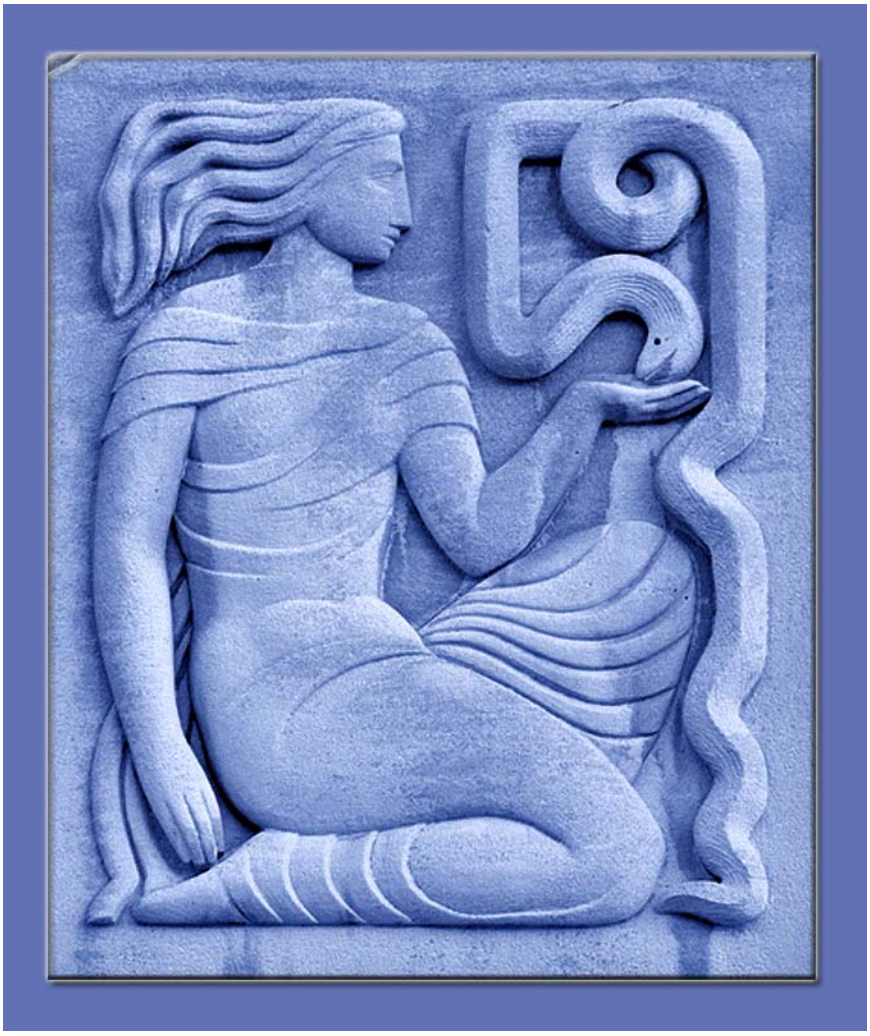
The Economic Impact of Prevention



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The Center for Public Health and Health Policy (CPHHP) was established as a University-wide Center in 2004. It serves as "the central organizing and implementing force in public health for teaching, research, and service activities…that…will enable the University to speak with one voice to any and all interested agencies and other constituencies regarding established or new needs in public health education and research of significance for all of our citizens throughout the State and the region." *(President Philip Austin, November, 2005)*

On the Cover: Hygeia, Greek goddess of prevention

Prepared By:

Brian L. Benson, MPP
Eileen Storey, MD, MPH
Charles G. Huntington, III, PA, MPH
Mary U. Eberle, JD
Ann M. Ferris, PhD, RD

University of Connecticut
Center for Public Health and Health Policy

The Economic Impact of Prevention

Executive Summary

From 2005 to 2006, U.S. health care spending increased 6.7 percent to $2.1 trillion, or $7026 per person. The most recent state estimates show that in 2004, total health care spending in Connecticut was over $22 billion or $6,344 per person, which at that time was 20 percent higher than the national average. Health care spending in the United States is expected to continue to increase during the next decade, and is estimated to reach $4.3 trillion in 2017, or $13,101 per person. If health care spending in Connecticut continues to exceed national estimates by 20 percent, it could reach $26.4 billion in 2017, or $15,721 per person.

While U.S. per capita health spending is the highest in the world, U.S. health outcomes lag behind those of most other industrialized countries. High health care costs in the face of suboptimal health outcomes suggest that the U.S. is getting poor value for its health care dollar. In contrast, a large body of evidence from a wide variety of sources suggests that investments in prevention produce value in health care spending, increased productivity and improved quality of life.

In an effort to contribute to current dialogue regarding health system reform, the Center for Public Health and Health Policy at the University of Connecticut reviewed the existing evidence on the effectiveness and cost-effectiveness of disease and injury prevention and health promotion. In economic terms, the Center's task was to elucidate the nature and extent of the evidence that demonstrates cost-effectiveness of disease and injury prevention programs and clinical prevention services.

Evidence clearly demonstrates the health benefits and economic value of prevention. The impact of benefit and value is greatest when prevention is implemented at the earliest opportunity.

Key Findings:

- Evidence clearly demonstrates the health benefits and economic value of prevention. The impact of benefit and value is greatest when prevention is implemented at the earliest opportunity.

- Primary prevention forestalls or blocks the onset of disease, thereby avoiding or delaying the costs associated with treatment and lost function. For example, immunizations reduce the transmission of infectious diseases and thereby reduce the costs associated

with treatment and other economic effects (e.g., reduced wages and productivity) of acquired disease.

- Secondary prevention takes the form of the early detection of asymptomatic diseases through screening. Early detection enables the interruption of the disease process at a point when treatment costs are less, when health and functioning can be preserved or more fully restored, and when related costs such as work absence are less. For example, cholesterol screening identifies asymptomatic persons at increased risk of coronary artery disease, which when untreated leads to significant increases in preventable death, disability, and medical expenditures.

- Tertiary prevention services intervene when a disease or injury has already occurred. Tertiary prevention seeks to limit relatively expensive hospitalizations and improve quality of life through the effective management of symptoms. Disease management programs have emerged as the cornerstone of tertiary prevention.

- Besides the traditional three dimensions of primary, secondary, and tertiary, prevention and health promotion interventions occur across a risk-reduction continuum that includes individualized interventions, clinician-directed services, and community- and employer- based strategies. For example, primary prevention of type II diabetes might include a built environment that facilitates walking, biking, and other safe opportunities for exercise in the community, and individualized and workplace exercise and diet programs. The secondary prevention of diabetes might include screening for early detection and diet and exercise counseling to delay onset. Tertiary prevention might include a disease management program to prevent serious complications of diabetes such as blindness and amputation.

At the individual level prevention entails making healthy choices as a result of education and an environment that influences and supports good choices.

- At the individual level prevention entails making healthy choices as a result of education and an environment that influences and supports good choices. Smoking, poor diet coupled with physical inactivity, and alcohol consumption were the leading actual causes of mortality in the United States in 1990 and again in 2000 and are significant drivers of health care utilization. Prevention programs and interventions are effective in supporting and encouraging healthy behaviors.

- Health care and health spending are not distributed uniformly in Connecticut, resulting in severe health disparities by race/ethnicity, income, education, and geographic location. Maintaining or improving the health of all state residents in coming years will require investments in prevention, particularly at the population level that encourage and support healthy behaviors, reverse or slow growth in rates of chronic diseases, and improve service delivery for underserved populations. Specific strategies need to be

developed that effectively deliver preventive services to, improve the health of, and support healthy behaviors among, minority populations.

- Connecticut neither maximizes investment in prevention nor receives optimal benefits of prevention for state-covered populations (e.g., state employees, persons covered by Medicaid, and the uncompensated care pool). Improved delivery of prevention programs and services is possible despite existing regulatory and structural restrictions.

Throughout the course of the Center's investigation, many questions arose. Most notably:

- What is the impact of growing burdens of chronic disease on health spending?
- Which characteristics of our health system constitute barriers to the implementation of prevention programs?
- What are the implications of universal health insurance coverage for prevention and vice versa?

Chronic disease

Chronic diseases have emerged as the major drivers of health care costs, as well as associated economic losses. The explosion in the rates of chronic diseases that intensify treatment levels and escalate spending is in large part due to unhealthy behaviors. Medical advances have also increased survival into old age resulting in many elderly people living with multiple chronic conditions. However, many chronic diseases are amenable to primary, secondary, and tertiary prevention services. The burden of chronic diseases such as heart disease, cancer, depression, hypertension, and type II diabetes could be greatly reduced if proven clinical and community preventive measures were fully implemented.

Structural frameworks

Controlling the growth of future health costs rests on the ability to prevent proactively, detect early, and manage well the diseases that drive health care costs.

The Center's analysis of the cost-effectiveness of prevention services is driven by three fundamental characteristics of the U.S. health care system. First, the U.S. lags behind most other developed nations in regard to the effectiveness and efficiency of its health care system. Second, significant disparities in specific measures of health, life expectancy, and quality of life exist along the lines of gender, race and ethnicity, income, education, geography, disability status, and sexual orientation. And, third, the flow of resources in the U.S. health care system is heavily skewed toward the diagnosis and treatment of disease and injury. The market forces that drive the current health care system produce medical care rather than healthy individuals and populations.

Implications of universal health insurance

Prevention is an integral part of the discussion as the United States moves toward universal health insurance. Current efforts in Connecticut to address the lack of coverage for over 350,000 residents create both an opportunity and a need to invest in a health system with a focus on prevention. Only a health system that enhances access to proven disease prevention and health promotion services has the potential to control costs and improve health outcomes in the long term.

As the evidence described in this report indicates, getting the most value for the U.S. health care dollar requires shifting the focus from medical treatment to population-based prevention. Controlling the growth of future health costs rests on the ability to prevent proactively, detect early, and manage well the diseases that drive health care costs.

Currently, prevention strategies that have proven effectiveness and provide value for the dollar are implemented at suboptimal levels. Thus, ample opportunities for improvement exist within the current U.S. health care system, even while working toward comprehensive reforms that support full implementation of prevention.

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Introduction

Health can be viewed from the perspective of the individual or the population. Individual health is typically measured in terms of the absence of disease or illness, while population health is generally measured in terms of life expectancy, functional capacity, and prevalence of disease in a group or community. Individual health services occur through diagnosis and treatment of individual patients, while population health services seek improvement in the conditions necessary for health for everyone in the community.[1] Population-based prevention, a prevention strategy in the vein of traditional public health, attempts to remove the underlying causes of disease, i.e., attempting to control the determinants of incidence and shift the whole distribution of exposure in a favorable direction.[2]

Prevention has become an increasingly important concern in light of the reemergence of universal health insurance as a priority issue among state and federal policymakers. Any expansion of health insurance coverage requires overcoming difficult obstacles in the current health care marketplace, including increasing health care costs and a shrinking base of employer-sponsored health insurance. Current efforts in Connecticut to address the lack of coverage for over 350,000 residents create an opportunity to invest in a health system with a focus on prevention, i.e., a health system that enhances access to proven disease prevention and health promotion services. Such a system has the potential to cost less and improve health outcomes in the long term.

Current efforts in Connecticut to address the lack of coverage for over 350,000 residents create an opportunity to invest in a health system with a focus on prevention.

The United States has long recognized the importance of population-based prevention at the federal level. The federal government's recent leadership in prevention is most notably associated with its *Healthy People* initiative. *Healthy People* was initiated by the U.S. Department of Health and Human Services (HHS) to identify opportunities to improve the health of all Americans through prevention. HHS first published *Healthy People 2000* in 1990 and then followed with *Healthy People 2010* in 2000. The goals of *Healthy People 2010* are to increase the quality and years of healthy life and to eliminate health disparities. These goals are supported by 467 specific objectives in 28 focus areas that range from diseases (e.g., cancer, diabetes) to behaviors and lifestyle factors (e.g., tobacco use, physical fitness) to specific components of the health system (e.g., public health infrastructure).[3]

A midcourse review published in 2006 found that 59 percent of the objectives had been fully or partially met, but for 26 percent of the objectives no change or negative progress had occurred.[4] The areas of poorest performance include substance abuse, nutrition and overweight, mental health and mental disorders, and chronic kidney disease. While some progress has been achieved in some objectives related to increasing quality and years of healthy life, progress has not occurred in eliminating health disparities.[5] Continued commitment to prevention and health promotion at the federal level is required to meet all *Healthy People 2010* goals and objectives, but evidence to date suggests that achieving progress in all focus areas and reducing health

disparities may require using different, more effective, and perhaps as yet undeveloped preventive strategies and programs.

The State of Connecticut followed the federal government's lead with the launch of *Healthy Connecticut 2000* in 1994. It applies some of the national goals in *Healthy People 2000* to Connecticut's population based on nineteen priority areas, many of which are amenable to disease prevention and health promotion.[6] The priority areas are grouped under four headings, which include Health Promotion, Health Protection, Preventive Services, and Surveillance and Data Systems. The *Healthy Connecticut 2000 Final Report*, published in 2005, documents improvement in many of the priority areas and recommends increased public health efforts in others, including tobacco use; diet, physical activity, and overweight; infectious and vaccine-preventable diseases; low birth weight; and environmental health.

Despite federal and state recognition of the importance of prevention and the documented progress toward many of the goals and objectives in *Healthy People 2010* and *Healthy Connecticut 2000*, the investment in prevention and health promotion in the United States and in Connecticut pales in comparison to the expenditures for diagnostic and treatment services. Health spending on treatment claims 90 percent of our health care dollar while less than 2 percent focuses on population-based prevention.[7] The lack of investment in disease prevention is reflected in the fact that only 49 percent of adults in the U.S. received recommended screening and preventive care in 2002 despite well-documented benefits,[8] and life expectancy decline relative to the national average in areas with high rates of chronic diseases related to smoking, overweight and obesity, diabetes, and high blood pressure.[9]

The United States has led the world in total health expenditures per capita and in the rate of health spending as a percentage of Gross Domestic Product (GDP) during the past two decades.[10] Despite this level of health spending, the United States ranks in the lower third of developed nations for most indicators of health status,[11] and last among nineteen industrialized countries in deaths that would have been avoided in the presence of effective health care.[12] The available evidence indicates that the United States is getting poor value for its health care spending.

Compared to other states, Connecticut places a particularly low priority on prevention. State per capita spending on population health interventions (including prevention of epidemics, protection against environmental hazards, injury prevention, promotion of disease control, encouragement of healthy lifestyles, disaster preparation, disaster response, and health infrastructure) ranks 44th in the country.[13] In contrast, Connecticut's performance on various measures of population health compares favorably with other states, although state comparisons in population health occur in the context of the relatively poor national health status of the United States. Additionally, buried in Connecticut's relatively high health status measures are some of the most extreme variations; i.e., health disparities. Thus, even for states with relatively good health status measures, substantial opportunities exist for improved health status and cost savings from a greater investment in prevention.

Despite clear evidence that prevention interventions forestall or block the onset of disease and thereby increase quality of life and lifespan, the extant disease prevention and health promotion efforts lack the urgency of more emergent medical needs. While preventive services are not

without their own costs, many preventive services yield potential cost savings. For example, in 2004 the National Committee for Quality Assurance (NCQA) identified 21,000 excess cases of osteoporosis-related fractures, 20,000 excess cases of late-stage colorectal cancer, and 7,600 excess cases of late-stage breast cancer that could have been averted with timely preventive care. Doing so would have saved $485.2 million in excess medical expenses.[14]

This paper identifies preventive interventions that are both effective in improving health status and quality of life and produce value for the dollar. Many of the interventions also provide opportunities to reduce lifetime health costs. This paper is intended to inform decisions regarding the allocation of resources toward health services that are effective as well as cost-effective. The potential impact of increased investment in prevention for the State of Connecticut is highlighted, particularly for populations that generally rely on the state for health care and health insurance, i.e., state employees and persons covered by Medicaid. Evidence is presented to support the transformation of our health system into one that prioritizes population-based prevention wherever it occurs, including individualized interventions, clinician-directed activities, community-based strategies, and population level approaches.

Economic Methods

Effectiveness studies, simulation modeling, and economic evaluations provide systematic and evidence-based frameworks for making decisions about funding for prevention interventions.[15] Effectiveness studies examine whether a specific intervention works in a community setting or practice environment, as opposed to bench research or a clinical study. Simulation modeling is a well-accepted alternative to effectiveness studies when data are not available from long-term intervention studies. Economic evaluations summarize the expected benefits, harms, and costs of implementing a specific strategy. When properly used in the health sphere, economic studies complement the evidence on the effectiveness of interventions.

Four main methods are used in economic evaluation of health programs: cost analysis, cost-effectiveness analysis, cost-utility analysis, and cost-benefit analysis. In cost-analysis, the costs of a program or intervention are identified or estimated, which allows calculation of unit costs, but does not provide information about program effectiveness or a direct measure of benefits. Cost-benefit analyses compare program costs and benefits over a period of time and are expressed in dollars as an aid in determining the best resource investments; however, there are practical and ethical issues in placing monetary value on health outcomes, including human life, that limit its widespread use. Thus, cost-effectiveness analysis and cost-utility analysis have become the predominant methods of economic evaluation used in health (including prevention) studies because they provide information on program costs and effectiveness/benefits but do not require health outcomes to be valued in monetary units.

Cost-effectiveness analysis and cost-utility analysis use a ratio that compares the costs and financial benefits of the intervention, including the costs of side effects and the savings from avoided illness and disability, to the health effects of the intervention, which is usually expressed as either a life year gained or saved (for cost-effectiveness analysis) or a quality-adjusted life year (QALY) gained or saved (for cost-utility analysis). [16,17,18] A quality-adjusted life year takes into account factors such as pain and disability. Both medical and non-medical costs (e.g., lost

productivity, transportation) associated with the intervention or illness are included in the ratio. In performing cost-effectiveness analysis and cost-utility analysis most researchers use discounting to account for the time value of money (inflation).[19] Comparisons of cost-effectiveness/utility ratios for different services are used to determine which services require the fewest dollars to produce the same unit of health. The lower the number, the more cost-effective the intervention.

Figure 1: Cost-Effectiveness Ratio

$$CE = \frac{\text{Cost with intervention} - \text{Cost without intervention}}{\text{Outcome with intervention} - \text{Outcome without intervention}}$$

A medical intervention is considered cost-effective when the intervention provides a health benefit at an acceptable cost. While the idea of "acceptable cost" is debated, the commonly accepted range of values for determining the cost-effectiveness of an intervention is $50,000 to $100,000 per life year or QALY gained. Historically, an intervention estimated at $50,000 or less per life year/QALY gained is considered a bargain, less than $100,000 is considered reasonable, and over $100,000 is considered a poor value. While competent researchers account for inflation in their estimates when possible, the generally-accepted cost-effectiveness thresholds have not increased in 25 years,[20, 21] thus they should be considered conservative estimates.

Prevention: Constructs and Cost-Effectiveness

Prevention is commonly divided into three dimensions: primary, secondary, and tertiary. Each dimension is essential to the health of populations and individuals. Primary prevention largely takes place in the societal domain, secondary prevention within health care and in other institutions such as schools and workplaces, and tertiary prevention is a component of good clinical care. The distinct boundaries of the traditional dimensions of prevention are blurring as medical practices and public/population health strategies evolve. Prevention and risk reduction are taking place across a continuum that includes individuals, communities, and clinical settings. However, separation of prevention into its traditional dimensions helps in understanding and organizing discussions of the effectiveness and cost-effectiveness of particular preventive interventions.

Primary prevention seeks to avert the occurrence of a disease or injury. Many of the most cost-effective primary prevention interventions occur at the population level.

Primary prevention:

Primary prevention seeks to avert the occurrence of a disease or injury. It includes clean water and air, safe and nutritious food, safe home and work environments, violence-free communities, safe transportation systems, and a public educated in the pursuit of good health. Many of the most cost-effective primary prevention interventions occur at the population level.

Several very important primary prevention activities occur in health care settings and are commonly provided by primary care providers. For example, immunizations prevent a host of deadly or debilitating diseases, and it could be argued that the development of vaccines and immunizations are some of the most important medical advances in human history. Primary care providers are well-positioned to provide referrals and to connect patients to primary prevention resources available in the community, and evidence shows a positive association between primary care and the provision of preventive services.[22]

Promoting healthy behaviors is an important component of primary prevention. Public information campaigns that encourage people to be physically active, avoid tobacco, and consume nutritious foods play vital roles in preventing disease and improving quality of life. Health promotion is also effective in community, school, and health care settings. For example, since 1991, U.S. teenage pregnancy, abortion, and birth rates have declined steadily in every age and racial/ethnic group. Teen pregnancy rates (per 1,000) in Connecticut dropped from 107 (per 1,000 teens) in 1988 to 70 (per 1,000 teens) in 2000.[23] The majority of this decrease is the result of improved contraceptive use,[24] which resulted from health promotion activities.

Economic and health policies also play a role in primary prevention. For example, the federal food stamp program has increased access to healthy food and provided consumer education to support healthy diets. The Special Supplemental Nutrition Program for Women, Infants, and Children, commonly known as the WIC program, is also oriented toward prevention. During critical periods of child development, WIC provides supplemental diets with nutritious foods, offers nutrition education and counseling, and provides referrals to health care providers and social services agencies, through which medical and developmental problems can be prevented, addressed at an early stage, or treated.

Another example of an economic policy with primary prevention implications occurred in Poland in the 1990s. A sharp reduction in heart disease deaths between 1991 and 1998 was attributed to a shift in consumption from animal (saturated) fats to vegetable (unsaturated) fats and increased consumption of fruits and vegetables after government subsidies for purchases of foods derived from animal sources ended.[25]

Environmental health factors play a central role in human development, health status, quality of life, and the safety of communities. Some of the components of environmental health include community design to encourage physical activity and reductions in environmental hazards such as exposure to toxic substances. For example, the elimination of lead in paint, gasoline, and other consumer products has reduced lead exposure among infants and children and resulted in healthier neurological development.[26]

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Primary prevention interventions in the workplace reduce the likelihood of death, injury, or illness.

Primary prevention interventions in the workplace reduce the likelihood of death, injury, or illness. For example, ergonomic interventions reduce the likelihood of musculoskeletal disorders caused by repetitive motions or poor design, and the use of less toxic materials, engineering controls, or personal protection such as respirators reduces exposure to harmful chemicals and gases. Noise reduction helps prevent hearing loss. Worksite stress reduction programs and improvements in work organization contribute to the prevention of hypertension, heart disease, and mental health problems.

Table 1 lists selected primary prevention interventions that have been proven to be both effective in preventing or minimizing disease and cost-effective (estimated cost of ≤ $100,000 per life year/QALY gained or less).

Appendix III provides further information and additional examples of primary prevention effectiveness studies and economic evaluations. It includes a discussion of the U.S. Task Force on Community Preventive Services and The Guide to Community Preventive Services: What Works to Promote Health?

Table 1. **Primary Prevention Interventions**
Examples with Demonstrated Evidence of Effectiveness and Cost-Effectiveness

Intervention	Study population(s)	Health effects/benefits
Community water fluoridation	Children 4-17 years old	Prevents dental caries.[27,28,29,30,31]
Early childhood development programs	Children 3 years old from low income families	Improved cognitive and social outcomes which often lead to improved long-term health.[32]
Reducing environmental pollutants	Children	Reduction in lead poisoning, asthma, cancer, and developmental disabilities.[33]
Maternal health and safe motherhood interventions; family planning	Adults and adolescents	Prenatal and delivery care, postpartum care, prevention of unintended pregnancies.[34]
Multi-component workplace health promotion program	Employees	Reductions in health risk factors and absenteeism; increased work performance.[35]
Workplace fitness facilities	Employees	Reduced disability and health care costs.[36]
Ergonomic interventions	Employed	Reduced workplace accidents, injuries, illnesses.[37,38]
Immunizations	Children, elderly	Infectious disease prevention.[39,40,41,42,43]
Reducing alcohol-impaired driving through sobriety checkpoints and mass media campaigns	Alcohol-impaired drivers	Accidents/trauma reduction, medical cost savings, averted productivity losses, pain, and suffering.[44,45,46,47]
Increasing excise taxes on tobacco products	Current and potential tobacco users, especially teens	Tobacco free lifestyles.[48]
Health education about smoking	Adolescents	Tobacco free lifestyles.[49]
Smoking bans and restrictions; environmental tobacco smoke restrictions	Current and potential tobacco users; general public	Medical cost savings, reduced morbidity and mortality, averted smoking-related fires, productivity gains.[50]
Prenatal and infancy nurse home visitation	Pregnant, low-income women and their children	Improvement in a wide range of maternal and child health outcomes, including reduced smoking and improved diets during pregnancy, fewer preterm deliveries, higher mean birthweights, reduction in child abuse and neglect, fewer child emergency room visits.[51]

Secondary prevention:

Secondary prevention refers to the early detection of a disease process and intervention to reverse or retard its progression.[52] Secondary prevention occurs through community screening programs that seek to test large groups of people or as part of individual health examinations given by health professionals. Many secondary prevention activities are effective in identifying health problems that could cause considerable morbidity and mortality if left untreated. For example, blood pressure screening and evaluating lipid profiles detect hypertension and hyperlipidemia, which, when treated, limit progression towards heart disease.[53]

In a highly functioning health system, primary care providers are crucial to the delivery of secondary prevention services. Many of the most beneficial and cost-effective secondary prevention interventions are delivered via primary care. Interventions generally take the form of counseling (e.g., to avoid tobacco use or increase exercise) or screening for asymptomatic disease such as cancer or high blood pressure.[54] Despite the importance of primary care for effective delivery of prevention services, the current healthcare market undervalues primary care.[55] Renewed emphasis should be placed on models of practice and reimbursement (e.g., the medical home) that support the effective delivery of primary care.

The United States Preventive Services Task Force (USPSTF) is the principal federal source of information about secondary prevention. The USPSTF, initially convened in 1984, resulted from the adoption of a comprehensive prevention policy by the U.S. Department of Health, Education, and Welfare. The USPSTF conducts rigorous, impartial assessments of the scientific evidence regarding the effectiveness of a broad range of clinical preventive services, including screening, counseling, and preventive medications. Results are published and updated periodically to reflect recent research, emerging evidence, and disease trends.[56]

According to expert analysis, the highest priority preventive services recommended by the USPSTF are aspirin use by high-risk adults, immunizing children, and tobacco-use screening and brief intervention.[57] Aspirin use can prevent myocardial infarction (heart attack) for persons at risk for coronary heart disease. Tobacco-use screening and intervention helps people quit smoking, thus reducing risk of developing tobacco-use related diseases such as heart disease, lung cancer, and chronic obstructive pulmonary disease. These services generate the highest health impact (measured as clinically preventable burden) and are the most cost-effective.[58]

Secondary prevention refers to the early detection of a disease process and intervention to reverse or retard its progression.

Many of the most beneficial and cost-effective secondary prevention interventions are delivered via primary care.

Please see Appendix IV for additional information about the activities and recommendations of the USPSTF.

Table 2 lists selected secondary prevention interventions that have been proven to be both effective in preventing or minimizing disease and cost-effective (estimated cost of ≤ $100,000 per life year/QALY gained or less).

Table 2. **Secondary Prevention Interventions**
Examples with Demonstrated Evidence of Effectiveness and Cost-Effectiveness[59]

Intervention	Target population	Health effects/benefits
Aspirin prophylaxis	Men ≥ 40, women ≥50, others at increased risk	Decreases incidence of coronary heart disease events in adults who are at increased risk for coronary heart disease.
Tobacco use screening and brief intervention	All adults	Increases tobacco abstinence rates.
Reducing out-of-pocket costs for effective smoking cessation therapies; multi-component interventions with client telephone support	Smokers	Tobacco free lifestyles.[60,61]
Colorectal cancer screening	Adults age ≥50	Reduces mortality from colorectal cancer.
Hypertension (high blood pressure) screening	All adults	Detection of hypertension. Treatment of hypertension substantially decreases the incidence of cardiovascular events.
Problem drinking screening and brief counseling	All adults	Identify adults whose levels or patterns of alcohol consumption place them at risk for increased morbidity and mortality. Reductions in alcohol consumption that are sustained over 6- to 12-month periods or longer.
Cervical cancer screening	All women who have been sexually active and have a cervix	Reduces incidence of and mortality from cervical cancer.
Cholesterol screening	Men ≥35 and women ≥45	Identify asymptomatic persons at increased risk of coronary heart disease. Diet and lipid-lowering drug therapy substantially decreases incidence of coronary heart disease.
Breast cancer screening	Women age 40+	Reduces mortality from breast cancer.
Breast cancer screening (mammography)	Women age 65+	Reduces mortality from breast cancer.[62]
Chlamydia screening	Sexually active women ≤25; older women at increased risk	Reduces incidence of pelvic inflammatory disease (PID).
Vision screening	Children aged < 5 years	Screening tests identify strabismus, amblyopia, and refractive error in children with these conditions and leads to improved visual acuity. Treatment of strabismus and amblyopia can improve visual acuity and reduce long-term amblyopia.
Visual Screening for Malignant Melanoma	Adults age 50+	Increases life expectancy and quality-adjusted life expectancy.[63]
Testing for Primary HIV Infection	Outpatients with fever or other viral symptoms	Early detection of HIV and cases avoided in sexual partners.[64]
Neonatal screening for Cystic Fibrosis	Neonates	Improved quality of life and life expectancy for persons with CF.[65]

Tertiary prevention:

The two main categories of tertiary prevention are disability limitation and rehabilitation.[66] Disability limitation seeks to halt the progression and limit the effects of symptoms caused by a disease or injury. Rehabilitation reduces social disability by both strengthening remaining functions and helping the patient learn to function in alternative ways.

Chronic disease management is a cornerstone of tertiary prevention.

As is the case for primary and secondary prevention, primary care providers have an important role in the delivery of tertiary prevention services. In particular, primary care providers have proven to be a critical factor in effective management of chronic disease, reducing complications and costs. For example, a study of urban children with asthma showed that children with a greater number of asthma-related primary care visits were less likely to have asthma-related emergency department visits.[67]

Chronic disease management in the clinical setting is a special type of disability limitation strategy and is a cornerstone of tertiary prevention. It aims to improve quality of life and improve health and functioning while simultaneously preventing costly hospitalizations for persons with chronic diseases, such as diabetes, congestive heart failure, and asthma.[68-69] In recent years disease management programs have moved beyond the clinical setting. For example, asthma management can be significantly enhanced through engagement of school nurses, and hypertension control can be improved through worksite interventions such as blood pressure monitoring, exercise programs, and healthy food choices in cafeterias.

Many disease management programs conducted independently by insurance companies are reaching plateaus in terms of effectiveness and cost savings. Many of these same programs have little interaction and coordination with primary care providers. Chronic disease management programs that include more coordination between insurers and primary care providers and that utilize innovative approaches to patient education and support for behavior change may result in better management of chronic disease and improved health outcomes.

Table 3 lists selected tertiary prevention interventions that have been proven to be both effective in managing or minimizing disease and cost-effective (estimated cost of ≤ $100,000 per life year/QALY gained or less).

Table 3. **Tertiary Prevention Interventions**
Examples with Demonstrated Evidence of Effectiveness and Cost-Effectiveness

Intervention	Target population	Program components	Health effects/economic benefits
Chronic Disease management	Persons with asthma	Patient education and medication management consistent with national guidelines.	Significantly reduced use of emergency health care services and considerable health cost savings.[70,71]
	Persons with congestive heart failure	Multidimensional program including patient education, monitoring, and physician notification.	Reduced medical costs compared to previous year while costs increased for control group compared to previous year.[72]
	Children with newly diagnosed type I diabetes	Education program for self-management of diabetes in the home.	Mean glycated hemoglobin (GHb) levels were 10% lower for the intervention group at 24 and 36 months. Costs of the intervention program did not differ significantly from traditional care.[73]
Disease management with reduced copayments for selected classes of medications	Persons with hypertension, diabetes, high cholesterol, or asthma	Reduced copayments for medications prescribed to control a chronic condition in the context of a disease management program. Drug categories include ACE inhibitors/ARBs, beta-blockers, several diabetes drugs, statins, and steroids.	Increased medication adherence above the effects of a disease management program alone.[74]
Combination pharmacotherapy (aspirin, beta-blockers, ACE inhibitors, statins)	Persons who have had a heart attack	Combination pharmacotherapy at no cost to participants.	Greatly reduces cardiac events, including heart attacks.[75]
ACE inhibitors	Medicare beneficiaries with diabetes	ACE inhibitors at no cost to participants.	Extends life and reduces Medicare costs.[76]

The Nation and the State of Connecticut: Costs, Challenges, and Opportunities

Behavior and lifestyle factors

While many public health and clinical guidelines emphasize the importance of healthy behaviors, only three percent of Americans follow all four healthy lifestyle recommendations (nonsmoking, healthy weight, consuming five or more fruits and vegetables per day, and regular physical activity).[77] Smoking, poor diet coupled with physical inactivity, and alcohol consumption were the leading "actual" causes of mortality in the United States in 1990 and again in 2000.[78] For example, overweight and obesity (conditions exacerbated by poor diet and physical inactivity) is estimated to cause 14-20 percent of all cancer-related mortality.[79]

Smoking, poor diet coupled with physical inactivity, and alcohol consumption were the leading "actual" causes of mortality in the United States in 1990 and again in 2000.

In addition to causing premature death, smoking, physical inactivity, and poor nutrition place significant economic pressure on the United States due to increased health care costs and lower productivity. Direct medical expenses attributed to smoking total more than $75 billion per year, and lost productivity is estimated to cost $80 billion per year.[80] Health care costs associated with physical inactivity were an estimated $76 billion in the year 2000, and poor nutrition was estimated to cost $33 billion in medical costs and $9 billion in lost productivity.[81]

Physical inactivity and poor eating habits have contributed to an increase in obesity in recent years. Adult obesity rates grew from 15 percent of the population in 1978-80 to 32 percent in 2003-2004.[82] For children 6 to 11 years old, obesity rates have increased from 15.1 to 18.8 percent between 1999 and 2004.[83] Obese children are about three times more expensive for the health system than average weight children.[84]

Obesity is a particularly important concern for women who are pregnant or trying to become pregnant. Evidence shows that obesity negatively affects ovulation, fertility, and birth outcomes; and weight loss substantially reduces perinatal costs.[85] In one study, costs were $275,000 per live birth before weight loss and $4,600 per live birth after weight loss.[86]

For most measures, health statistics and behaviors of the Connecticut population are similar to or slightly better than those found in the rest of the country. For example, more than 12 percent of adults in the state report their health as fair or poor, 21 percent of adults did not participate in any leisure time exercise or physical activity in the past 30 days, over 20 percent are obese, and 17 percent are smokers.[87]

In 2006 state rankings, Connecticut ranked 4th lowest in the percentage of adult smokers.[88] Despite our enviable position in the rankings, our costs attributable to smoking are staggering. In 2004 in Connecticut, the medical costs due to smoking were $1.63 billion and lost productivity due to smoking was $1.02 billion. Direct Medicaid costs due to smoking were $430 million.[89]

The high costs attributable to smoking suggest substantial potential returns for increased investment in tobacco-use prevention. However, Connecticut is the only state in the nation that committed no tobacco settlement money for tobacco prevention programs in fiscal year 2008.[90] The CDC recommended minimum FY 2008 State funding for tobacco prevention programs is $21.2 million, and the estimated annual state tobacco revenue (settlement plus excise taxes) is $377.5 million.[91]

Effective tobacco-use prevention programs have been implemented in other states (e.g., Massachusetts, Vermont, New York, and Montana). Programs directed at reducing the number of children and youth who become smokers have been particularly effective.[92,93] Some programs also lead to short-term health cost savings. Specifically, reducing smoking among pregnant women (including teens) reduces smoking-related pregnancy and birth complications (including low birthweight) and related healthcare costs.[94,95] Until tobacco-use prevention and cessation are prioritized at the state level, Connecticut will continue to endure increased long-term health costs, lower economic productivity, reduced quality of life, and avoidable mortality—all attributable to smoking.

Connecticut ranks eighth among states in percentage of overweight/obese adults.[96] However, the state has not escaped the national trend towards rising obesity rates. Obesity rates in Connecticut rose from 15.1 percent of the population in 1990 to 20.6 percent in 2007.[97] The continued growth in obesity in Connecticut is likely to lead to detrimental health effects such as diabetes and hypertension (even among children and adolescents) along with their associated health care costs and productivity losses.

Chronic disease

Seven out of ten deaths in the United States are caused by chronic disease.[98] In 2003, Connecticut ranked higher than 33 other states for deaths caused from seven of the most common chronic diseases—cancer, diabetes, heart disease, hypertension, stroke, mental disorders, and pulmonary conditions.[99] The economic impact in Connecticut (in treatment expenditures and lost productivity) of these seven chronic diseases was estimated at $16.2 billion in 2003.[100] An estimated $1.7 billion in health care costs, lost productivity, and premature mortality were attributed to diabetes in 2002 in Connecticut.[101] For lung cancer, Connecticut inpatient hospital charges in 2001 were $44.4 million, or more than $21,000 per hospitalization.[102]

In 2003, Connecticut ranked higher than 33 other states for deaths caused from seven of the most common chronic diseases.

If trends in disease prevalence continue at current rates, the economic impact of cancer, diabetes, heart disease, hypertension, stroke, mental disorders, and pulmonary conditions is estimated to be $44.5 billion in Connecticut in 2023.[103] By making reasonable improvements (i.e., smoking reduction, weight control with improved nutrition, exercise, and early detection of disease) in preventing and managing chronic disease, Connecticut could reduce future economic costs of these diseases by $11.9 billion in 2023.[104]

Health disparities

One of the primary goals of *Healthy People 2010* is the elimination of health disparities among different segments of our population. Connecticut's relatively high rankings among states in many health status measures mask striking health disparities that exist within its borders. Health care and health spending are not distributed uniformly in Connecticut, resulting in severe health disparities by race/ethnicity, income, education, and geographic location. For example, in 2002 cancer incidence was higher for whites than for blacks or Hispanics, but the cancer death rate in 2004 was higher for blacks than for whites.[105] The diabetes death rate in 2004 for blacks was more than double the rate for whites.[106]

Health care and health spending are not distributed uniformly in Connecticut, resulting in severe health disparities.

Greater efforts are needed to develop effective preventive interventions that specifically focus on minority populations.

Several factors help to explain these disparities. When diseases such as cancer and diabetes are detected, they are often detected later in the disease trajectory for minority populations, which is a reflection of poorer access to preventive and primary care. There are also genetic and biologic factors. For example, breast cancer incidence rates are lower for African Americans but the tumor types common among African American women are different than the tumor types common among white women, and the cancers tend to be at a more advanced stage when recognized. This, along with access to treatment and socioeconomic status contribute to breast cancer survival rates that are lower for African American women.[107,108,109] These data suggest that greater efforts are needed to develop effective preventive interventions that specifically focus on minority populations. In fact, the midcourse review of *Healthy People 2010* found that no progress had been made in reducing health disparities, despite implementation of various recommended strategies.[110]

Disparities are also evident in data related to healthy behaviors. In Connecticut, 37 percent of all adults are at a healthy weight and 21 percent of all adults are obese. For the white adult population, 38 percent are at a healthy weight and 20 percent are obese. However, only 25 percent of the black adult population and 24 percent of the Hispanic adult population is at a healthy weight, while 31 percent of black adults and 23 percent of Hispanic adults are obese.[111]

In Connecticut, poverty is widespread and deeply rooted in urban centers and in pockets of rural areas. In general, population groups with high rates of poverty suffer from poorer health status than population groups with lower rates of poverty. Lower income groups are also more sensitive to the negative effects of cost sharing in regard to receiving health care and preventive services. For example, one study showed that the effect of cost sharing on screening mammography is magnified among women residing in lower income areas. Screening rates decreased 9 percent in one year in health plans that instituted cost sharing compared to screening rates in health plans that did not institute cost sharing.[112]

Connecticut is a relatively small state; however, some of its rural areas are isolated in terms of access to timely care. People in rural areas are less likely to receive preventive care, which may in part explain their higher rates of heart disease, cancer, and diabetes compared to rates for people in urban areas.[113] Further, residents in non-urban areas in Connecticut experience 28 percent more premature death than residents in suburban areas.[114]

Prevention benefits to the state and other employers

Total health care spending in Connecticut was over $22 billion in 2004, which was 12.1 percent of the gross state product.[115] While quality of clinical care is high in Connecticut, costs are also high compared to other states.[116] Additionally, state health rankings occur within the context of a national health system that performs poorly relative to other industrialized nations in regard to cost and outcomes.[117,118,119] For example, U.S. Census bureau data shows that 43 countries have life expectancies that exceed the United States, and 40 countries have lower infant mortality.[120] If Connecticut were considered a country, it would rank 27th in infant mortality.[121]

Prevention leads to healthier, more productive employees.

As described above, poor, urban, rural, and minority populations are at a particular disadvantage due to lack of access to health care in general and preventive care in particular. For example, the percentage of women who receive prenatal care varies from 78 percent among Hispanics to 92 percent among whites.[122] Access to adequate prenatal care is a particular concern in Connecticut's urban centers. During the period between 1999 and 2001, 10.9 percent of births statewide occurred to mothers with late or no prenatal care. In Hartford, 19.6 percent of births occurred with no or late prenatal care. The equivalent figure in Bridgeport was 19.7 percent; 18.2 percent in New Haven, 19.9 percent in Waterbury, 21.3 percent in New London, and 21.3 percent in New Britain.[123] Over 45 percent of the children enrolled in Connecticut's Medicaid program live in these cities.[124] In the Missouri Medicaid program, an analysis of prenatal, newborn, and post-partum costs demonstrated savings of $1.49 for every $1.00 spent on prenatal care.[125] Thus, enhancing access to prevention-focused prenatal care in Connecticut's cities is likely to improve birth outcomes and lower Medicaid costs.

Medicaid, the largest single expense in the Connecticut state budget, is projected to grow from $2.70 billion in fiscal year 2003 to $4.35 billion in fiscal year 2012—an increase of 71 percent.[126] While increasing reimbursement to Medicaid providers should improve access to care for the Medicaid-covered population, ensuring that cost-effective, culturally-appropriate preventive services and interventions are prioritized and available will both improve population health and help control costs over the long term.

Prevention has the potential to benefit employers (including state government) in several ways. First, prevention leads to healthier, more productive employees. For example, absenteeism associated with obesity and morbid obesity costs employers an estimated $4.3 billion annually.[127] On-the-job work impairment or "presenteeism" is recognized by employers as a major drain on worker productivity. Research shows that the presence of a chronic condition, (e.g., allergies, arthritis, or back and neck disorders) was the most important determinant of work impairment.[128] One study estimated the costs to employers of lost productive time (reduced

performance at work and work absence) among workers with depression to be $44 billion per year.[129] Recent research also suggests that many employers would experience a positive return on investment from outreach and enhanced treatment of depressed workers, not only through increased worker productivity, but also through improved job retention, which reduces hiring and training costs.[130]

As is the case for most employers, health insurance costs paid by the state for employees, retirees, and Medicaid beneficiaries has increased in recent years.[131] While more research is needed to assess the long-term effects, early indications suggest that prevention can lead to reduced health insurance costs. Research involving 46,026 employees from six large employers found that the presence of common modifiable health risks (self-assessment of depression, high stress, high blood glucose levels, being over- or under- weight, tobacco use, high blood pressure, and a sedentary lifestyle) is associated with short-term increases in health expenditures for affected employees.[132] Many of these health risks are present in state-covered populations and are amenable to clinical and community preventive services.

In another research project, a large employer eliminated cost sharing for preventive services and increased cost sharing for non-preventive medical services for a group of employees. Preliminary analysis indicates that the benefit change resulted in a five percent reduction in total costs among affected employees, compared with a four percent increase in total costs in the control group.[133] While evidence of effectiveness and cost-effectiveness of prevention programs specifically targeted to state-covered populations is sparse, it is reasonable to expect that what works in the private sector will work in the public sector. However, research should be conducted to identify effective programs that can contribute to an evidence base of effective prevention strategies for state employees, retirees, and Medicaid-covered populations.

Being uninsured reduces rates of preventive service use.[134,135] In Connecticut, a major portion of the cost of uncompensated care (health care for the uninsured and underinsured) is covered by state funds. Uncompensated care primarily covers costs of diagnosing and treating illness and injury. To the extent that preventive services avoid or mitigate such illness or injury in the uninsured or underinsured, the value of health spending for uncompensated care could be improved. In all likelihood the state is not realizing the economic benefits of prevention for persons covered by uncompensated care funds.

Connecticut has ranked in the top ten in state health rankings since 1990.[136] Maintaining and improving the health of state residents in coming years will require investments in prevention, particularly at the population level, that encourage healthy behaviors, reverse or slow growth in rates of chronic diseases, and improve service delivery for underserved populations.

Conclusion

The ancient Greeks believed that *Asclepius*, the god of medicine, had two daughters. One, *Panacea*, was responsible for treatment, while the other, *Hygeia,* was responsible for prevention.[137] While the ancient Greeks may have viewed prevention and treatment as equally important, the priority in modern medicine in the United States is clearly the treatment of disease.

Treatment is reactionary and largely ignores factors related to poor health until after deleterious effects emerge. On the other hand, prevention is proactive. Effective prevention interventions target the behavior and lifestyle factors that undermine health and provide value for the dollar.

Evidence clearly demonstrates the health benefits and economic value of prevention at all points along its primary-secondary-tertiary continuum and wherever prevention services are delivered, including community settings, health care providers' offices, in the workplace, or at home. The impact and value is greatest when prevention is implemented at the earliest opportunity, but prevention efforts yield results all along the continuum. For example, tobacco-use prevention is more effective and cost-effective than smoking cessation, but both are important elements of a cost-effective health system. The same argument holds true for numerous conditions, including hypertension, diabetes, and obesity.

U.S. health care spending increased 6.7 percent to $2.1 trillion in 2006, or $7026 per person.[138] Health care spending is expected to continue to increase during the next decade, and is estimated to reach $4.3 trillion in 2017, or $13,101 per person.[139] The continuing upward spiral of health care costs points to a need to invest in services that reduce lifetime health care spending. A recent analysis of policy options for achieving savings and improving value in health spending noted that reductions in tobacco use and obesity have the potential to save a cumulative $474 billion in national health expenditures over ten years.[140]

Thus, prevention is an essential and effective component of any evidence-based strategy to improve the value of current health spending, slow the growth of health care costs, and ultimately reduce long-term health spending. Additionally, prevention provides considerable quality of life and functionality benefits and may foster more equitable access to health care for all residents.

Prevention is an essential and effective component of any evidence-based strategy to improve the value of current health spending, slow the growth of health care costs, and ultimately reduce long-term health spending.

Appendix I

Healthy People 2010

Healthy People 2010 has two overarching goals:

- **to increase quality and years of healthy life**
- **to eliminate health disparities.**

These goals are supported by specific objectives in the following focus areas:

1. Access to quality health services
2. Arthritis, osteoporosis, and chronic back conditions
3. Cancer
4. Chronic kidney disease
5. Diabetes
6. Disability and secondary conditions
7. Educational and community-based programs
8. Environmental health
9. Family planning
10. Food safety
11. Health communication
12. Heart disease and stroke
13. HIV
14. Immunization and infectious diseases
15. Injury and violence prevention
16. Maternal, infant, and child health
17. Medical product safety
18. Mental health and mental disorders
19. Nutrition and overweight
20. Occupational safety and health
21. Oral health
22. Physical activity and fitness
23. Public health infrastructure
24. Respiratory diseases
25. Sexually transmitted diseases
26. Substance abuse
27. Tobacco use
28. Vision and hearing

Full achievement of the goals and objectives of *Healthy People 2010* depends on a health system that integrates individual health care, population-based public health, and healthy behaviors. The *Healthy People* initiative envisions prevention efforts that move beyond the traditional medical care system and into neighborhoods, schools, workplaces, and families in which people live their daily lives. These are the environments in which a large portion of prevention occurs.

Appendix II

Healthy Connecticut 2000

The *Healthy Connecticut* project was launched in 1994 by the state Department of Public Health. It applies the national goals of *Healthy People 2000* to the Connecticut population. The *Healthy Connecticut 2000* Final Report was published in 2005 and evaluates the state's progress toward goals and objectives developed to improve health and functioning of state residents. The report lists 19 priority areas as shown in Table A1. As in *Healthy People 2000* and *Healthy People 2010*, the priority areas of *Healthy Connecticut 2000* have a clear emphasis on prevention and health promotion.

Table A1. *Healthy Connecticut 2000* Priority Areas
Health Promotion
Physical Activity and Fitness
Nutrition
Tobacco
Family Planning
Violent and Abusive Behaviors
Educational and Community-Based Programs
Health Protection
Unintentional Injuries
Occupational Safety and Health
Environmental Health
Food and Drug Safety
Oral Health
Preventive Services
Maternal and Infant Health
Heart Disease and Stroke
Cancer
Diabetes and Chronic Disabling Conditions
HIV Infection
Sexually Transmitted Diseases
Immunization and Infectious Diseases
Surveillance and Data Systems
Surveillance and Data Systems

Updates to *Healthy Connecticut 2000* document improvement in many of the priority areas listed above. The report also recommends several areas related to prevention and health promotion where future public health efforts will be particularly important in Connecticut. These include: tobacco use; diet, physical activity, and overweight; infectious and vaccine-preventable diseases; pregnancy and childbirth (low birth weight); and environmental health.

Appendix III

The U.S. Task Force on Community Preventive Services

The Task Force on Community Preventive Services compiled and reviewed existing research to determine the effectiveness of preventive interventions. The effectiveness and economic benefit of several recommended strategies follow.

Changing Risk Behaviors and Addressing Environmental Changes

Risk factors and behaviors discussed include tobacco use, physical activity, and the social environment.

Tobacco Use

Environmental tobacco smoke is a health hazard.[141] The Task Force reviewed studies of activities designed to reduce exposure to environmental tobacco smoke and found strong evidence of the effectiveness of smoking bans and restrictions. Bans and restrictions were found to be effective in reducing exposure to environmental tobacco smoke by 60 percent, in helping reduce cigarette consumption, and in increasing the number of people who quit smoking. Cost-effectiveness analysis was based on a study that modeled the costs and benefits of a ban or restriction of smoking in all nonresidential buildings in the United States. Modeled costs included implementation and enforcement of the ban and construction and maintenance of designated smoking areas. Benefits included medical cost savings, value of lives saved, averted costs of reduced smoking-related fires, and productivity gains. The net benefit to society ranged from $42 to $78 billion.[142]

Physical Activity

The studies reviewed used several approaches to increasing physical activity, including informational campaigns, behavioral and social interventions, and environmental and policy changes. The Task Force found strong evidence of effectiveness of increasing physical activity for several interventions. Only two of the studies analyzed cost-effectiveness. The behavioral intervention that provided strong evidence of effectiveness and cost-effectiveness was an individually-adapted health behavior change program. These programs are tailored to individual interests and teach participants to make moderate-intensity physical activity a part of their daily routines.

The Social Environment

The Task Force included early childhood development, access to affordable and safe housing, and culturally competent health care in the social environment. It recommended comprehensive, center-based, early childhood development programs for low income children, because of strong evidence of effectiveness and associated cost-effectiveness. Tenant-based rental assistance programs (e.g., Section 8) were also determined to be effective, but cost-effectiveness data were not available.

Reducing Disease, Injury, and Impairment

This part of the report included community preventive services related to cancer, diabetes, vaccine-preventable diseases, oral health, motor vehicle occupant injury, and violence.

Economic analyses were found for diabetes, vaccine-preventable diseases, oral health, motor vehicle occupant injury, and violence.

Diabetes

The Task Force recommends diabetes disease management based on strong evidence of the effectiveness of 27 studies and cost-effectiveness based on two studies. One of the studies described a program of education for self-management of diabetes in the home. While costs of the intervention program did not differ significantly from traditional care, mean glycated hemoglobin (GHb) levels were 10 percent lower for the intervention group at 24 and 36 months.[143]

Vaccine preventable diseases

The Task Force recommends school-based vaccination programs based on nine studies that demonstrate sufficient evidence of effectiveness. Vaccination programs in schools increase immunization coverage by approximately 58 percentage points.[144] One study assessed the cost-effectiveness of British Columbia's hepatitis B vaccination program in 1994 and 1995. The investigators found that the cost of vaccinating each student was $44, and future health expenditures decreased by $35 per child. When the value of productivity losses is considered, the vaccination program results in cost savings of $75 per child.[145]

Motor Vehicle Occupant Injury

Sobriety checkpoints are used to reduce driving after drinking by increasing drivers' perceived risk of being caught. Studies have shown that checkpoints reduce fatal and non-fatal injury crashes. An economic evaluation modeled a sobriety checkpoint of one-year in duration for a community with a population of 100,000. The estimated benefit from alcohol-related crashes averted was $7.6 million, while the estimated cost of the intervention was $1.6 million.[146]

Violence

The Task Force recommends early childhood home visitation to prevent violence against children based on strong evidence of effectiveness of several studies, one of which also demonstrated cost-effectiveness. In these programs, parents and children are visited at home during a child's first two years of life by trained personnel who provide information, support, and training about child health, development, and care. The Task Force reviewed 21 studies and concluded that early childhood home visitation is effective in reducing child maltreatment by approximately 39 percent.[147]

One study analyzed the cost-effectiveness of an early childhood visitation program, finding that services provided to low-income families resulted in a net benefit to government of $350 per family.[148] Costs examined in the study included nurses' salaries, fringe benefits, travel, and support staff. Benefits included reduced use of government benefits such as AFDC and child protective services and tax revenues from parents returning to work. Costs and benefits in this study were limited to government costs and benefits. If costs and benefits of participants, the health care system, and society at large are taken into account, even greater benefits would be demonstrated, particularly from reduced use of child treatment services through the educational, employment, human services, and criminal justice systems.

Appendix IV

The U.S. Preventive Services Task Force

The mission of the USPSTF is:

1) to evaluate the benefits of primary and secondary preventive services in apparently healthy persons based on age, sex, and risk factors for disease, and
2) to make recommendations about which preventive services should be incorporated into primary care practice.

The USPSTF recommends that preventive and curative services should be held to the same basic standard of cost-effectiveness. In other words, a preventive service should not be held to a higher cost-effectiveness standard than a treatment service simply because it is not designed to treat a diagnosed health problem. Early identification of disease through screening generally reduces costs of treatment and improves quality of life for individuals who are diagnosed.

Analysts have produced estimates of relative health impact and cost-effectiveness of USPSTF recommendations as well as utilization data. High-ranking services (those services that reduce burden of disease and are cost-effective) with low utilization rates include: tobacco-use screening and brief intervention, screening adults aged 50 and older for colorectal cancer, immunizing adults aged 65 and older against pneumococcal disease, and screening young women for chlamydia.

Appendix V

Economic Methods Glossary

Acceptable cost: In an environment of limited resources, the level of cost tolerated by a decision maker or society for delivery of a medical intervention or program.

Cost analysis: A type of economic evaluation in which the costs of a program or intervention are identified or estimated, allowing calculation of unit cost or cost per unit of service.

Cost-benefit analysis (CBA): A type of economic evaluation in which a program's cost is compared to the program's benefits for a period of time, expressed in dollars, as an aid in determining the best investment of resources.

Cost-effectiveness analysis (CEA): A type of economic evaluation that seeks to determine the costs and effectiveness of a medical intervention compared to similar alternative interventions to determine the relative degree to which they will obtain the desired health outcome(s).

Cost-effectiveness ratio: The incremental cost of using an intervention to obtain a unit of effectiveness (such as dollars per life-year gained) compared with an alternative such as another treatment or no treatment.

Cost saving: An intervention which costs less and is more effective than an intervention to which it is being compared.

Cost-utility analysis (CUA): A specific type of cost-effectiveness analysis using quality-adjusted life years as the effectiveness endpoint. By convention, cost-utility analyses are often referred to as cost-effectiveness analyses; however not all cost-effectiveness studies use the cost-utility methodology.

Cost-utility ratio: The incremental cost of an intervention to achieve one quality adjusted life year, compared with an alternative intervention.

Direct medical costs: The cost of medical resources consumed, such as physician visits, surgery, medical supplies and hospitalization. These costs are included in the numerator of the cost-effectiveness ratio.

Direct non-medical costs: The cost of non-medical resources such as child care or transportation that are attributable to the treatment (e.g., transportation to a medical appointment). These costs are included in the numerator of the cost-effectiveness ratio.

Discounting: Calculating the present value of future costs and outcomes.

Dominance: "Simple" or "strong" dominance refers to the situation in which an intervention is dominated by the intervention to which it is being compared. This means that the alternative intervention is more effective and less costly than the original intervention.

Effectiveness: The extent to which an intervention achieves health improvements, which can be measured in terms of various outcomes such as cases of disease prevented, years of life saved, or quality-adjusted life years saved.

Effectiveness Studies: Formal analyses that assess the effectiveness of specific health interventions delivered in a practice setting or as part of a community demonstration project.

Incremental cost: The difference between the cost of an intervention of interest and the cost of the intervention to which it is being compared.

Incremental cost-effectiveness ratio: The incremental cost of an intervention divided by the incremental effectiveness.

Net costs: The total cost of an intervention, taking into account any savings in medical resources that the intervention may produce (for example, a drug therapy that decreases hospitalization would have a net cost that included the price of the drug, minus the savings in hospitalization).

Quality-adjusted life years (QALYs): A method that assigns a preference weight to each health state, determines the time spent in each state, and estimates life-expectancy as the sum of the products of each preference weight and time spent for each state.

Simulation modeling: Manipulation of a simplified representation of a system intended to promote understanding of the real system. Manipulation generally involves compressing time or space thus enabling one to perceive the interactions that would not otherwise be apparent because of their separation in time or space.

Time costs: The cost of the time a patient incurs while seeking or receiving care.

Adapted from the Tufts-New England Medical Center, Institute for Clinical Research and Health Policy Studies, Center for the Evaluation of Value and Risk in Health Care; Academy Health Glossary of Terms Commonly Used in Health Care, 2004 Edition; and www.systems-thinking.org.

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