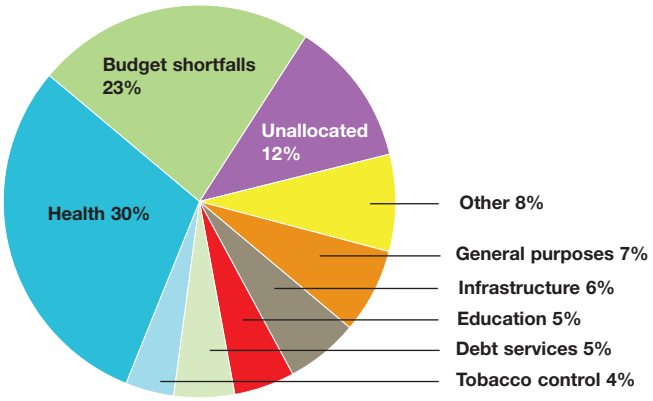
State and Local Governments

- *Funding for State Tobacco Prevention and Control Programs*

Under the 1998 Master Settlement Agreement (MSA),[353] 46 states receive allocations to implement tobacco control measures and to some degree compensate them for Medicaid program costs of providing care to citizens with diseases caused by tobacco use. The remaining four states (Florida, Minnesota, Mississippi, Texas) reached separate settlements with the tobacco companies and receive similar annual payments. A 2000 report of the U.S. Surgeon General outlined the goals and components of comprehensive statewide tobacco control programs.[354] CDC has developed inflation-adjusted, per capita estimates of the funding level (and percent of total MSA funding per state) required to establish and maintain an effective statewide tobacco prevention and control program employing evidence-based interventions to prevent tobacco use initiation and support cessation efforts.[355,356]

However, last year, only three states (Colorado, Delaware, Maine) invested at least the minimum per capita amount recommended by CDC. A small number of other states (e.g., California, Massachusetts, Florida) – in some cases using tobacco tax revenues, not MSA funds – have demonstrated that both smoking rates and expenditures to treat diseases caused by tobacco can be reduced with adequate funding for tobacco control programs. But in the vast majority of states, tobacco control programs are, and have been, seriously underfunded (see Figure 18).

Figure 19 **Funding for Tobacco Prevention**



Source: Government Accounting Office. *Tobacco Settlement: States' Allocations of Payments from Tobacco Companies for Fiscal Years 2000 through 2005, GAO,* February 27, 2007.

States have more than enough money from tobacco settlement payments and tobacco excise taxes to fund tobacco control at minimum CDC-recommended levels (approximately 7.3 percent of annual tobacco settlement payments plus tobacco tax revenues), but with many state budgets in crisis, numerous legislatures have diverted tobacco settlement and tobacco tax dollars to fund budget shortfalls and other needs such as infrastructure, education, and debt service. Between 2000 and 2005, about 30 percent of MSA spending was for health care, including Medicaid, health insurance, hospitals, technology, and research (Figure 19). According to a speaker, sustaining tobacco control funding also is hampered by perceptions that the tobacco problem is "solved," and that tobacco issues are "old news." These views may well be fostered to some degree by the tobacco industry.

…the best way to reach a larger audience is to increase funds dedicated to public education prevention programs. Experts have concluded that defunding successful prevention campaigns leads to an erosion of the program messages, increased susceptibility to initiation, rapid and sharp emergence of pro-tobacco attitudes and beliefs, and a marked rise in intentions to smoke.

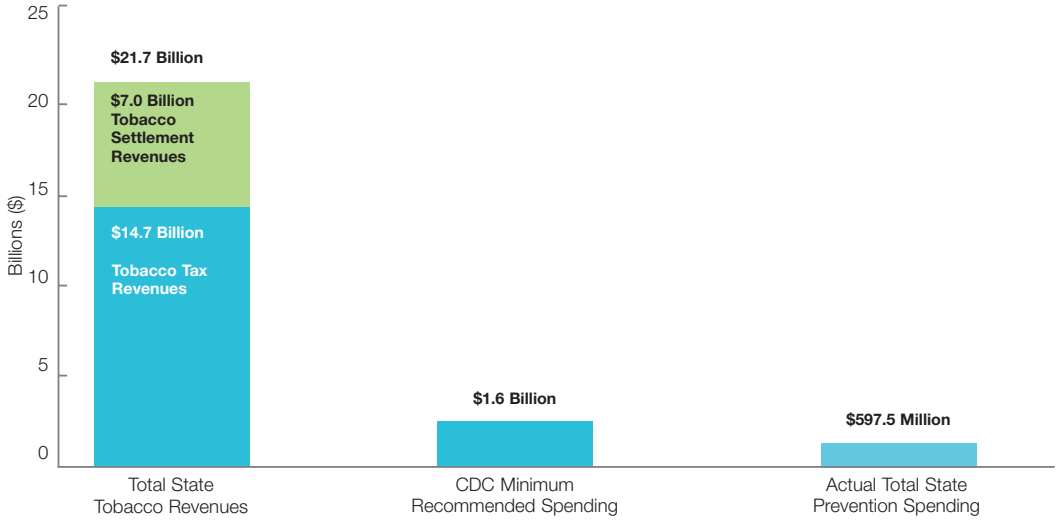
— Donna Vallone, Ph.D.
American Legacy Foundation

Some of the most successful tobacco control programs recently have suffered crippling decreases in funding. For example, funding for the Massachusetts tobacco control program was cut from $48 million in 2002 to $2.5 million in 2004. The comprehensive tobacco control program in Indiana has lost half of its funding in recent years (currently 69 percent below the CDC-recommended minimum level) while tobacco companies have increased their marketing expenditures in Indiana (a state frequently selected for test-marketing new tobacco products) to $475 million per year, an amount equal to 44 times the state expenditure for tobacco control.[357]

Similarly, tobacco control funding in Florida was cut from $37.5 million in 2003 to $1 million in 2004.[358] The youth anti-tobacco campaign in Minnesota lost 75 percent of its funding in 2003 after operating for three years; surveys of adolescents before and after the campaign showed decreased susceptibility to smoking during the campaign and a dramatic rise in susceptibility (from 43 percent to 53 percent) six months after the campaign was halted.[359] Speakers maintained that tobacco industry pressure has been a factor in funding reductions in these and other states. In Mississippi, the previously exemplary state program has been entirely defunded due to aggressive opposition by the state's governor, a former tobacco lobbyist.[360,361]

In total, state tobacco prevention expenditures declined from $731.2 million in FY 2002 to just $597.5 million in FY 2007 – less than three percent of the $21.3 billion available

Figure 20 **FY 2007 Funding for Tobacco Prevention**



Source: Campaign for Tobacco-Free Kids, et al. *A Broken Promise to Our Children: The 1998 State Tobacco Settlement Eight Years Later*, December 2006.

for tobacco control in FY 2007 and only 37 percent of the $1.6 billion CDC estimates is necessary to have a minimally robust tobacco prevention program (Figure 20).

The MSA payments to the states, due by April 15th each year, will increase substantially in 2008 and will remain at higher levels thereafter. The increase in payments to the 46 states, the District of Columbia, and the U.S. territories that are parties to the MSA will total more than $900 million annually. These payments are additional, new funding that states will receive each year from 2008 to 2017 to conform to provisions of the MSA. After 2017, when these so-called "bonus" payments end, the continuing unadjusted core MSA base payment amounts are scheduled to increase, keeping the annual payments to the states substantially higher than current levels.[362]

Right now, states are spending only three percent of the money available to them through tobacco excise taxes or the Master Settlement Agreement. It would only take eight percent of these funds to fully support comprehensive programs in every state.

— Corinne Husten, M.D., M.P.H. Centers for Disease Control and Prevention

Thus, whereas the states previously had few excuses for not funding tobacco control at CDC-recommended minimum levels, no legitimate excuse seems possible after 2008. The states now have a chance to invigorate tobacco control efforts and once again achieve reductions in smoking prevalence that have stalled and even increased in some groups of youth and adults since state tobacco control funds declined over the past few years.

- *Tobacco Excise Taxes*

Increases in tobacco excise taxes, which are passed along to consumers in the form of higher tobacco product prices, have proven highly effective in reducing tobacco use by promoting cessation among current users, discouraging relapse among former users, preventing initiation among potential users, and reducing consumption among those who continue to use tobacco. These revenues also provide crucial dollars needed to fund anti-tobacco efforts.

For every 10 percent increase in tobacco product prices, the number of adult smokers decreases by approximately 1.5 percent and overall tobacco consumption drops by about two percent.[363] Young people who smoke are up to three times more responsive to price increases than adults,[364] and price increases are particularly effective in preventing youth from transitioning from experimentation to regular, addicted smoking.[365, 366] In addition, several studies concluded that higher cigarette taxes and prices result in significant reductions in smoking prevalence among pregnant women – an estimated five to seven percent reduction following a 10 percent price increase.[367, 368] It has been argued that tobacco tax increases disproportionately impact poor smokers (i.e., the tax is regressive). Though generally true, tax increases also result in greater reductions in smoking among this population, with the dual effect of shifting the tax burden to higher income smokers and helping to reduce disparities resulting from the health consequences of tobacco use.[369]

The lowest income smokers are about four times more responsive to price than higher income smokers, so you see big reductions in tobacco use in response to tax increases among the lowest income groups.

— Frank Chaloupka, Ph.D.
University of Illinois at Chicago

State tobacco excise taxes vary widely (Figure 21), and therefore so do cigarette prices. For example, in Rhode Island, the state excise tax is $2.46. By contrast, the cigarette tax in South Carolina is only seven cents. A few cities and other municipalities have levied additional local tobacco taxes to drive prices higher. As of June 2007, Chicago had the highest combined state and local tax in the country at $3.66 per pack.[370] Nationwide, the average cigarette state tax (as of January 1, 2007) was $1.00 per pack, up seven cents over the previous year.[371] As of March 2007, the average retail price of a pack of cigarettes, including Federal and state excise taxes, was $4.28.[372]

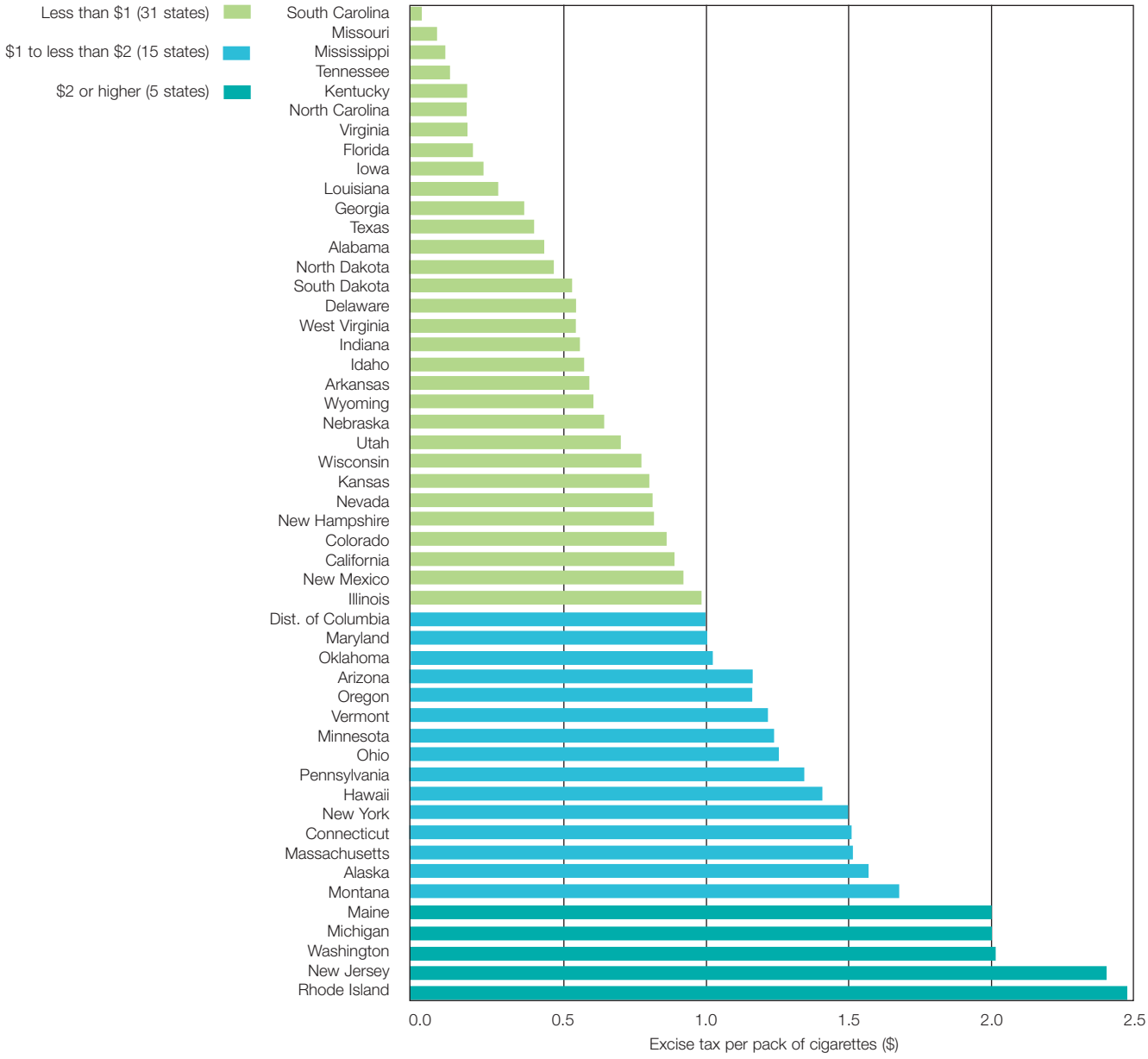
Although many states have raised their excise taxes, in some cases repeatedly, the tobacco companies also have raised cigarette prices, vastly increasing revenues the industry has available to counter anti-smoking programs (Figure 22). They also have increased retailer discounts and other promotions that offset the effect of excise tax increases.

- *State Cancer Control Plans*

As of November 2006, 49 states had comprehensive cancer control plans (CCCs) in place. These plans have been developed with guidance and financial assistance provided by CDC and a coalition of national partners (NCI, ACS, American College of Surgeons Commission on Cancer, Lance Armstrong Foundation, Intercultural Cancer Council, C-Change, National Association of Chronic Disease Directors, National Association of County and City Health Officials) that have supported the Comprehensive Cancer Control Leadership Institutes.

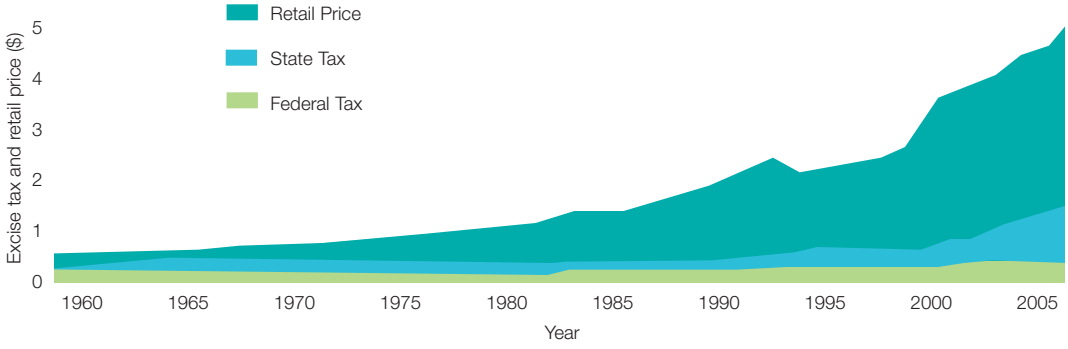
CDC recommends that CCCs include a comprehensive tobacco control component using the evidence-based strategies described in the *Best Practices for Comprehensive Tobacco Control Programs*[373] and *The Guide to Community Preventive Services: Tobacco Use Prevention and Control*.[374] A recent analysis[375] of the extent to which tobacco control is addressed in state CCCs found considerable variation in the degree to which plans address tobacco control components stipulated in the two guidelines; cessation programming was most often addressed, while chronic disease programming was the component least often included. In nearly half of the 39 state plans evaluated, funding for tobacco control was included in the state plan; of these plans, almost 53 percent included a specific, measurable goal for this funding, either as a dollar amount or a percent of recommended CDC

Figure 21 **Cigarette Excise Tax, by State, 2005**



Source: National Conference of State Legislatures & Federation of Tax Administrators. Provided by National Government Relations Department, American Cancer Society, 2005. American Cancer Society Surveillance Research.

Figure 22 **Trends in State and Federal Excise Taxes and Retail Price, 1960 – 2005**



Source: American Cancer Society. Cancer Prevention & Early Detection Facts & Figures 2006, American Cancer Society, Atlanta, GA 2006.

funding. The authors conclude that states have opportunities to improve compliance with tobacco-related CDC recommendations for cancer control.

- *Medicaid Programs*

The 2000 Public Health Service clinical practice guidelines[376] suggested that all state Medicaid programs provide coverage for tobacco dependence treatments (e.g., nicotine gum, patch, nasal spray, inhaler, bupropion) and behavioral interventions (e.g., individual, group, and telephone counseling). Medicaid coverage for cessation treatments still varies considerably by state;[377] in 2005, one state reported complete coverage, 38 reported some coverage, four reported some coverage for pregnant women only, seven covered all medications and at least one form of counseling, and nine reported no coverage of treatments.[378]

Non-governmental Organizations and Other Partners

Though much remains to be done to end the death and suffering from cancer and other diseases caused by tobacco use, the sustained combined efforts of strong partnerships among non-profit organizations, professional organizations, pharmaceutical industry developers of cessation treatments, and Federal agencies have achieved commendable progress in science, public health, and tobacco product control. These partners include, among others, the American Lung Association, American Cancer Society, Campaign for Tobacco-Free Kids, Association for Nonsmokers' Rights, American Medical Association, American Legacy Foundation, National Medical Association, Society for Research on Tobacco and Nicotine, NCI, CDC, and the Agency for Healthcare Research and Quality (AHRQ).

...cigarette sales dropped more than twice as fast in states with comprehensive tobacco control programs compared to the states that didn't have such programs. The more states spent on the comprehensive program, the greater the reduction in smoking. The longer states invested, the greater and faster the impact.

— Corinne Husten, M.D., M.P.H. Centers for Disease Control and Prevention

For example, the American Legacy Foundation, which developed the successful truth® anti-tobacco campaign, has been an important force in the efforts of non-governmental organizations. The truth® campaign has proven to be an effective educational tool and smoking deterrent for youth. The Foundation has been funded from payments mandated by the MSA. However, the last payment through the MSA will likely occur in 2008. While careful investment of these funds will allow the Foundation to continue operations, the termination of payments will substantially reduce its capacity to conduct national public education efforts.

Additionally, the Smoke-Free Families National Dissemination Office, originally funded in 1993 by the Robert Wood Johnson Foundation, is a partnership of more than 60 organizations dedicated to improving the dissemination and adoption of evidence-based interventions to reduce smoking among women during and around the time of pregnancy. The partnership's goals are to: (1) improve the science base in this area through new research and enhancement of available data, (2) increase system capacity through innovative systemwide approaches to implementing evidence-based interventions, (3) expand training and technical assistance, and (4) pursue policy initiatives to help reduce smoking among pregnant women.

These and other continued partnerships will be crucial to the success of current and future tobacco control efforts. Speakers recommended that collaborations also should be sought with non-profit, professional, and government agencies focused primarily on other diseases caused by tobacco (e.g., NHLBI, American Heart Association) to leverage resources and harmonize public health messages and policy.

Tobacco Industry

Numerous speakers stated in the strongest terms that over the past half century, the tobacco industry has developed increasingly sophisticated strategies to oppose effective public policies and programs to reduce tobacco consumption, reaching into all levels of the political system and maintaining public denial in the face of overwhelming scientific evidence of addiction and harm from tobacco products. At the political level, many of the industry's activities have been conducted in secret or through third parties to hide from the public and policymakers its role in orchestrating and financing opposition to tobacco control policies.[379,380,381] Annual tobacco industry contributions to Federal political candidates, political parties, and political action committees (PACs) total over $3 million, and tobacco industry expenditures lobbying Congress exceed $20 million per year.[382]

In 2005, the tobacco industry spent $13.4 billion on product promotion, including advertising, sports event sponsorship, and myriad promotions that lower the cost of cigarettes (and offset the effect of excise tax increases).[383] Promotions also include free samples of cigarettes to targeted populations (e.g., young people in night clubs), and free or low cost merchandise featuring brand logos in exchange for coupons or other proof of cigarette purchases. It is estimated that as much as 80 percent of tobacco marketing is now concentrated on price discounts. Discounts have the greatest impact on youth, who are the most price-sensitive consumers.[384]

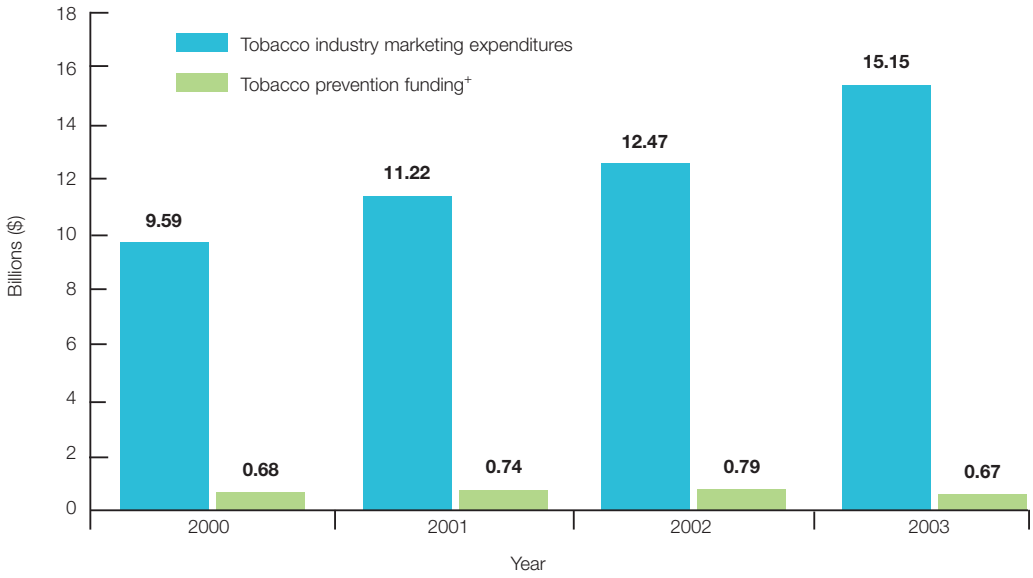
Since the 1998 Master Settlement Agreement with the states, tobacco marketing expenditures have increased by 123 percent. For every dollar spent in the United States on tobacco control, the industry spends almost $23 in product promotion.[385] As detailed above and shown in Figure 23, this dramatic increase has occurred as state tobacco control expenditures have diminished. Ironically, the 1969 legislation[386] that removed tobacco advertising from television and radio largely prevented states from taking local action to ban other tobacco advertising (e.g., print).

A speaker noted that it costs the tobacco industry only about five cents to make a pack of cigarettes. With the average wholesale price in March 2007 at $2.48,[387] the profit margin of the tobacco industry is staggeringly high.

It was suggested that a key strategy in reducing tobacco use should be finding ways to take the profit out of the tobacco business. For example, if nicotine were removed from cigarettes and other forms of tobacco, consumption almost certainly would fall – it is far easier to make a choice about whether or not to use tobacco if one is not addicted to nicotine. However, research is needed on modifications that would result in less addicting cigarettes.[388]

Other strategies to reduce tobacco profits might include prohibiting the import of manufactured tobacco products and unprocessed leaf tobacco, which would shrink domestic supply, drive up product prices, and reduce smoking prevalence. Similarly, prohibiting the export of tobacco products could stymie at least some industry efforts to expand their markets into developing countries. One speaker even suggested that the Federal government buy out the tobacco stockholders, thereby taking control of the industry. This idea has been explored by Canadian authors who propose that the tobacco

Figure 23 **Tobacco Industry Expenditures on Cigarette Marketing* vs. Tobacco Prevention Funding,** 2000 – 2003**



* Marketing includes advertising and promotional expenditures.
** Some tobacco prevention funding totals based on estimates calculated by the Campaign for Tobacco-Free Kids
\+ Tobacco prevention funding is by Fiscal Year.

Source: Marketing expenditures: Federal Trade Commission, Federal Trade Commission Cigarette Report for 2003, Washington, DC, 2005. Tobacco Prevention Funding: Campaign for Tobacco-Free Kids, *A Broken Promise to Our Children. The 1998 Master Settlement Agreement Seven Years Later,* Washington DC, 2005. American Cancer Society Surveillance Research.

...if the tobacco companies' influence wasn't there, which comes through their money, then the Congress would do the right thing and the President would do the right thing. We would be free of this addiction to the money.

— *Stanton Glantz, Ph.D. University of California, San Francisco*

industry could become a public sector enterprise whose focus is shifted toward helping smokers quit and gradually phasing out tobacco use.[389]

The tobacco industry continues to work aggressively to attract new smokers – to replace those who quit, die, or have been persuaded not to start smoking by anti-tobacco efforts. Recent evidence demonstrates clearly that tobacco companies have intentionally altered cigarette formulas to increase the nicotine dose delivered and the addictiveness of the product.[390] Another strategy has been aggressive marketing to several targeted populations (see also pp. 64-72):

- Women. The tobacco companies began targeted marketing of women as early as the 1920s using two principal themes: that smoking is stylish and attractive, and that it is a sign of independence and empowerment. Cigarettes also were marketed as a weight control aid.[391] The industry first introduced brands specifically intended to appeal to women in the late 1960s, and continues to do so. Women, and particularly young women, were considered to be the largest potential market for "light" and "low-tar" brands introduced in the 1970s.[392] Some of the women-focused brands are promoted with overtly feminine themes and packaging, while others are marketed with a dual-sex approach emphasizing independent and fun-loving imagery.[393] In early 2007, a female-oriented expansion of the Camel cigarette line, Camel No. 9, was introduced, with a marketing budget estimated at $25 million to $50 million. The name is intended to suggest sophistication (i.e., "dressed to the nines"), according to a tobacco marketing executive. The cigarettes are hot pink and mint green, with floral accents in the advertising and a "light and luscious" slogan. Launch parties for the new brand, attended by young women, feature free massages and hairstyling, and "goody bags" containing make-up, jewelry, and free samples of Camel No. 9 cigarettes.[394] Tobacco control advocates are particularly concerned about the planned heavy advertising in publications with young readers, an indication that – despite company denials – the brand is intended to encourage smoking initiation among young girls.[395]

- Racial/ethnic minorities. The tobacco industry continues to target racial and ethnic minorities. In 2004, for example, a promotion brazenly targeting African American youth included extensive advertising, special collector cigarette boxes, a music CD, and a national disc jockey competition. All of the promotion components featured a hip-hop music theme. Anti-tobacco advocates drew media attention to the promotion, and several states sued the company for violating terms of the 1998 MSA. As part of its settlement of the law suit, the promotion was abandoned and the company made monetary payments to the states.[396]

- Young adults. A speaker noted that the tobacco industry is well aware that most initiation prevention programs are aimed at teens and that racial and ethnic minorities tend to start smoking later than Caucasians. Individuals in the 18 to 24 year-old age group are past the age at which addiction is most easily cultivated, but a considerable number smoke cigarettes at social occasions. In 2006, one tobacco company opened an upscale lounge in Chicago, the only place at which a new premium brand of cigarettes – custom-rolled in one of several flavors – can be obtained. Its goal is to appeal to the desire for exclusivity and sophistication; tobacco control advocates note that these characteristics also will increase the brand's appeal to adolescents.[397] The lounge was able to obtain an exception from Chicago's recently enacted smoke-free law by defining its business as being primarily cigarette manufacturing. Taking another tack, the tobacco industry is making large donations to universities,[398] ostensibly to fund research to reduce the harm caused by tobacco, improve cessation interventions, and prevent youth smoking. By doing so, the industry also may be purchasing crucial access to this segment of the young adult population.

We talk about personal responsibility. The truth of the matter is that close to 90 percent of all long-term smokers are addicted before they're old enough to purchase the product legally. We're talking about an addiction that is as powerful as any that we know in our society. We're talking about an industry that changes how the product is made to ensure that nicotine remains at levels that lead to addiction and that then blames the consumer for the diseases it causes. We have a responsibility to see that that doesn't happen.

— Matthew Myers, J.D. Campaign for Tobacco-Free Kids

In another ploy to build goodwill, tobacco companies are sponsoring tobacco education and cessation assistance Web sites that are intended to show the industry's social responsibility and desire to discourage tobacco use initiation by youth. Similarly, tobacco companies sponsor smoking prevention advertising, some of which is aimed at youth and some that targets parents. A recent study[399] of the effect of televised tobacco company-funded prevention advertising found that exposure to this advertising generally had no beneficial outcomes for youth. However, particularly among 10th and 12th graders surveyed, exposure to the parent-oriented advertising was actually harmful – associated with lower perceived harm of smoking, stronger approval of smoking, stronger intentions to smoke in the future, and greater likelihood of having smoked in the past month.

In 2006, threatened by an enforcement action under the MSA, one major tobacco company entered into an agreement[400] to cease manufacturing and selling flavored cigarettes in the United States. Other tobacco companies were unaffected. However, it appears that the company already has found ways to sidestep the agreement by introducing a new line of "Signature Blend" cigarettes with varieties such as "robust" and "infused." The product advertising indicates that the tobacco is "accented with" or has a "flavor similar to" honey, cocoa, espresso, citrus, and apple.

To counteract the economic impact of smoke-free ordinances being enacted in numerous states and counties (e.g., they contribute to less smoking and facilitate quitting) and increased public awareness of the danger of environmental tobacco smoke, the tobacco industry is developing new smokeless tobacco (ST) products and promoting them heavily for use in circumstances in which smoking is not permitted or acceptable. In addition to representing a way of circumventing smoke-free ordinances, the industry's objective is for smokers to view these products as safer, discreet, and less offensive than inhaled tobacco products.

Use of ST by smokers of any age may cause individuals to forgo a cessation attempt and lead to relapse among former smokers. Smokeless products should not be viewed as a smoking cessation aid; a typical "pinch" of some of the most popular snuff products contains 10 to 20 milligrams of nicotine compared with four milligrams in the highest dose of nicotine gum or lozenge.[401] Further, some individuals may both smoke and use ST, resulting in higher dosing and more serious consequences due to dual delivery mechanisms.[402]

Children don't come with the genetic potential to start smoking. There's no start-smoking gene....social environment influences how kids think about smoking. In particular, the social environment positions the behavior, smoking, to be something that certain adolescents and young children aspire to.

— James Sargent, M.D.
Dartmouth-Hitchcock Medical Center

Faced with a shrinking market in the United States, the tobacco companies are increasing their focus on foreign markets, particularly developing countries. A speaker cited a recent assessment that "the economic future of the [tobacco] industry rests in low and middle income countries, where rising incomes, trade liberalization, increased freedoms for women, and the widespread introduction of sophisticated Western-style advertising ensure a thriving future for tobacco sales."[403] Numerous speakers emphasized the moral responsibility of the U.S. government to prevent the export of our tobacco problem.

Educational System

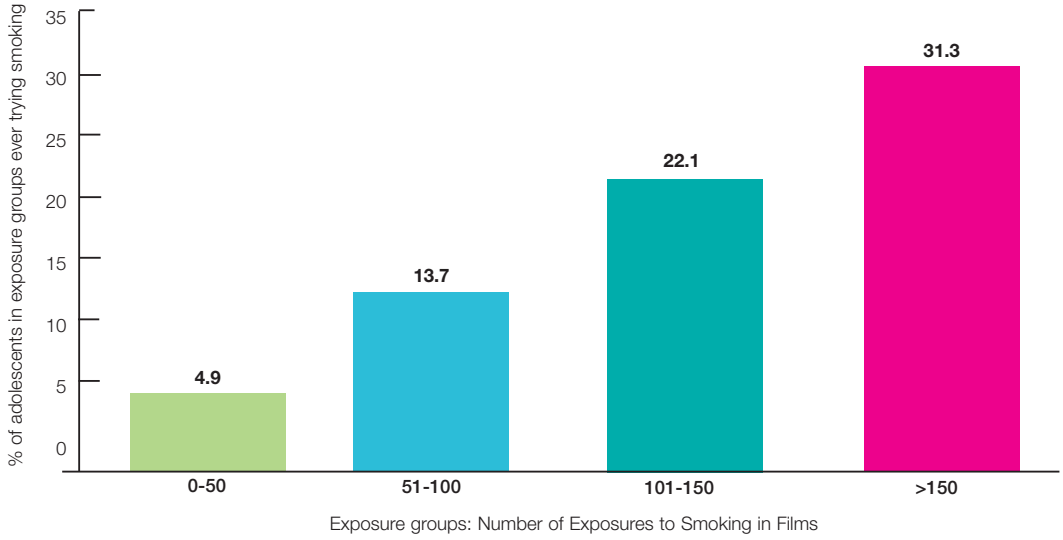
Speakers emphasized the importance of school-based tobacco prevention programs, which should focus both on prevention and cessation, and ideally should begin by the 6th grade.[404] In 2000, 38 states required that tobacco use prevention be taught in elementary schools.[405] However, the effectiveness of current school-based anti-tobacco programs has been mixed. New approaches are needed that are theory-guided, culturally sensitive, tailored to student needs, employ modern interactive computer technologies when possible, and continue throughout middle and high school. Video games and the Internet may provide additional opportunities for effective anti-tobacco education.

Media

Images of popular actors smoking in films became increasingly frequent until about 1950; from 1950 to approximately 1990, images of smoking decreased significantly. Since 1990, however, the frequency of these images has again increased; by 2002, smoking in movies was as common as it was in 1950.[406]

Speakers maintained that movies have been a major factor in legitimizing and glamorizing smoking, particularly for women and youth. The frequent portrayal of smoking behavior in films between 1930 and 1950 was not accidental. Strong historic links exist between Hollywood and the tobacco industry, which used the movies and movie actors (who made numerous tobacco commercials) to promote smoking and in particular, to introduce women to cigarettes. A speaker observed that films of that era effectively instructed men

Figure 24 **Effects of Seeing Tobacco Use in Films on Trying Smoking Among Adolescents**



Source: Sargent JD, Beach ML, Dalton MA, et al. Effect of seeing tobacco use in films on trying smoking among adolescents: cross sectional study, *British Medical Journal* 2001;323:1394-1397.

in how to teach women to smoke and that much of the upswing in smoking prevalence during this period was due to smoking initiation among women.[407]

More than a decade of research on the effect of smoking images in movies has established that movies are a major recruiter of new teen smokers in the United States – about 390,000 each year. Unless current trends are altered, about 120,000 of these smokers ultimately will die from tobacco-related diseases.[408] Smoking in movies is an established risk factor for smoking initiation – youth who watch smoking in the movies are 2.7 times more likely to try smoking than those who are not exposed to these images.[409] The likelihood of smoking initiation increases with the number of impressions/exposures to smoking (see Figure 24). Research has shown that smoking in movies contributes to adolescents' perceptions that smoking is a common and acceptable behavior and to viewers' positive attitudes and beliefs about tobacco use (e.g., smoking is enjoyable, relaxing, grown-up, attractive, safe).[410] A survey of smoking in feature films and by adolescents' favorite movie actors showed that adolescents whose favorite film stars smoked in movies were more likely to have positive attitudes about smoking. The more frequently the favorite actor was observed smoking, the more likely the teen viewer was to try smoking or to be an established smoker.[411]

Beginning in 2002, the total amount of smoking in movies was greater in youth-rated (G/PG/PG-13) films than in adult-rated (R) films. This is due in part to a larger percentage of films being rated in youth categories over the past several years. According to data from an ongoing, 10-year NCI-funded study of the impact of movie smoking on smoking initiation, smoking currently appears in three-quarters of youth-rated movies.[412]

A recent review[413] suggests that viewing strong anti-smoking messages prior to viewing movie smoking decreases the impact of movie smoking on adolescents. Speakers suggested that limiting movie smoking only to R-rated films would decrease adolescent exposure to smoking images and subsequent smoking initiation. In addition to anti-tobacco trailers, a speaker suggested a ban on cigarette product placement in films (even if no one is shown smoking) and a requirement that closing film credits should contain a certification that the film makers received no pay for tobacco product promotion. These recommendations are the focus of Smokefreemovies,[414] a public health campaign that aims to reduce the impact of smoking in movies on teens through voluntary movie industry policy changes.

They also are endorsed by numerous medical associations including the World Health Organization, American Heart Association, American Lung Association, American Medical Association, and American Medical Association Alliance.[415]

In 2003, a letter to the Motion Pictures Association of America (MPAA) signed by 25 state Attorneys General described the results of the NCI-sponsored study[416] and emphasized the enormous public health impact the movie industry could have by reducing or eliminating movie smoking. According to a speaker, the industry maintained that most movie smoking is contextual (i.e., consistent with the behavior of a particular character or historical period), that people who smoke in movies are usually the "bad guys," and that while movie makers have no intent to encourage or glamorize smoking, freedom of speech in storytelling must be preserved.[417] In 2006, 40 Attorneys General wrote to the MPAA calling for the industry to enact the rating system change and further, to add anti-smoking messages to movie DVDs produced for home viewing.[418] In December 2006, the MPAA invited representatives of the Harvard School of Public Health and key researchers to present the evidence described above to representatives from the major motion picture associations and movie producers. In May 2007, the industry announced that it would consider the context of movie smoking when assigning ratings; movies in which smoking is not in the context of historical fact would be likely to receive an R rating.

It should be noted, however, that some older adolescents (unaccompanied by an adult) who attend movies at multiplex cinemas buy tickets to youth-rated films, then go to the theaters showing R-rated movies once past the ticket-taker. Adolescents also view R-rated films at home on cable channels or DVDs, which actually may account for the majority of their exposure to R-rated movies. In addition, the R rating would not prevent 18 to 24 year-olds (see p. 87), a population targeted by the tobacco industry, from being exposed to movie smoking. Further, it is foreseeable that if movie smoking is prohibited in youth-rated movies, such images may increase in adult-rated films. This could have the unintended effect of exposing this older, but still vulnerable population to even more images of movie smoking than previously.

Employers, Insurance, and the Health Care System

Direct health care costs due to tobacco-related disease are now estimated at $75 billion annually, and indirect costs exceed $81 billion.[419] Smokers have higher overall health care costs compared with nonsmokers, and family members of employees who smoke (or are exposed to secondhand smoke) often have higher health care costs compared with families in which no one smokes.

Each pack of cigarettes sold in the United States costs the country an estimated $7.18 in health care costs and lost productivity.

— Corinne Husten, M.D., M.P.H. Centers for Disease Control and Prevention

Many employers are actively exploring ways of limiting employee health care costs due to tobacco use. Along with expanding smoke-free policies in the workplace, a growing number of employers are including coverage for smoking cessation prescription medications in their group health plans. However, most insurers still are unwilling to cover the cost of over-the-counter nicotine patches/gum or cessation-related counseling, even though both have been proven to be integral components of the multifaceted cessation interventions that achieve the highest quit rates. Knowing that some individuals who cannot afford nicotine patches or gum may defer a quit attempt because of this cost, some employers are reimbursing employees for the cost of over-the-counter nicotine replacement therapies as an added incentive to quit smoking. Reducing out-of-pocket costs increases the number of people who attempt to quit, increases the use of proven cessation therapies, and increases the number of people who successfully quit.[420] Other employer incentives may include discounts on health insurance premiums and other financial incentives to stop using tobacco.

Tobacco dependence is a chronic condition that often requires repeated interventions. Effective treatments exist that can produce long-term and even permanent abstinence, but support within the health care system for tobacco cessation interventions has been inadequate. Many physicians and other health care providers do not assess patients' smoking status at each visit despite the recognized importance of smoking cessation. Yet, as is true regarding cancer screening, provider recommendation is perhaps the strongest motivator for smokers to attempt to quit. While providers are effective at motivating a quit attempt, these attempts often fail because smokers do not receive the assistance they need to succeed.[421] Lack of coverage for smoking cessation services in many health insurance plans has created a disincentive for providers to undertake time-intensive interventions and follow-up. Patients who are identified as tobacco users may be referred to quit lines and Web sites that provide smoking cessation support, but many physicians are unaware of these resources. Often, neither patients nor providers are aware of coverage the patient may have for cessation services.

A significant step toward better integrating tobacco use cessation services and support into the health care system was taken in 2000 when the AHRQ published guidelines[422] developed by a multidisciplinary, non-Federal panel of experts for clinicians treating tobacco use and dependence. The guidelines specify steps (the "5As," see Table 10) to take with patients who use tobacco. These guidelines, however, have not been universally adopted

Table 10 **Guide for Clinicians Treating Tobacco Use and Dependence**

ASK — Implement an office-wide system to ensure that, for every patient at every clinic visit, tobacco use status is queried and documented (e.g., expand vital signs to include tobacco use or use an alternative universal identification system).

ADVISE — In a clear, strong, and personalized manner, urge every tobacco user to quit; assure the patient that the clinician will help him/her.

ASSESS — Determine if the patient is willing to make a quit attempt at this time (e.g., within the next 30 days):

- If the patient is willing to make a quit attempt, provide assistance.
- If the patient will participate in an intensive treatment, deliver such a treatment or refer to an intensive intervention.
- If the patient clearly states he or she is unwilling to make a quit attempt at this time, provide a motivational intervention.
- If the patient is a member of a special population (e.g., adolescent, pregnant smoker, racial/ethnic minority), consider providing additional information.

ASSIST — Aid the patient in quitting:

- Help the patient develop a quit plan.
- Provide practical counseling (problem solving/training).
- Provide a supportive clinical environment (i.e., assure the patient that medical office staff are available to provide help).
- Help the patient obtain extra-treatment social support (e.g., from family and friends).
- Recommend the use of approved pharmacotherapy, except in special circumstances; explain how these medications increase smoking cessation success and reduce withdrawal symptoms.
- Provide supplementary materials (e.g., print materials from Federal or other agencies).

ARRANGE — Schedule follow-up contact, either in person or via telephone (e.g., initial contact during the first week following the quit date, second contact within the first month, as indicated thereafter).

Source: Fiore MC, Bailey WC, Cohen SJ, et al. *Treating Tobacco Use and Dependence,* Quick Reference Guide for Clinicians, U.S. Department of Health and Human Services, Public Health Service, October 2000.

We know that when health care providers discuss tobacco use with their patients who smoke, when they recommend treatment and they follow up with their patients, it increases their satisfaction with their health care. It doesn't alienate them. But rather than waiting for it to happen, we want patients to feel like they're not getting good care if their health care providers are not routinely checking in with them and encouraging them to quit smoking.

— Susan Curry, Ph.D. University of Illinois at Chicago

by clinicians. In a recent study of brief 5As interventions, patients reported the frequency of ASK and ADVISE components at 75 percent, followed by lower ASSESS and ASSIST rates (60 to 65 percent) and minimal implementation of the ARRANGE component.[423] Some speakers suggested that a national campaign to fully integrate the guidelines into the standard of care is warranted.

Conversely, a speaker maintained that the 5As intervention is too brief to be effective for most smokers (even if repeated), and recommended that more intensive cessation programs should be more readily available and appropriately reimbursed. Changes such as the recently expanded tobacco cessation treatment coverage now available to Medicare patients[424] with tobacco-related disease will likely lead to greater coverage by other public programs and by the private insurance industry. Cessation services provided by clinical social workers now are being covered under Medicare for patients with a smoking-related illness,[425] and may be covered by some private health plans.

Studies in a limited number of managed care and employer populations suggest that both insurers and employers may add smoking cessation benefits at minimal cost burden to their members/employees, and with potential savings, particularly where the population is relatively stable.[426] Use of cessation services has been shown to vary with the level of coverage; full coverage has been associated with significantly higher quit rates, quit attempts, and use of nicotine gum and patches in adult smokers.[427,428] An economic model of bupropion use in both managed care and worksite smoking cessation programs projected that over a 20-year period, health plans would save $4.10 to $4.69 in health care costs for each dollar spent covering smoking cessation, while employers would save $5.04 to $6.48 for each dollar spent.[429]

To address the issue of continued smoking among people with cancer, in January 2006 the M. D. Anderson Cancer Center launched the Tobacco Treatment Program (TTP), a tobacco use cessation and relapse prevention program in the oncology setting. Supported by Texas State Tobacco Settlement funds, the program is made available at no charge to all patients at the cancer center who report that they currently smoke or recently have quit. In its first year, the TTP provided services to more than 400 patients and family members. Efficacy data are not yet available to determine the program's long-term success in maintaining tobacco abstinence, but these data will be of interest to cancer centers and other oncology treatment settings considering implementation of a smoking cessation program. A TTP representative noted, however, that other cancer centers may have difficulty implementing this or a similar program without earmarked funding.

Individuals and Families

Clearly, the most important thing individuals can do to reduce tobacco-related cancer risk is to cease using any form of tobacco. As outlined above, most smokers make multiple quit attempts before they are successful and require support and assistance to succeed. Individuals also can support anti-tobacco policies and programs (e.g., stronger programs to prevent youth access to tobacco, improved anti-tobacco education in schools, mandated insurance coverage for comprehensive tobacco cessation services).

Chapter 5

Environmental Tobacco Smoke

Environmental Tobacco Smoke and Cancer

Also referred to as secondhand smoke, passive smoking, and involuntary smoking, environmental tobacco smoke (ETS) has been established as a cause of approximately 3,000 lung cancer deaths each year among nonsmokers in the United States.[430] ETS is a significant contributor to cardiac, respiratory, and other diseases in individuals exposed to it. In total, ETS exposure claims the lives of approximately 38,000 nonsmokers annually.[431,432] More than 126 million people in the U.S. continue to be exposed to ETS at home, at work, and in public places.[433] The Centers for Disease Control and Prevention (CDC) has estimated that 60 percent of the U.S. nonsmoking population has biological evidence of ETS exposure.[434] Health care costs associated with ETS total $10 billion per year.[435]

ETS is comprised of "sidestream" smoke that comes from the burning tip of a cigarette or cigar, and "mainstream" smoke from the mouth end. Tobacco smoke contains thousands of chemicals that are released into the air both as particles and gases. Some of these chemicals are the combustion products of the many substances added to tobacco to make smoking more palatable and to increase the level of "free" nicotine, which is more addictive because it is more rapidly absorbed. Additives may include various humectants (moisturizers), sugars, flavorings such as chocolate and vanilla, cocoa (dilates airways), ammonium compounds, menthol, eugenol (an anesthetic), and numerous other chemicals.[436] Table 11 lists the major categories of established, probable, and possible carcinogens in environmental tobacco smoke.

The June 2006 report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*,[437] effectively ended debate regarding the harm associated with ETS exposure. Among the major conclusions of the report were:

...there is no safe level of exposure to secondhand smoke — zero.

— Cynthia Hallett, M.P.H. Americans for Nonsmokers' Rights

- Secondhand smoke causes premature death and disease in children and in adults who do not smoke.
- Children exposed to secondhand smoke are at increased risk for sudden infant death syndrome, low birth weight, acute respiratory infections, ear problems, and more severe asthma. Smoking by parents causes respiratory symptoms and slows lung growth in their children.
- Exposure of adults to secondhand smoke has immediate adverse effects on the cardiovascular system and causes coronary heart disease and lung cancer.
- Scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.
- Many millions of Americans, both children and adults, still are exposed to secondhand smoke in their homes and workplaces despite substantial progress in tobacco control.

Table 11 **List of Known, Probable, and Possible Cancer-Causing Chemicals in Secondhand Smoke**

Polycyclic Aromatic Hydrocarbons
Benz(a)anthracene
Benzo(b)fluoranthene
Benzo(j)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Dibenz(a,h)anthracene
Dibenzo(a,l)pyrene
Dibenzo(a,e)pyrene
Indeno(1,2,3-cd)pyrene
5-Methylchrysene

N-Nitrosamines
N-Nitrosodimethylamine
N-Nitrosoethylmethylamine
N-Nitrosodiethylamine
N-Nitrosodi-n-propylamine
N-Nitroso-di-n-butylamine
N-Nitrosopyrrolidine
N-Nitrosopiperidine
N-Nitrosodiethanolamine
N-Nitrosonornicotine
4-(Methylnitrosamino)-1-(3pyridyl)-1-butanone

N-Heterocyblic Amines
AaC
IQ
Trp-P-1
Trp-P-2
Glu-P-1
Glu-P-2
PhIP

Volatile Hydrocarbons
1,3-Butadeine
Isoprene
Benzene
Styrene

Aromatic Amines
2-Toluidine
2,6-Dimethylaniline
2-Naphthylamine
4-Aminobiphenyl

Miscellaneous Organic Compounds
Acetamide
Acrylamide
Acrylonitrile
Vinyl chloride
DDT
DDE
Catechol
Caffeic acid
1,1-Dimethylhydrazine
Nitromethane
2-Nitropropane
Nitrobenzene
Ethyl carbamate
Ethylene oxide
Propylene oxide
Methyleugenol
MeAaC (2-amino-3-methyl-*9-H*-pyrido[2.3-*b*]indole)

Inorganic Compounds
Hydrazine
Arsenic
Beryllium
Nickel
Chromium (only hexavalent)
Cadmium
Cobalt
Lead
Polonium-210

Aldehydes
Formaldehyde
Acetaldehyde

Heterocyclic Compounds
Quinoline
Dibenz(a,h)acridine
Dibenz(a,j)acridine
Dibenzo(c,g)carbazole
Benzo(b)furan
Furan

Adapted from: National Cancer Institute. *Risks Associated with Smoking Cigarettes with Low Machine-Measured Yields of Tar and Nicotine,* Smoking and Tobacco Control Monograph No. 13, U.S. Department of Health and Human Services, National Institutes of Health, NIH Pub. No. 02-5074, October 2001.

- Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposures of nonsmokers to secondhand smoke.
- Smoke-free policies do not have an adverse economic impact on the hospitality industry.

In addition to the health conditions cited by the Surgeon General's report, evidence suggests that ETS exposure is associated with metabolic syndrome in adolescents.[438] Due to the illnesses caused by ETS, exposed children miss more days of school compared with those not exposed to ETS.[439] A study of ETS exposure among poor children found exposure rates as high as 89 percent among children whose mothers smoked.[440] Such exposure also may increase children's risk for cancer later in life, since ETS exposure has been associated with biologically effective doses of certain carcinogen-protein adducts (chemical reaction products) and general measures of genetic damage.[441]

Some studies have reported an association between ETS exposure and increased breast cancer risk. The Surgeon General's report characterizes the link between ETS and breast cancer as suggestive but not sufficient to infer a causal relationship.[442] Nonetheless, this possibility provides another reason for women to avoid ETS exposure; additional research is needed to clarify this issue.[443,444] Other evidence suggests that ETS may be associated with an increased risk of nasal sinus cancer.[445] Veterinary research indicates that ETS also increases cancer risk in pet dogs and cats.[446,447]

Environmental Tobacco Smoke Exposure – Key Participants and Positive Steps

The momentum toward passage of smoke-free laws has been gathering speed and received a significant push with publication of the Surgeon General's report on ETS. In addition to protecting nonsmokers, smoke-free laws are estimated to help the 70 percent of smokers who want to quit by providing them with public environments free from any temptation or pressure to smoke.[448]

In *State Tobacco Control 2005*, the American Lung Association issued its Smokefree Air 2010 Challenge, alling on policymakers to pass/and or close loopholes in smoke-free laws governing public places and workplaces so that all communities and states are 100 percent smoke free by 2010.[449]

If you want to maintain an acceptable level of indoor air quality while somebody is smoking, you need to introduce a significant amount of air into the space, and that air velocity through ventilation is similar to the level of a hurricane.

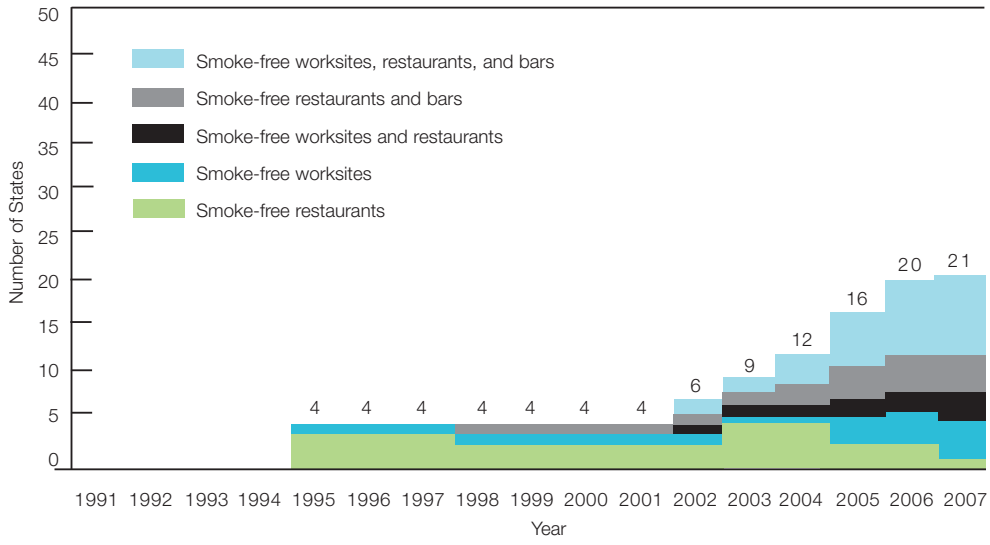
— Kiyoung Lee, Sc.D., M.P.H. University of Kentucky

Government

Smoke-free Ordinances

Many jurisdictions continue to allow smoking in public places, although the number and pace at which cities, counties, and states are enacting smoke-free ordinances is accelerating rapidly (Figure 25). As of July 3, 2007, approximately 162 million Americans are living in locales with smoke-free ordinances. During the period from the beginning of the Panel's meetings (September 2006) until publication of this report (August 2007), at least 133 new smoke-free laws were passed by state, county, and local governments.

Figure 25 **Major Smoke-Free Air Legislation in the 50 States and District of Columbia, 1991 – 2007**



Source: The MayaTech Corporation and the Roswell Park Cancer Institute.
Note: Data are for laws enacted by August 25, 2006; data for 2007 are as of January 1, 2007 only.

Smoke-free ordinances differ across the country. Many of the earliest smoke-free policies were enacted in government buildings, although in many cases the buildings were not 100 percent smoke-free. Typically, smoke-free ordinances start with public buildings and other public spaces, then later include the hospitality industry (hotels, bars, restaurants). Smoke-free initiatives often begin at the city or county level, then expand statewide (e.g., Maryland). In a small number of jurisdictions, smoke-free ordinances even apply to outdoor public venues such as parks and stadiums.

The strongest resistance to smoke-free ordinances typically comes from bar and restaurant owners, who fear a significant loss of business if smoking is prohibited on their premises. Such fears have proven to be unfounded. Numerous studies and hard economic data have shown that smoke-free laws hurt neither sales nor employment and sometimes increase business as people who previously had stayed away from establishments that permitted smoking begin patronizing the newly smoke-free businesses.[450,451]

Ordinances have been passed even in tobacco-growing states, including parts of Kentucky and Virginia. As the mayor of Lexington, Kentucky underscored in her testimony to the Panel: "If it can happen in Kentucky, it can happen anywhere." The mayor of Georgetown, Kentucky (population approximately 19,000) traced the history of its 100 percent smoke-free ordinance, enacted in October 2005. Both officials noted the importance of becoming educated about the relevant science and evidence regarding economic impact; listening to community concerns, including the food and beverage industry, health care community, and public throughout the process; emphasizing that the issue is public health, not business interference or the right to smoke; and having a planned, deliberate approach to implementation. The ordinance in Georgetown is proving to be a model for other small cities in Kentucky.

An advocate for smoke-free environments recommended that community groups interested in establishing smoke-free laws begin at the local level to avoid the common barrier of greater tobacco industry influence at the state level. The speaker further recommended allowing adequate time to educate the population and give them time to experience smoke-free living before moving to establish a state-level law. The importance of a solid infrastructure to implement and enforce a state smoke-free law was emphasized.

Non-governmental Organizations and Other Partners

Many of the same non-governmental organizations working to reduce tobacco use are involved in efforts and partnerships to reduce ETS exposure. One such organization is Americans for Nonsmokers' Rights,[452] which has been instrumental in educating the public about ETS, has advocated effectively for smoke-free ordinances, and maintains a database that tracks and analyzes information on tobacco control laws.

Tobacco Industry

Smoke-free laws pose a major threat to tobacco sales because they reflect a changing culture in which tobacco use is becoming increasingly unacceptable. In 1993, an industry-funded group estimated that three to five fewer cigarettes smoked per smoker per day due to smoking restrictions would reduce annual manufacturer profits by more than $1 billion per year.[453] Ever since the first Surgeon General's warning in 1986 about the danger of ETS, the tobacco industry has waged a fierce campaign of legal challenges and scientific disinformation, the latter achieved by funding respected scientists to produce studies favorable to the industry and to present them at prestigious scientific meetings.[454] One such industry-funded study,[455] published in 2003, has prompted an independent review and fueled a debate as to whether universities should be prohibited from taking grants from the tobacco industry.[456]

Tobacco industry attempts to thwart smoke-free policies have been well documented.[457,458] Although some tobacco companies acknowledge ETS health risks on their Web sites, the industry continues to oppose new smoke-free laws and is actively pursuing ways of replacing lost revenues. To counter decreasing tolerance for smoking and smoke exposure, the tobacco companies are developing and marketing a growing number of smokeless products, including some that are spitless. These products allow smokers to maintain nicotine dosage and still comply with smoking restrictions. One such product has been test marketed in the Midwest. In addition to heavy mail advertising and inclusion of coupons for product samples placed in cigarette packages, callers to the manufacturer's quit line subsequently have found themselves on a mailing list for product advertising. Clearly, the intent is to offer smokers an alternative when they are in places where smoking is banned, and to avoid losing as customers those who quit using cigarettes.

Smoke-free is the wave of the future. This issue is not about rights or revenues. It is about health.

— Everette Varney, Mayor
City of Georgetown, Kentucky

Workplace/Employer

As of July 2007, 41.1 percent of the total U.S. population live in states with 100 percent smoke-free workplace laws. A total of 8,466 municipalities with 100 percent smoke-free laws had such legislation in at least one of three main categories (workplaces, restaurants, bars).[459] These figures reflect dramatic increases in the passage of smoke-free workplace laws in recent years, but an estimated 30 percent of workers continue to be exposed to ETS, and exposure varies considerably by occupation.[460] Workers in bars and restaurants are among the most highly exposed. A recent study[461] compared the levels of a specific tobacco carcinogen (associated with lung tumors in smokers and ETS-exposed nonsmokers) in nonsmoking workers at bars and restaurants that permitted smoking with levels in workers at smoke-free establishments. The workers exposed to ETS had evidence of the carcinogen in their urine within hours of a workplace exposure, and the level of the chemical increased by approximately six percent for every hour of exposure. The researchers also found that once inhaled, it took up to 45 days for the chemical to leave the body.

A meta-analysis of 22 studies of workplace ETS exposure conducted worldwide provides the strongest evidence to date that ETS exposure in the workplace is associated with increased lung cancer risk.[462] Overall increased relative risk of lung cancer was found to be 20 percent across all workplace types combined, with a two times greater risk among highly exposed workers.

With the passage of numerous smoke-free laws governing public places, however, a growing number of employers are prohibiting smoking in or around the workplace. In an extension of this policy, the National Cancer Institute and the National Institute on Drug Abuse have mandated that conferences and other meetings sponsored by the agencies must be held in smoke-free jurisdictions, unless specific circumstances justify an exception to this policy. The National Institutes of Health is considering whether to expand this policy to all of its Institutes and Centers. Both the American Public Health Association and American Hospital Association also have established this policy.

Individuals and Families

Some individuals and families still permit smoking in the home, in the car, and around children, exposing family members and visitors to significant ETS levels. Changing this situation will require personal action. Of note, 16 states are considering legislation to ban smoking in cars when children are present.[463] Opponents believe these laws are an inappropriate intrusion by government and that this decision should be left to parents. Arkansas, Louisiana, Puerto Rico, and the city of Bangor, Maine have passed such laws. Individuals also can protect themselves and their families from ETS exposure by patronizing smoke-free businesses and voting for smoke-free local and state ordinances.

Part IV

Conclusions, Recommendations, and Research Needs

Conclusions

The President's Cancer Panel has long maintained that participants in the National Cancer Program include not just research institutions, health care entities, and patient advocates, but all of the institutions, organizations, industries, and individuals that by their action or inaction contribute to reducing or exacerbating the national burden of cancer. In large measure, cancer researchers and the acute care health system have been charged, albeit erroneously, with addressing the epidemics of obesity- and tobacco-related cancer morbidity and mortality. They cannot do this without a change in focus, and they cannot do it alone.

Policy decisions that would enable more people to choose cancer risk-reducing behaviors have been limited both in number and scope. Yet cancer control research evidence clearly recognizes the critical need for legislative, policy, and environmental changes to support individual behavior change. The public health infrastructure – which has enormous potential for promoting healthy behaviors – is underdeveloped and undervalued. The important roles of government at all levels, the health care and insurance systems, and entities not usually considered to be participants in the National Cancer Program – the media, city planners, employers, the agricultural system, the educational system, the food, beverage, and restaurant industries, to name only a few – have been underappreciated.

Who is Responsible for What?

Discussions of disease prevention almost inevitably include debate as to the relative responsibilities of the individual and institutions in addressing the issues discussed in this report. The Panel concludes that:

Government and institutions have an obligation to protect the public health. Citizens have the right to expect that the government and other influential institutions will not promulgate and support policies that cause direct harm to health or, by omission, allow harmful circumstances that require institutional intervention to go unaddressed. The power of policy as a behavior change strategy is well recognized and must be applied constructively and thoughtfully to reduce the toll of cancer associated with poor diet, inactivity, and tobacco. Population-level solutions are needed to help resolve the lifestyle-related problems contributing to cancer risk, and it is up to policymakers to authorize and support the implementation of such solutions.

The health care community of researchers, providers, and advocates must coordinate and integrate education and prevention messages related to obesity, diet and nutrition, physical activity, tobacco use, and environmental tobacco smoke exposure with educational efforts related to other diseases that have common risk factors (e.g., diabetes, cardiovascular disease) in order to make the most of available resources and to simplify and harmonize risk reduction messages. The health care community also has an important role in advocating for policy changes and for funding to support treatment and necessary research related to lifestyle factors and cancer.

Individuals – to the best of their ability – have the obligation to seek out and understand information about the risks of poor diet, inactivity, tobacco use, and environmental tobacco smoke exposure and make personal choices to protect their health and that of their families. In addition, individuals need to adopt an activist approach to create political awareness that these issues are important to individuals and families and to create and reinforce political will. For example, individuals must insist that schools provide healthy food for students, that workplaces and public places are smoke-free, and that unhealthy products rejected in this country are not dumped on developing nations.

Making It Happen

The Need for Political Will

All of the issues discussed in this report have suffered to varying degrees from politicization that continues to derail or limit progress toward a healthier population that is less burdened by cancer. We cannot continue to fund tobacco- and obesity-related research, thinking it will solve the problems caused by cancer risk-promoting behaviors and products, and also acquiesce to the demands of the industries that encourage those behaviors and produce those products. Changes in Administration or the appointment of Cabinet secretaries should not cause shifting political winds that result in conflicting policies or policies that limit or undo previous progress toward improved public health.

The leadership of this nation must summon the political will to:

- Be responsible members of the global community and immediately ratify the Framework Convention for Tobacco Control.
- Unmask and resist the tactics of disease vectors (the tobacco, food, and beverage industries) that are at the core of so much of the cancer and other chronic diseases that are sickening and killing Americans by the hundreds of thousands each year.
- Fund tobacco control efforts at least at minimum CDC-recommended levels in each state. With large increases in the Master Settlement Agreement payments to states beginning in 2008, now is an opportune time for states to make this commitment.
- Authorize the Food and Drug Administration (FDA) to regulate tobacco product contents and tobacco product advertising. The Panel recognizes that current FDA resources and infrastructure are insufficient to fulfill this crucial role. Therefore, adequate resources must be appropriated upon granting FDA this authority.
- Accept the rapid reduction and eventual elimination of tobacco use and environmental tobacco smoke exposure as a moral obligation and not export the problem to developing nations.
- Coordinate U.S. agricultural subsidy and public health policy related to diet and nutrition to improve the food supply and help ensure that all people have access to affordable, healthy food.
- Require the elimination of unhealthy foods from school breakfast and lunch programs – government at all levels must cease being a purveyor of unhealthy foods that lead to disease and increased health care costs.

- Enable effective regulation of food advertising, particularly in conjunction with children's television programming and in all other media targeting children. Voluntary efforts by the food and restaurant industries are a step in the right direction, but do not go far enough and lack governmental oversight.

- Fund improvements to the built environment, including sidewalks, safe lighting, playground refurbishment and construction, and neighborhood design that will enable and encourage people to become more physically active.

The Need for Significant Culture Change

The evolution of cultural norms and the exercise of political will are interdependent processes. Political will is necessary to implement policies that contribute to health and lead to changes in normative cultural behaviors. At the same time, political will is molded by public demand, and public demand is driven in part by cultural norms. Experiences with state and local policy changes related to environmental tobacco smoke exposure and other tobacco issues (e.g., taxes, youth access, advertising bans) provide ample lessons that can be applied to help make regular physical activity and healthy food choices the norm rather than the exception.

Public attitudes must be modified through policy, persuasion, and access such that it becomes the norm to be personally committed to a healthy lifestyle, for healthy food options to be readily available and affordable for all, and for tobacco use and tobacco smoke exposure to be viewed as unacceptable. The participation of government, employers, health care providers, media, other thought leaders, and individuals will be important to catalyze and sustain social change in these crucial areas.

The Need to Shift Health Care Emphases toward Disease Prevention

Likewise, the culture of the health care and health insurance systems must shift to a markedly increased emphasis on disease prevention rather than disease treatment. The prevention of disease through lifestyle behavior changes must be appreciated, integrated, and supported financially within the health care and health insurance systems. The ability of the current health care system to keep pace with the rapidly escalating needs for cancer and other chronic disease treatment related to obesity and tobacco use is unsustainable.

The Need for More Unified Efforts among Disease-focused Public and Non-governmental Agencies

The American public continues to be barraged – and confused – by a plethora of health information and recommendations. Myriad public and private agencies, many of them focused on a single disease or health problem, launch public education campaigns with messages that may conflict or be redundant with messages being disseminated by other organizations.

Numerous Federal, state, and prestigious non-governmental agencies have issued recommendations and guidelines and established Web sites with information, personal health tracking tools, and other components designed to help individuals and targeted groups adopt healthier lifestyles. Many, though certainly not all, of these initiatives have been described in these pages. Yet relatively few people are even aware that these recommendations and Web sites exist, in part because their promotion generally is limited and scattershot in approach, and also because their messages are lost in the din of health information "noise."

By focusing on risk factors common to the major chronic diseases affecting the population (e.g., cancer, hypertension, heart disease, diabetes), health promotion messages can be simplified and harmonized to better educate the public about behaviors that will reduce the risk of specific diseases and contribute to overall health and well-being. Such a coordinated approach will allow for a more comprehensive communication approach to the population with a limited number of clear messages.

It also is crucial for public and private sector organizations to optimize available resources by taking full advantage of existing infrastructure. An abbreviated list of resources and infrastructure includes the U.S. Department of Agriculture's Cooperative Extension Service; the National Cancer Institute's Cancer Information Service, network of cancer centers, and cancer surveillance program; research and communications components of other NIH Institutes; programs of the Centers for Disease Control and Prevention, Food and Drug Administration, and Agency for Healthcare Research and Quality; community and other health centers funded by the Health Resources and Services Administration and Indian Health Service; the Department of Education; the Department of Veterans Affairs and active military health care networks; the Federal Trade Commission; numerous academic and non-governmental health, social service, consumer, and industry organizations; and state and local health departments.

These entities should collaborate to the maximum extent possible to establish coordinated, active dissemination efforts designed to reach diverse populations. Such efforts must include fully the segments of the population that lack computer access or do not get health information from this source. These groups include but are not limited to the poor, the elderly, people with physical and mental disabilities, those with limited literacy and/or health literacy, and recent immigrants. To take best advantage of available resources, community services addressing diet and nutrition, physical activity, and tobacco control should be integrated into a cohesive wellness-oriented effort rather than departmentalized. To be most effective, a workforce of regional or local coordinators or "sales representatives" will be needed whose principal role is to promote healthy lifestyles at the community level. These actions will require fiscal commitments, but expenditures can be minimized by leveraging the resources of all participating stakeholders.

Continued Research Needs

Specific cross-cutting research needs remain. Among the most important of these is research on ***behavior change*** – both its dynamics and how to achieve it long term at both individual and population levels. A better understanding of the mechanisms that support individual behavior and cultural change will inform related ***health services research*** (e.g., evaluation of existing and new physical activity and nutrition interventions, studies of the economic savings achieved by companies that implement workplace wellness programs). Similarly, behavioral research will inform and improve research and practice in ***health communications*** to the population in general, and to populations of special vulnerability, such as cancer survivors, youth, women, minorities, and immigrants. Finally, ***policy research*** is required to ascertain how policy can best stimulate and reinforce interventions to encourage lifestyle choices that reduce cancer risk.

As highlighted below and enumerated on pp. 115-116, research still is needed in specific areas related to nutrition and diet, physical activity, and tobacco. This list is not intended to be exhaustive, but summarizes areas of emphasis identified at the Panel's meetings.

Diet, Nutrition, and Physical Activity

Expanded research is needed to understand the influence of specific dietary elements (micronutrients) and/or physical activity in specific cancers, including biologic mechanisms affecting energy balance and cancer. In addition, much remains to be learned about the contribution of specific substances in food (e.g., high fructose corn syrup, food additives, chemicals) to obesity. A better understanding also is needed on the role of energy balance in cancer survivorship, incidence of recurrences and second cancers, and prognosis. All of these areas of research would benefit from improved measurement methods and tools, such as better measures of obesity in children and adults, physical activity, and diet.

Tobacco

We have irrefutable evidence on the addictiveness of tobacco and the lethal and detrimental health effects of tobacco use and smoke exposure. A number of pharmacologic, counseling, and behavioral interventions have been shown to be effective, particularly when used in combination, in helping people quit smoking or using smokeless tobacco products, and in maintaining abstinence. But research still is required, for example, to better understand the mechanisms of physical and psychological addiction to tobacco; some of these findings also may apply to food addictions. In addition, ongoing research is needed to clarify the type, amounts, and toxicity of tobacco constituents and smoke chemistry, to improve methods for quantifying smokers' lung cancer risk under diverse genetic and environmental scenarios, and to evaluate the impact of new tobacco products and tobacco industry marketing efforts on disease and death caused by tobacco use.

Opponents of tobacco product content regulation maintain that tobacco users will smoke more intensely or resort to other behaviors to achieve their accustomed nicotine dosage. Evidence to date shows that these fears are unfounded. However, the Panel believes this evidence should be confirmed through surveillance research on whether regulation has unintended consequences.

The Panel believes strongly that the need for specific types of research should not and must not preclude firm and rapid action to implement in all segments of our population cancer risk-reducing policies and interventions that have been shown to be effective in both the United States and around the world.

President's
Cancer
Panel

Recommendations

Overarching Recommendations

Elected officials, policymakers, and institutions have a moral obligation to protect the public health; they must assert their collective political will to change policies contributing to the obesity epidemic and continued tobacco use, both of which result in increased cancer risk and incidence.

The health care community (i.e., researchers, providers, and advocates) must coordinate and integrate education and prevention messages related to diet, nutrition, physical activity, and tobacco use and exposure with other diseases (e.g., diabetes, heart disease) to make the most of available resources and to simplify and harmonize common risk reduction messages. The health care community also has an important role in advocating for policy changes and funding to support necessary research related to lifestyle factors and cancer.

Individuals – to the best of their ability – must assume personal responsibility for learning about cancer risks associated with obesity and tobacco use in order to make healthy lifestyle choices for themselves and their families. In addition, individuals have an obligation to be proactive through advocacy and voting support to ensure that elected officials and other policymakers understand and are responsive to the public's desire for policies and programs that will enable them to make healthier lifestyle choices.

Diet, Nutrition, and Physical Activity	Responsible Stakeholder(s) and Other Entities
1. Adopt policies and provide funding to improve the built environment to encourage physical activity. For example: • Address safety issues that discourage physical activity. • Plan new communities that encourage physical activity. • Retrofit existing communities to encourage physical activity (e.g., install sidewalks, improve community centers, parks, playgrounds).	• Congress • Department of Housing and Urban Development • State and county legislatures • City planners
2. Coordinate U.S. agricultural subsidy and public health policy related to diet and nutrition to improve the food supply and help ensure that all people have access to affordable, healthy food. Specifically: • Structure farm supports to incentivize/encourage increased production of fruits and vegetables; limit farm subsidies that promote the production of high fructose corn syrup for use in food. • Support healthier food choices by restructuring regulations governing acceptable food choices allowed by the Women, Infants, and Children Program, Headstart, and school lunch programs.	• Congress (via the Farm Bill reauthorization) • Department of Agriculture • Department of Health and Human Services • State and local governments

Diet, Nutrition, and Physical Activity	Responsible Stakeholder(s) and Other Entities
3. Improve access to affordable, healthy foods in urban communities; implement "fair food" policies similar to fair housing policies.	• Department of Agriculture • State governments
4. Regulate and monitor food advertising in media targeting children.	• Food and Drug Administration • Federal Trade Commission • State governments • Food and restaurant industries • Print, broadcast, and other media producers and outlets
5. Reinstate physical education at meaningful levels in grades K-12 and expand physical activity offerings to include individually-oriented activities (e.g., yoga, weight training) that could be maintained for life. Though not an ideal measure, include body mass index (BMI) measurement, as adapted for youth, as part of school physical fitness assessments and provide this information to parents. Parents also should receive information about the relationship of BMI to disease risk and how to decrease BMI through behavioral change.	• Department of Education • Department of Health and Human Services • State and local boards of education
6. Replace unhealthy food choices in school food service facilities and vending machines with healthful foods and beverages. Include information in elementary and secondary school health curricula about the meaning of energy balance and how to read and interpret food labels and other health information related to diet and nutrition.	• Department of Education • Department of Agriculture • State and local boards of education
7. Make nutrition information about restaurant foods readily available on menus and understandable to customers.	• Food and restaurant industries
8. Increase support and incentives for employee wellness (e.g., diet, fitness). Provide healthier choices in workplace food service facilities/vending machines and provide economic subsidies that encourage healthy food choices.	• Employers
9. Provide coverage for nutrition counseling and fitness promotion as part of all comprehensive health benefit packages as an accepted mechanism for reducing risk and preventing disease.	• Health insurance companies • Centers for Medicare and Medicaid Services • Veterans Administration • Civilian Health and Medical Program of the Uniformed Services • Indian Health Service
10. Measure BMI as part of routine physical exams and counsel patients about the meaning of this measurement. Educate patients about the necessity of balancing food intake and physical activity to avoid and reverse obesity.	• Primary care and other health care providers
11. Seek out opportunities to increase personal and family fitness and health.	• Individuals and families

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure	Responsible Stakeholder(s) and Other Entities
1. Ratify and fully implement the Framework Convention for Tobacco Control. Key provisions include: comprehensive bans on tobacco advertising, promotion, and sponsorship, larger and stronger warning labels on tobacco product packaging, provision of tobacco addiction treatment, disclosure of tobacco product ingredients, and public protection against environmental tobacco smoke exposure.	• President • Congress
2. Authorize the Food and Drug Administration (FDA) to strictly regulate tobacco products and product marketing. FDA must receive sufficient funding and personnel to carry out this crucial role.	• President • Congress
3. Increase the Federal excise tax on tobacco products.	• Congress
4. Require all Federal facilities to be smoke-free.	• Congress • Federal agencies
5. Reallocate existing National Cancer Institute, Centers for Disease Control and Prevention, and other Federal resources to better mirror the tobacco-related disease burden and capitalize on and opportunities for progress.	• Congress • Department of Health and Human Services (National Institutes of Health, Centers for Disease Control and Prevention, Health Resources and Services Administration, Substance Abuse and Mental Health Services Administration) • Veterans Administration
6. Add the conduct of meaningful tobacco-related activities to the evaluation criteria for NCI-designated Cancer Centers.	• National Cancer Institute
7. Reduce the influence of the tobacco industry: • U.S. political parties and individual candidates should refuse campaign contributions from the tobacco industry or its subsidiaries. • Prohibit recipients of National Cancer Institute grants and contracts from accepting money from tobacco companies or their subsidiaries. Other Federal agencies should consider similar requirements.	• All U.S. political parties • National Cancer Institute
8. Strengthen anti-tobacco efforts at the state and local levels: • Increase state commitment of Master Settlement Agreement funds and/or tobacco tax funds for tobacco control programs to at least the minimum level recommended by the Centers for Disease Control and Prevention for each state. • Pass smoke-free ordinances for all public and private workplaces and public spaces. • Encourage state governments to further increase tobacco excise taxes to discourage purchase of cigarettes and other tobacco products. • Require all public schools and universities to be 100 percent smoke-free.	• State and local governments

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure	Responsible Stakeholder(s) and Other Entities
• Require state-funded programs (e.g., Medicaid, corrections, mental health) to offer smoking cessation services. • Ensure that all state cancer control plans include a tobacco control component.	
9. Develop and provide evidence-based multimedia curricula and educational materials in grades K-12 on the dangers of tobacco use and tobacco smoke exposure and the role of the tobacco industry in promoting tobacco use. Encourage colleges and universities to disseminate tested anti-tobacco messages for the 18 to 24 year-old age group through campus radio and television stations, Web sites, and print publications.	• Department of Health and Human Services (National Institutes of Health, Centers for Disease Control and Prevention, Food and Drug Administration) • State and local boards of education • Non-governmental organizations
10. Cease including images of smoking in movies, television, music videos, video games, and other visual media with child, adolescent, and young adult audiences.	• All visual media producers
11. Prohibit smoking in and around the workplace. Support worker efforts to quit smoking; provide incentives for cessation.	• Employers
12. Make coverage of tobacco use cessation services and medications a standard benefit in all comprehensive health benefit packages.	• Health insurance companies • Centers for Medicare and Medicaid Services • Veterans Administration • Civilian Health and Medical Program of the Uniformed Services • Indian Health Service
13. Incorporate smoking cessation services into the comprehensive care of cancer patients, survivors, and their family members.	• Cancer centers • Academic and community hospitals and medical centers • Private oncology offices/practices • All publicly-funded clinics and health centers
14. Adopt the Agency for Healthcare Research and Quality *Guidelines for Clinicians Treating Tobacco Use and Dependence* as part of the standard of care for all health care providers.	• Primary and other health care providers
15. Quit smoking and use of any smokeless tobacco products. Prohibit smoking in the home and car. Protect children from exposure to smoking in movies and smoking role models. Patronize only smoke-free restaurants and other businesses.	• Individuals and families

Research Needs

Cross-Cutting

Conduct research on:

- Interrelationships of multiple lifestyle factors and the dynamics and mechanisms of achieving/maintaining behavior change in individuals and populations.
- Health services utilization, including data collection and studies of the economic savings achieved by companies that implement workplace wellness programs; evaluation of existing and new physical activity, nutrition, and tobacco prevention and cessation interventions.
- Health communications (e.g., to the population in general, and to populations of special vulnerability, such as cancer survivors, youth, racial/ethnic minorities, immigrants).
- The impact of poverty, gender, and race/ethnicity across the life span to support intervention development and reduce health disparities.
- Policy-related interventions that would improve the effectiveness of programmatic or therapeutic interventions.
- How current and emerging communication technologies (e.g.,V-chip) can be used to minimize media exposure to images of smoking and advertising for unhealthy foods.
- Data collection to document health status improvements and cost savings due to lifestyle behavioral interventions.

Diet, Nutrition, and Physical Activity

Expand research on:

- The influence of dietary elements, weight loss, and/or physical activity on cancer biomarkers, preneoplastic changes, and incidence of specific cancers, including biological mechanisms linking energy balance and cancer.
- "Fitness genes," other gene pathways, and biomarkers that influence the effect of physical activity on cancer risk and identify population subgroups that will benefit the most from increased activity to reduce cancer risk.
- Mechanisms of food addiction and possible parallels to other addictions.
- The role of energy balance in cancer survivorship (e.g., prognosis, recurrence, survival, comorbidities, and quality of life).
- Mechanisms involved in protective effects of physical activity on cancer recurrence and mortality and on improved function following cancer treatment; cardiac rehabilitation may serve as a model for resultant programs.
- The relationship between socioeconomic position and obesity.
- The impact of the built environment on physical activity.
- The role of high fructose corn syrup, food additives, and chemicals in obesity.
- Intervention studies to inform prediction of the impact of physical activity on cancer risk.
- Tools for measuring diet, physical activity, and obesity (e.g., BMI).

Tobacco Use Prevention and Treatment; Environmental Tobacco Smoke Exposure

Government and the non-profit and private sectors should collaborate as appropriate to design and conduct anti-tobacco campaigns, particularly targeting vulnerable populations (e.g., 18 to 24 year-olds, the poor, low literacy populations).

Require the collection of information on smoking status and exposure to environmental tobacco smoke on participants in all federally-sponsored clinical trials.

Key Federal research agencies/sponsors (e.g., National Cancer Institute; National Heart, Lung, and Blood Institute; National Institute on Drug Abuse; Centers for Disease Control and Prevention) addressing diseases caused by tobacco use and tobacco smoke exposure should have an intramural tobacco research program.

Sponsor research on:

- Communication interventions needed to further strengthen public attitudes that smoking is unacceptable.
- The dynamics and mechanisms of behavior change relevant to tobacco use prevention and cessation, including studies specific to particularly vulnerable populations such as the poor, ethnic/racial minorities, individuals with low literacy levels, persons with mental illness and/or addictions, active military and veterans, cancer survivors, and individuals with comorbid conditions.
- How current and emerging communications technologies can be used to reduce exposure to media images of smoking and other detrimental lifestyle behaviors.
- Biochemical mechanisms of nicotine addiction to inform the development of more effective treatment strategies.
- Methods of assessing the type, amounts, and toxicity of constituents in cigarettes and other tobacco products and measures to evaluate smoke chemistry, human toxicant exposure, harm, and addiction.
- Methods for quantifying individual smokers' risk of lung cancer based on combinations of genetic and environmental variables.
- Policy-related interventions that would improve the effectiveness of tobacco control interventions.
- The impact of changes in tobacco industry products and marketing strategies/tactics on tobacco use initiation and related cancer morbidity and mortality both in the U.S. and globally.

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Appendix A

Participant Roster
President's Cancer Panel Meetings
2006-2007
Promoting Healthy Lifestyles to Reduce the Risk of Cancer

September 11, 2006
University of Minnesota Cancer Center — Minneapolis, MN

Name	Affiliation
Lance Armstrong	President's Cancer Panel
Rachel Ballard-Barbash, M.D., M.P.H.	National Cancer Institute
Leslie Bernstein, Ph.D.	Keck School of Medicine and USC/Norris Comprehensive Cancer Center
Tim Byers, M.D., M.P.H.	University of Colorado Comprehensive Cancer Center
Kathy Cunningham, M.Ed., R.D., L.D.N.	Boston Public Health Commission
Gregory Curt, M.D.	CEO Roundtable
Deborah Galuska, Ph.D., M.P.H.	Centers for Disease Control and Prevention
Alvaro Garza	Snack Essentials
Robert Jeffery, Ph.D.	University of Minnesota
John Kersey, M.D.	University of Minnesota
Margaret Kripke, Ph.D.	President's Cancer Panel
LaSalle D. Leffall, Jr., M.D., F.A.C.S.	President's Cancer Panel, Chair
James Levine, M.D., Ph.D.	Mayo Clinic College of Medicine
Abby Sandler, Ph.D.	President's Cancer Panel, Executive Secretary National Cancer Institute
Kathryn Schmitz, Ph.D., M.P.H.	University of Pennsylvania School of Medicine
M. L. Slattery, Ph.D., M.P.H.	University of Utah School of Medicine
Paul Stitt, M.S., C.N.S.	Nutritional Resource Foundation
Doug Ulman	Director's Consumer Liaison Group

October 23, 2006
University of Kentucky — Lexington, KY

Name	Affiliation
Lance Armstrong	President's Cancer Panel
Michele Bloch, M.D., Ph.D.	National Cancer Institute
Frank Chaloupka, Ph.D.	University of Illinois at Chicago
Richard Clayton, Ph.D.	University of Kentucky
Alfred Cohen, M.D., F.A.C.S.	University of Kentucky
Susan Curry, Ph.D.	University of Illinois at Chicago
Gary Giovino, Ph.D., M.S.	State University of New York at Buffalo
Cynthia Hallett, M.P.H.	Americans for Nonsmokers' Rights
Melissa Hudson, M.D.	St. Jude Children's Research Hospital
Corinne Husten, M.D., M.P.H.	Centers for Disease Control and Prevention
Teresa Ann Isaac	City of Lexington, Kentucky
Margaret Kripke, Ph.D.	President's Cancer Panel
Kiyoung Lee, Sc.D., M.P.H.	University of Kentucky
LaSalle D. Leffall, Jr., M.D., F.A.C.S.	President's Cancer Panel, Chair
Matthew Myers, J.D.	Campaign for Tobacco-Free Kids
Abby Sandler, Ph.D.	President's Cancer Panel, Executive Secretary National Cancer Institute
James Sargent, M.D.	Dartmouth-Hitchcock Medical School
Lee Todd, Jr., Ph.D.	University of Kentucky
Donna Vallone, Ph.D.	American Legacy Foundation
Everette Varney	City of Georgetown, Kentucky

December 5, 2006
Oregon Health & Science University Cancer Institute — Portland, OR

Name	Affiliation
Grover Bagby, Jr., M.D.	Oregon Health & Science University
Eugenia Calle, Ph.D.	American Cancer Society
Karen Glanz, Ph.D., M.P.H.	Emory University
Peter Greenwald, M.D., Dr.P.H.	National Cancer Institute
David Heber, M.D., Ph.D.	University of California, Los Angeles
Danielle Killpack	Nike, Inc.
Margaret Kripke, Ph.D.	President's Cancer Panel
Lawrence Kushi, Sc.D.	Kaiser Permanente
LaSalle D. Leffall, Jr., M.D., F.A.C.S.	President's Cancer Panel, Chair
Jonathan Lever, M.Ed., J.D.	YMCA of the USA
Anne McTiernan, M.D., Ph.D.	Fred Hutchinson Cancer Research Center
Dwayne Proctor, Ph.D., M.A.	Robert Wood Johnson Foundation
LaDonna Redmond	Institute for Community Resource Development
Kenneth Reed, Ed.D., M.S.	PE4life
Abby Sandler, Ph.D.	President's Cancer Panel, Executive Secretary National Cancer Institute
Kerri Winters-Stone, Ph.D.	Oregon Health & Science University

February 12, 2007
University of Mississippi Medical Center — Jackson, MS

Name	Affiliation
Lance Armstrong	President's Cancer Panel
K. Michael Cummings, Ph.D., M.P.H.	Roswell Park Cancer Institute
Richard Daynard, J.D., Ph.D.	Northeastern University School of Law
Pebbles Fagan, Ph.D., M.P.H.	National Cancer Institute
Joe Files, M.D., F.A.C.P.	University of Mississippi Medical Center
Anita Gaillard	Indiana Tobacco Prevention and Cessation Agency
Stanton Glantz, Ph.D.	University of California, San Francisco
Ellen Gritz, Ph.D.	The University of Texas M. D. Anderson Cancer Center
Dorothy Hatsukami, Ph.D.	University of Minnesota
Jack Henningfield, Ph.D.	Pinney Associates
Daniel Jones, M.D.	University of Mississippi Medical Center
Margaret Kripke, Ph.D.	President's Cancer Panel
LaSalle D. Leffall, Jr., M.D., F.A.C.S.	President's Cancer Panel, Chair
Cathy Melvin, Ph.D., M.P.H.	Smoke-Free Families
Thomas Payne, Ph.D.	University of Mississippi Medical Center
Alexander Prokhorov, M.D., Ph.D.	The University of Texas M. D. Anderson Cancer Center
Abby Sandler, Ph.D.	President's Cancer Panel, Executive Secretary National Cancer Institute
Margaret Spitz, M.D., M.P.H.	The University of Texas M. D. Anderson Cancer Center (written testimony)
Doug Ulman	Director's Consumer Liaison Group
Douglas Ziedonis, M.D., M.P.H.	University of Massachusetts Medical School

Appendix B Obesity Measurement

Overweight and obesity usually are assessed by determining an individual's body mass index (BMI), a measure of weight relative to height. BMI is computed as:

$$\text{weight (lbs.)}/\text{height}^2\ \text{(in.)} \times 703$$

BMI correlates reasonably well to direct measures of body fat, and is used to screen for weight categories associated with health problems. For adults aged 20 years and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women (Table 12).

Table 12 Body Mass Index Scores – Adults

	Normal						Overweight					Obese										Extreme Obesity					
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Height (in)	Weight (lbs)																										
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167	172	177	181	186	191	196	201	205	210	215
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173	178	183	188	193	198	203	208	212	217	222
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179	184	189	194	199	204	209	215	220	225	230
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185	190	195	201	206	211	217	222	227	232	238
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191	196	202	207	213	218	224	229	235	240	246
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197	203	208	214	220	225	231	237	242	248	254
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204	209	215	221	227	232	238	244	250	256	262
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210	216	222	228	234	240	246	252	258	264	270
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216	223	229	235	241	247	253	260	266	272	278
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223	230	236	242	249	255	261	268	274	280	287
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230	236	243	249	256	262	269	276	282	289	295
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236	243	250	257	263	270	277	284	291	297	304
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243	250	257	264	271	278	285	292	299	306	313
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250	257	265	272	279	286	293	301	308	315	322
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258	265	272	279	287	294	302	309	316	324	331
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265	272	280	288	295	302	310	318	325	333	340
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272	280	287	295	303	311	319	326	334	342	350
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279	287	295	303	311	319	327	335	343	351	359
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287	295	304	312	320	328	336	344	361	369	377

Source: Adapted from *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.*

BMI is not an ideal measure, however, in that it does not differentiate fat from bone mass or lean muscle, nor does it assess fitness. Consequently, an athlete who has a low percentage of body fat but a high percentage of lean muscle might erroneously be identified as overweight. Similarly, a person whose BMI indicates a normal or low normal weight might have a high percent body fat but little lean muscle.

The accuracy of BMI also is affected by gender and age. For example, women tend to have more body fat than men with the same BMI, and older people tend to have more fat than younger adults with the same BMI.

BMI also is not ideally suited for use with children and adolescents as it does not reflect developmental stages in youth that can affect significantly the ratio of fat to muscle and bone. To make the BMI score more useful for this population, it is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the United States. The percentile indicates the relative position of the child's BMI number among children of the same sex and age. The growth charts show the weight status categories used with children and teens (underweight, healthy weight, at risk of overweight, and overweight). BMI-for-age weight status categories and the corresponding percentiles are shown in Table 13.

Despite its limitations, BMI continues to be used because it provides a basic measure of body fatness and can be assessed quickly and inexpensively by clinicians or individuals.

Table 13 **BMI Weight Status Categories – Children and Teens**

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
At risk of overweight	85th to less than the 95th percentile
Overweight	Equal to or greater than the 95th percentile

Sources: Centers for Disease Control and Prevention. "Body Mass Index – About BMI for Adults." At: http://www.cdc.gov/nccdphp/dnpa/bmi/index.htm (accessed 4/6/07)

Centers for Disease Control and Prevention. "Body Mass Index – About BMI for Children and Teens." At: http://www.cdc.gov/nccdphp/dnpa/bmi/childrens_BMI/about_childrens_BMI.htm (accessed 4/6/07)

Appendix C Index of Acronyms and Organizations

ACS	American Cancer Society
AHRQ	Agency for Healthcare Research and Quality
ASSIST	American Stop Smoking Intervention Study
BMI	Body Mass Index
BRFSS	Behavioral Risk Factor Surveillance Survey
CCC	Comprehensive Cancer Control Plan
CDC	Centers for Disease Control and Prevention
CHAMPUS	Civilian Health and Medical Program of the Uniformed Services
CSA	Community-supported Agricultural Program
CMS	Centers for Medicare and Medicaid Services
DOJ	Department of Justice
ETS	Environmental Tobacco Smoke
FDA	Food and Drug Administration
FMNV	Foods of Minimal Nutritional Value
FTC	Federal Trade Commission
FCTC	Framework Convention on Tobacco Control
GERD	Gastroesophageal Reflux Disease
HFCS	High Fructose Corn Syrup
HHS	Department of Health and Human Services
HRSA	Health Resources and Services Administration
IARC	International Agency for Research on Cancer
IHS	Indian Health Service
IOM	Institute of Medicine
IU	International Unit
MSA	Master Settlement Agreement
MTF	Monitoring the Future
MPAA	Motion Picture Association of America
NCI	National Cancer Institute
NCSL	National Conference of State Legislatures
NEAT	Non-exercise Activity Thermogenesis
NEMS	Nutrition Environment Measures Survey
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
NHLBI	National Heart, Lung, and Blood Institute
NIDA	National Institute on Drug Abuse
NIH	National Institutes of Health

NRT	Nicotine Replacement Therapy
PAC	Political Action Committee
PCP	President's Cancer Panel
RWJF	Robert Wood Johnson Foundation
SPARK	Sports, Play, and Active Recreation for Kids
SAMHSA	Substance Abuse and Mental Health Services Administration
ST	Smokeless Tobacco
TREC	Transdisciplinary Research on Energetics and Cancer
TTP	Tobacco Treatment Program
USDA	U.S. Department of Agriculture
VA	Veterans Administration
VHA	Veterans Health Administration
WIC	Women, Infant, and Children Program
YMCA	Young Men's Christian Association
YWCA	Young Women's Christian Association

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