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CDC

CENTERS FOR DISEASE CONTROL AND PREVENTION

An Ounce of Prevention. . . .

What Are the Returns?

Second Edition, Revised October 1999

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES

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What Are the Returns?

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October 1999

U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Disease Control and Prevention
Atlanta, Georgia 30333

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CENTERS FOR DISEASE CONTROL AND PREVENTION

INTRODUCTION

As the nation moves toward the twenty-first century, the fundamental challenge facing the Centers for Disease Control and Prevention (CDC) is the same as it was in its early days over 50 years ago — improving the quality of people's lives by preventing disease, injury, and disability through collaboration with public and private partners throughout the world.

CDC seeks to improve health, but to do so in economically responsible ways. When human and financial resources are limited, public health efforts must focus on prevention strategies that yield the most benefit for the investment. Fortunately, many current prevention strategies already offer excellent opportunities to promote good health at a reasonable cost.

Measuring the Costs

This report outlines 19 strategies and demonstrates how spending money to prevent disease and injury and promote healthy lifestyles makes good economic sense. Each prevention strategy was evaluated based on —

- ✓ *the health impact of the related disease, injury, or disability on U.S. society;*
- ✓ *the effectiveness of the prevention strategy;*
- ✓ *the costs of the disease, injury, or disability; and*
- ✓ *the cost-effectiveness of the strategy.*

Some childhood vaccines, for example, save up to $29 in direct medical costs for each dollar spent. Other strategies, such as yearly mammograms, carry a net cost but are considered cost-effective because they give considerable value in return for the money invested.

By using a standardized method to evaluate the effectiveness and cost-effectiveness of each strategy, the authors have established a starting point for comparing the variety of information. The result is a sound economic guideline for making prevention decisions and allocating money.

To reach their conclusions, the authors reviewed an array of research studies. Although these studies were chosen through extensive search and rigorous evaluation, the information presented is limited by the methods, assumptions, and accuracy of the original research. Many studies were conducted in specific populations, for example, and the reader should exercise caution in generalizing the findings. Because of these limitations, continued research is needed to further demonstrate the effectiveness and cost-effectiveness of these and other public health strategies.

A summary of the assumptions and variables used in the original studies is provided on the inside back cover. For more information regarding particular studies or prevention strategies, please consult the cited references.

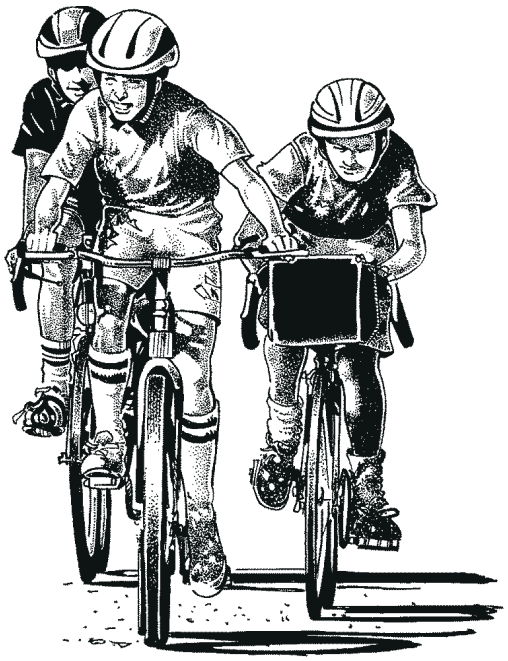
The material presented in this publication has been published in the *American Journal of Preventive Medicine's* April 1999 issue.

BICYCLE-RELATED HEAD INJURIES

Approximately 45% of American youth aged 20 years or younger ride bicycles (an estimated 33 million bicyclists). Each year, about 247 of these young cyclists suffer fatal head injuries, and another 140,000 are treated in emergency departments for bicycle-related head injuries (*BR-1*).

The use of bicycle helmets reduces the risk of head injury by an estimated 85% (*BR-2*). Counseling bicyclists and parents of children who ride bicycles about the importance of helmet use is recommended to reduce injuries and deaths caused by bicycle crashes (*BR-3*). Such counseling appears to have a positive effect on helmet use among children (*BR-4*). Other effective prevention strategies include passage of laws requiring bicyclists to wear helmets and community-wide programs that promote helmet use.

Bicycle-related head injuries for all age groups have an annual economic cost of more than $3 billion (US$ 1991) (*BR-5*). A law passed in Maryland in 1990 requiring all bicyclists aged 16 years or younger to wear a helmet increased helmet use from 4% to 47%, for a cost of $36,643 per head injury prevented (US$ 1992). A community-wide promotional program costs $37,732 per head injury prevented (*BR-6*).



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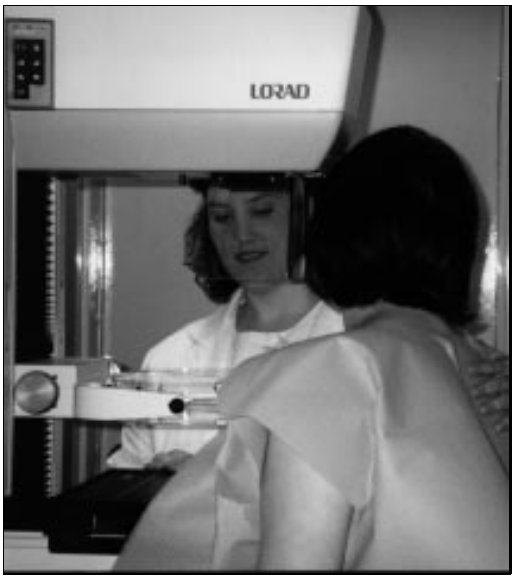
BREAST CANCER

Breast cancer is the most common cancer and the second leading cause of death by cancer in women. Nearly 44,000 deaths and 180,200 new diagnoses were expected in 1997 (*BC-1*). Although definitive breast cancer prevention is not possible, early detection improves a woman's prognosis.

The U.S. Preventive Services Task Force recommends that women aged 50 through 69 years receive routine screening for breast cancer every 1 to 2 years, with either mammography alone or mammography plus an annual clinical breast exam (*BC-2*). A review of screening effectiveness studies has led to the conclusion that such screening can reduce breast cancer mortality by 20% to 30% (*BC-2*).

In 1990, breast cancer resulted in $6.5 billion in medical care costs, which is more than any other cancer (US$ 1993) (*BC-3*). Reviews of the available cost-effectiveness studies report that mammography screening costs approximately $60,000 per life-year gained (*BC-4–BC-6*).

Data in one study indicate that the combination of an annual mammogram and a clinical breast exam, followed by appropriate treatment, prevents premature death, at a cost of $22,000 to $84,000 per life-year gained in women aged 55 to 65 years, depending on the effectiveness of screening (US$ 1984) (*BC-7*).



Mammography Screening

Image Courtesy of Columbus Cancer Clinic, Columbus, Ohio

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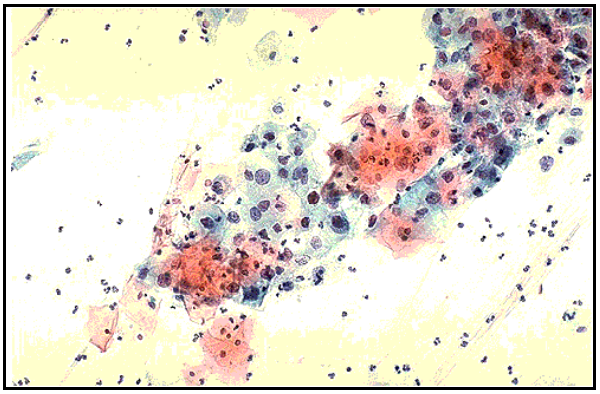
CERVICAL CANCER

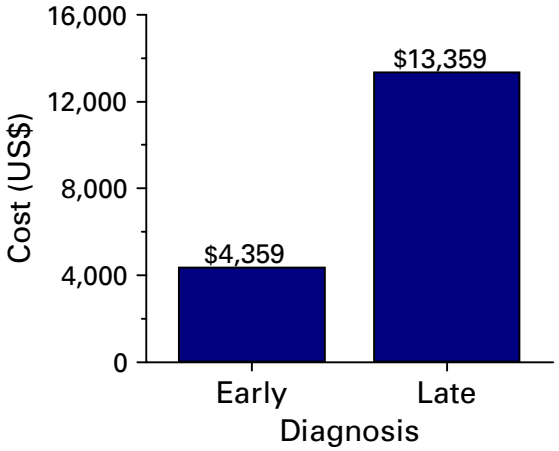
For 1997, a total of 4,800 deaths from cervical cancer and an estimated 14,500 new cases of the disease were expected. One third of all women with cervical cancer die within 5 years of diagnosis.

However, early detection increases the 5-year survival rate to 91% (*CC-1*). Routine screening for cervical cancer with Pap testing at least once every 3 years is recommended for women at the onset of sexual activity (*CC-2*). Performing Pap tests every 3 years reduces invasive cervical cancer by 91.2%. Only a slightly greater reduction of 93.3% results from annual screening (*CC-3*). A review of studies conducted in the United States, Canada, and Europe reports that mortality attributed to cervical cancer has been reduced by 20% to 60% since the implementation of cervical cancer screening programs (*CC-2*).

The costs of diagnosis, treatment, and follow-up associated with early stages of cervical cancer are $4,359, whereas the same costs for late, invasive cervical cancer are more than triple that amount, or $13,359 (US$ 1988) (*CC-4*). Screening average-risk, asymptomatic women aged 20 through 75 years every 3 years costs $14,000 per life-year gained. The cost of annual screening of the same population is approximately $40,000 per life-year gained (US$ 1987) when compared with a no-screening strategy (*CC-5*).



Photomicrograph of Pap Smear
Image from WebPath, Courtesy of Edward C. Klatt, M.D.



Cervical Cancer
Cost of Care

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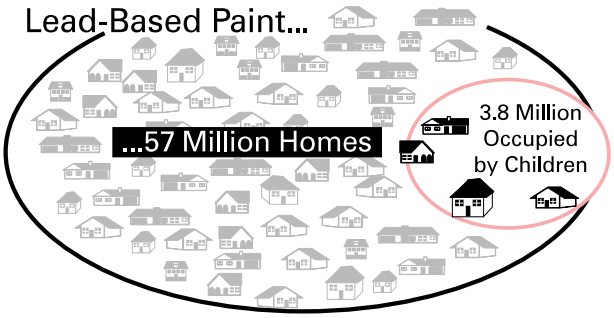

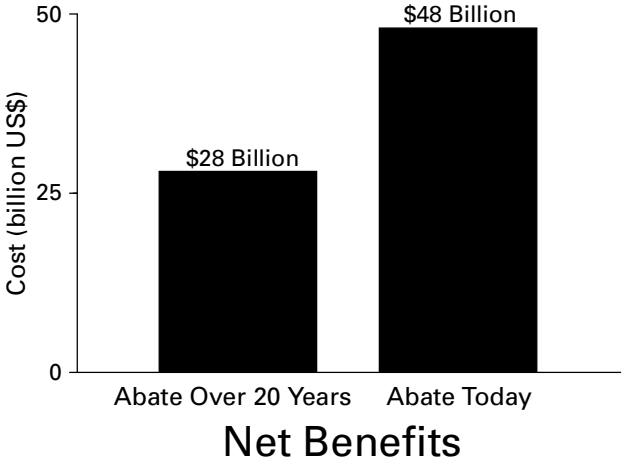

CHILDHOOD LEAD POISONING

Elevated blood-lead levels in children have been associated with lower IQs, increased behavioral problems, and other health complications. Approximately 930,000 U.S. children aged 1 through 5 years have an elevated blood-lead level (10 µg/dL or higher), which puts them at risk for adverse health effects (*CL-1*).

Population-wide prevention strategies are effective in reducing the incidence of lead poisoning. For example, the virtual elimination of lead from gasoline and soldered cans has reduced the blood-lead levels of children aged 1 through 5 years by more than 70% (*CL-2*). However, reducing the amount of lead-based paint in residences and public buildings in the United States remains a public health priority. Today, an estimated 57 million residences in the United States still contain lead-based paint, and young children live in 3.8 million of those homes (*CL-3*).

The long-term benefits of removing (also called abating) lead-based paint from a home far outweigh the short-term financial costs. Abating the lead from an average pre-1950, lead-painted home would cost approximately $2,225, but would save $4,323 over the lifetime of the home. Thus, abating the lead from a home offers a net benefit of $2,098. Abating the lead from all pre-1950, lead-painted homes today would yield $48 billion in net benefits. If abatements were carried out over 20 years, the total net benefit would be $28 billion (US$ 1989) (*CL-4*).

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CHILDHOOD VACCINE-PREVENTABLE DISEASES

Reported cases of childhood diseases that can be prevented by vaccination have decreased dramatically in the United States in the past century. Examples include —

- ✓ paralytic polio, virtually eliminated (*CV-1, CV-2*);
- ✓ diphtheria, virtually eliminated (*CV-1, CV-2*);
- ✓ measles, reduced by 99.8% (*CV-1, CV-2*);
- ✓ rubella, reduced by 99.6% (*CV-1, CV-2*);
- ✓ mumps, reduced by 98.9% (*CV-1, CV-2*);
- ✓ pertussis, reduced by 93.8% (*CV-1, CV-2*);
- ✓ tetanus, reduced by 91.5% (*CV-1, CV-2*); and
- ✓ *Haemophilus influenzae* type b disease, reduced by 95% (*CV-3, CV-4*).

Vaccination against childhood diseases is one of the most cost-effective health interventions available. The measles-mumps-rubella (MMR) vaccine saves $16.34 in direct medical costs for every $1 spent (US$ 1992) (*CV-5*). The diphtheria and tetanus toxoids and pertussis (DTP) vaccine saves $6.21 for every $1 spent (US$ 1992) (*CV-6*).

A new vaccine for chickenpox (*varicella zoster virus*) has recently been recommended for use in the United States. The typical costs of a case of chickenpox include approximately $16 in medications and $201 in work loss by parents. A routine vaccination program for healthy children would cost $4.20 per chickenpox case prevented, or $16,000 per life-year gained. When productivity losses are considered, $5.40 is saved for every $1 spent on a chickenpox vaccination program (US$ 1990) (*CV-7*).

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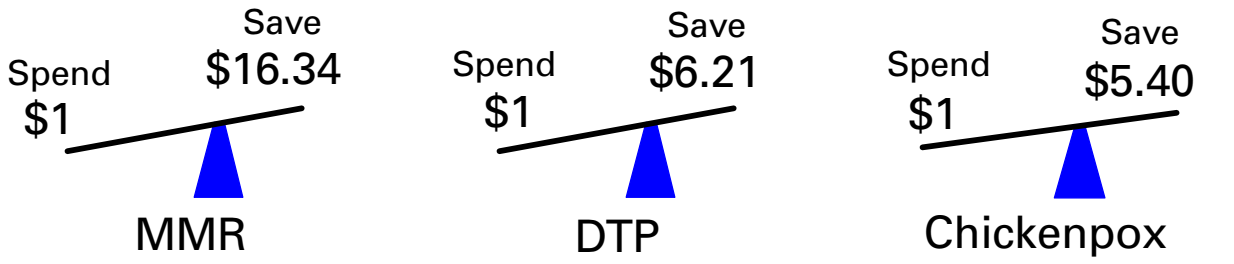

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CHLAMYDIA-RELATED INFERTILITY

In the United States, chlamydia infection is the most common of the bacterial sexually transmitted diseases (STDs), affecting an estimated 4 million persons (*CY-1–CY-3*). Approximately 75% of women and 50% of men who are infected have no symptoms of the disease and can go untreated. Of the approximately 2.6 million women with untreated infections, 15% to 40% develop pelvic inflammatory disease (*CY-3*). Approximately 20% of pelvic inflammatory disease cases result in infertility and 6% in potentially fatal ectopic pregnancy (*CY-4*).

Routine screening and treatment are recommended for sexually active female adolescents and other women at high risk for infection (*CY-1*). Chlamydia screening and treatment can reduce the incidence of pelvic inflammatory disease by as much as 56% (*CY-5*).

Chlamydia and its complications cost the United States approximately $2.6 billion each year (US$ 1997) (*CY-3*). Universal screening and treatment for chlamydia of women aged 15 through 20 years in STD and family planning clinics with a 6.6% prevalence of chlamydia infection would save approximately $900 to $1,000 for each case of chlamydia successfully treated (US$ 1993) compared with a no-screening strategy (*CY-6*).

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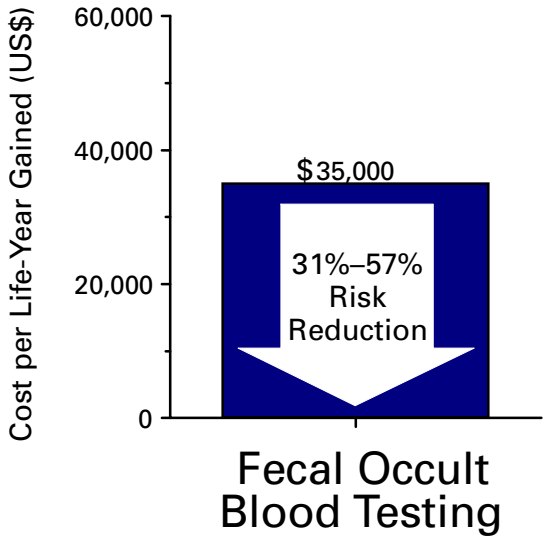

COLORECTAL CANCER

In 1998, an estimated 47,700 persons died from colorectal cancer and approximately 131,600 new cases were diagnosed. Colorectal cancer is the fourth leading cause of cancer and the second leading cause of cancer-related deaths in the United States (*CR-1*).

The U.S. Preventive Services Task Force recommends that all persons aged 50 years or older be screened annually with fecal occult blood testing, sigmoidoscopy, or both. These tests detect precancerous and cancerous polyps and lesions. Studies have documented a 31% to 57% reduction in the risk for colon cancer among persons who receive fecal occult blood testing (*CR-2*).

The cost of treating a patient with colorectal cancer varies from $20,000 to $30,000, depending on the stage of disease. In a 65-year-old population, annual fecal occult blood testing costs $35,000 per life-year gained (US$ 1989) (*CR-3*).

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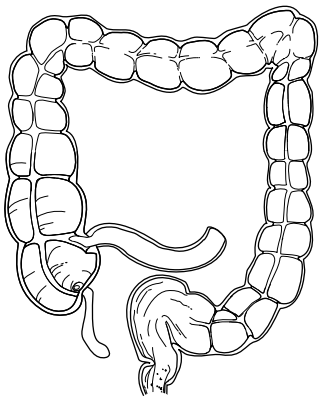

CORONARY HEART DISEASE

Coronary heart disease is the leading cause of death in the United States, accounting for nearly 500,000 deaths annually. Experts recommend that physicians emphasize ways to prevent coronary heart disease, including counseling their patients to exercise more and eat a healthy diet (*CH-1*). The total direct medical care cost of coronary heart disease in 1997 was estimated at $47.5 billion. Including lost productivity, the disease was expected to cost the United States $90.9 billion in 1997 (*CH-2*).

Physical Activity

In 1986, an estimated 35% of the excess coronary heart disease that occurred among persons with sedentary lifestyles could have been eliminated by increasing physical activity (*CH-3*). One cost-effectiveness study indicated that a regular exercise regimen would cost only $3,433 per life-year gained. When the cost of time expended for exercise is considered, the cost is $27,851 per life-year gained (US$ 1985) (*CH-4*).

Nutrition

Reducing fat intake 1% to 3% would reduce the overall incidence of coronary heart disease by 32,000 to 92,700 cases, saving $4.1 billion to $12.7 billion in medical costs and productivity losses over 10 years (US$ 1993) (*CH-5*).

Increased physical activity and improved nutrition are only two ways to potentially reduce coronary heart disease. Others are targeted at the leading causes (e.g., hypertension, smoking, and diabetes).

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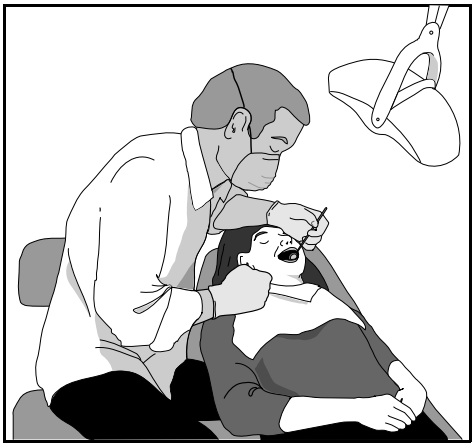
DENTAL CARIES

Approximately 88 million persons (38% of the U.S. population) served by public drinking water do not have access to water with sufficient fluoride to prevent dental caries (cavities) (*DC-1*). Children with lifelong exposure to optimally fluoridated water have at least 18% fewer caries than children with no exposure to optimally fluoridated water.

Of all persons receiving optimally fluoridated community drinking water, approximately 85% are served by water systems for which the annual per capita cost of fluoridation is $0.12 to $0.75 (US$ 1988). The average cost of fluoridating drinking water for one person's lifetime is $38.25. Every $1 spent on water fluoridation could save as much as $80 in treatment costs for dental caries in children (US$ 1988) (*DC-2*).



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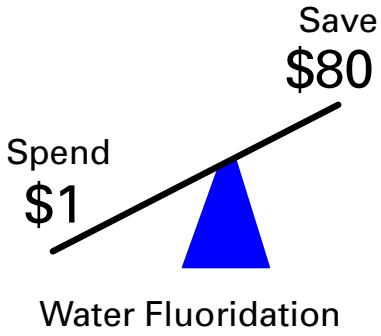

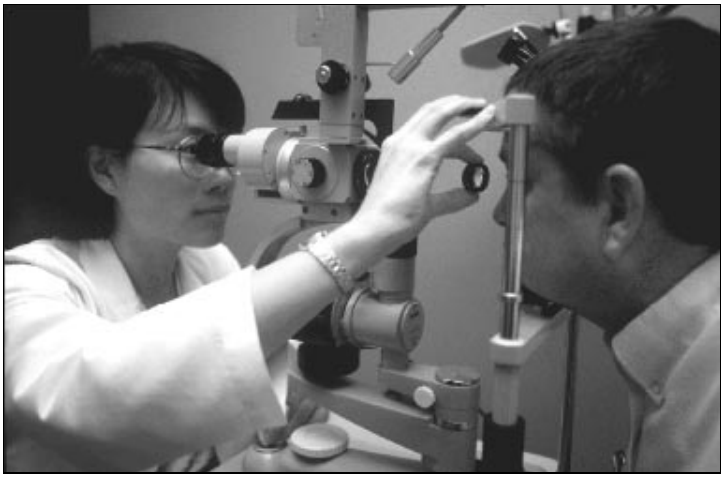

Retina Specialist Examining a Patient
Image Courtesy of Emory Eye Clinic, Atlanta, Georgia

DIABETIC RETINOPATHY

Diabetes mellitus accounts for 12,000 to 24,000 new cases of blindness each year (approximately 12% of all new cases) (*DR-1*). Early detection through screening and timely intervention with laser photocoagulation can reduce the incidence of severe vision loss 50% to 90% (*DR-2*).

Screening is highly cost-effective. The currently suggested screening and treatment for diabetic retinopathy costs $1,757 per life-year of sight gained, or $3,190 per quality-adjusted life-year gained (US$ 1990) (*DR-2*).

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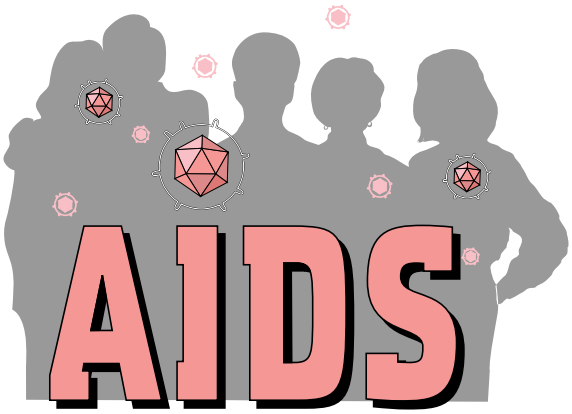
HIV/AIDS TRANSMISSION

As many as 650,000 to 900,000 persons in the United States are infected with human immunodeficiency virus (HIV)(*HA-1*). Acquired immunodeficiency syndrome (AIDS) was the leading cause of death among men aged 25 through 44 years and the fourth leading cause of death for women in the same age group in 1994 (*HA-2,HA-3*). As of December 1997, AIDS has been reported in 641,086 persons, more than 390,000 of whom have died from the infection (*HA-4*). Further, perinatal transmission results in hundreds of HIV-infected infants being born each year.

If HIV is identified in symptomatic persons, they can benefit from early treatment, and further transmission of the virus can be prevented. Periodic screening and counseling is recommended for all persons at high risk for infection and for pregnant women with any risk for infection (*HA-5*).

The lifetime cost of treating a person with HIV from the time of infection through the development of AIDS to death is estimated at $119,000 (US$ 1992) (*HA-6*). Annually, AIDS costs the United States an estimated $15.2 billion (US$ 1991) (*HA-7*). In populations with high HIV-infection rates, annual screening followed by medical treatment costs less than $11,000 per life-year gained (US$ 1990) (*HA-8*). Programs that combine HIV counseling, testing, referral, and partner notification services yield benefits of $20 for every $1 invested (US$ 1990) (*HA-9*). A voluntary counseling and testing program for pregnant women in conjunction with treatment of infected mothers with zidovudine (ZDV) could prevent 656 infant



HIV infections each year and offer an annual net savings of $38 million (*HA-10*).

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INFLUENZA AMONG ELDERLY PERSONS

During each of the 10 influenza epidemics from 1972 through 1991, approximately 20,000 deaths were reported. More than 90% of the deaths attributed to pneumonia and influenza in these epidemics occurred among persons aged 65 years or older (*IE-1*). Annual influenza vaccination is recommended for all persons aged 65 years or older and those in selected groups at high risk for infection (*IE-2*).

Vaccination of older adults saved an estimated $30 to $60 in hospitalization costs per $1 spent on vaccination and reduced mortality from influenza and pneumonia, all acute and chronic respiratory conditions, and congestive heart failure by 39% to 54% during the 1990–1993 influenza seasons, according to the results from a serial cohort study (*IE-3*). Other estimates indicate that vaccination costs Medicare $145 per life-year gained for the 1988–1992 period (*IE-4*).

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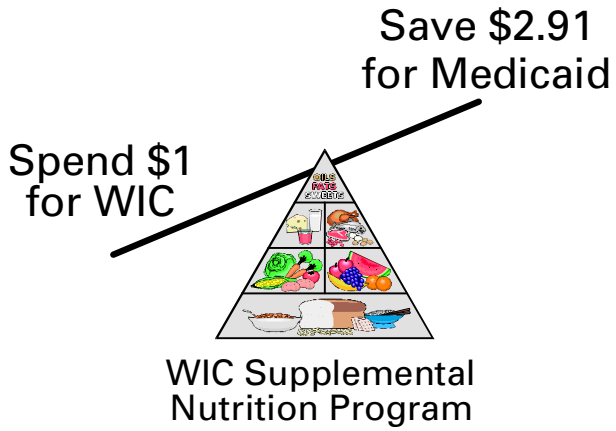

LOW BIRTHWEIGHT

Low birthweight is a principal cause of infant mortality and a leading cause of childhood illness (*LB-1*). In 1991, the U.S. low-birthweight (less than 2,500 gm) rate was 13.6% among black infants and 5.8% among white infants (*LB-2*). Early and adequate prenatal care and proper nutrition during pregnancy can lower the risk of having a low-birthweight infant (*LB-3*).

In 1988, $4 billion in medical costs were incurred for low-birthweight infants in the first year of life. This amounted to almost $15,000 in additional costs for each of the 271,000 infants born weighing less than 2,500 gm (*LB-4*). If all U.S. women received adequate prenatal care, the estimated savings would be $14,755 per low-birthweight birth prevented (US$ 1984) (*LB-3*).

An analysis indicates that the U.S. Department of Agriculture's Supplemental Nutrition Program for Women, Infants, and Children (WIC), in conjunction with Medicaid benefits, can save Medicaid $2.91 for each $1 spent on WIC (US$ 1988) by preventing women in poverty from giving birth to low-birthweight infants (*LB-5*).

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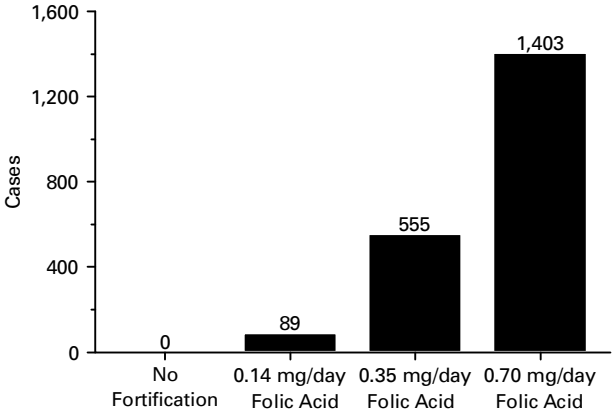
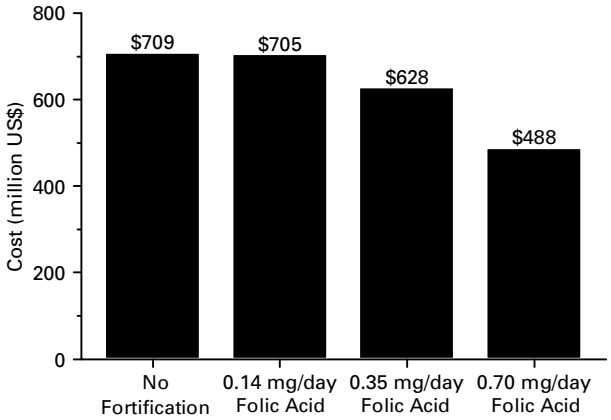
NEURAL TUBE DEFECTS

One of every 1,000 pregnancies is affected by a neural tube defect such as spina bifida and anencephaly (*NT-1*). Neural tube defects are serious central nervous system birth defects that often result in death or that cause lifelong disability in survivors. The U.S. Public Health Service has recommended that all women of childbearing age capable of becoming pregnant consume at least 0.4 mg per day of folic acid to reduce the risk for neural tube defects in their infants. An estimated 50% of all neural tube defects could be prevented with folic acid (*NT-2*).

The lifetime cost of treating and caring for a person affected by spina bifida is approximately $408,000 (US$ 1993). The total annual cost to the United States for neural tube defects is $709 million. Low-level fortification of the food supply with folic acid, as mandated by the U.S. Food and Drug Administration, will prevent 89 children from being born with neural tube defects and save $4 million per year. Higher levels of fortification could save more money and prevent more of these types of birth defects (*NT-3*).



Neural Tube Defects Averted *(NT-3)*



Yearly Costs of Neural Tube Defects *(NT-3)*

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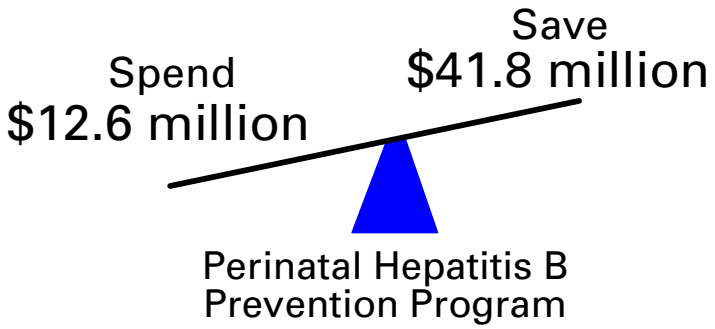

PERINATAL HEPATITIS B

Each year in the United States, an estimated 200,000 to 300,000 persons become infected with hepatitis B virus (*PH-1*). Infants and young children represent approximately 10% of these infections and are at highest risk for developing chronic or lifelong infection (*PH-2*). Annually, an estimated 22,000 births occur to women infected with hepatitis B virus.

Early detection in pregnant women can prevent infection in the newborn (*PH-1*). Thus, screening is recommended for all pregnant women at their first prenatal visit. For infants born to mothers infected with hepatitis B virus, vaccine combined with a single dose of hepatitis B immunoglobulin administered within 12 hours of birth is 75% to 95% effective in preventing chronic hepatitis B virus infection, whereas vaccine alone has an effectiveness of 65% to 96%. However, when these regimens were directly compared, the combination of vaccine and immunoglobulin was generally more effective (*PH-1*).

For children born in 1991 who received health-care services in the public sector, lifetime medical costs associated with hepatitis B virus infection are estimated at $13.7 million for perinatal infections and $26.9 million for infant infections (US$ 1993) (*PH-2*). A national program to screen the mothers of these children during pregnancy and vaccinate infants born to mothers who test positive would save 640 lives each year at a cost of $12.6 million annually or $164 per life-year gained. When medical and work-loss costs are considered, the prevention program would save $41.8 million annually (US$ 1993) (*PH-2*).

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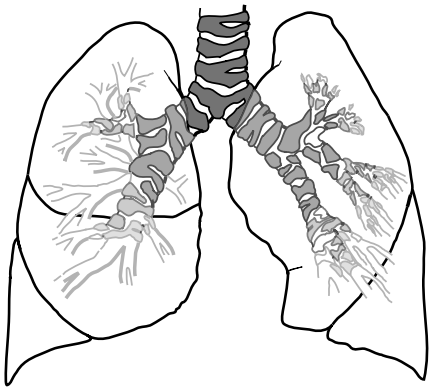
PNEUMOCOCCAL DISEASE

Pneumococcal disease is a leading cause of morbidity and mortality in the United States. S*treptococcus pneumoniae* causes 150,000 to 570,000 cases of pneumonia, 16,000 to 55,000 cases of bacteremia, and 2,600 to 6,000 cases of meningitis annually, all resulting in approximately 40,000 deaths (*PD-1–PD-3*). Surveillance studies have reported annual invasive pneumococcal disease (e.g., septicemia, meningitis) rates of 15 to 30 per 100,000 persons. A systematic review of the literature indicates that the following categories of persons have higher rates of disease:

- ✓ persons aged less than 5 years or 65 years or older;
- ✓ blacks, Native Americans, and Alaska Natives;
- ✓ nursing home residents;
- ✓ alcoholics; and
- ✓ persons with underlying chronic medical or immunodeficient conditions.

Elderly persons and patients with other life-threatening conditions are most likely to die from pneumococcal disease (*PD-4*). Pneumococcal vaccine is recommended for persons aged 65 years or older and others at high risk for infection (*PD-4*). The effectiveness of the current vaccine in preventing pneumococcal disease in immunocompetent persons ranges from 57% to 85% (*PD-2–PD-5*). Approximately 1 million persons are hospitalized with pneumonia



annually, resulting in more than $4 billion in medical expenses (US$ 1991). Pneumococcal pneumonia accounts for approximately 10% of those cases (*PD-6*). Studies of the cost-effectiveness of the vaccine among populations aged 65 years or older indicate a net savings of $141 per person vaccinated (US$ 1986–88) (*PD-7*) to $6,154 per life-year gained (US$ 1983) (*PD-6*).

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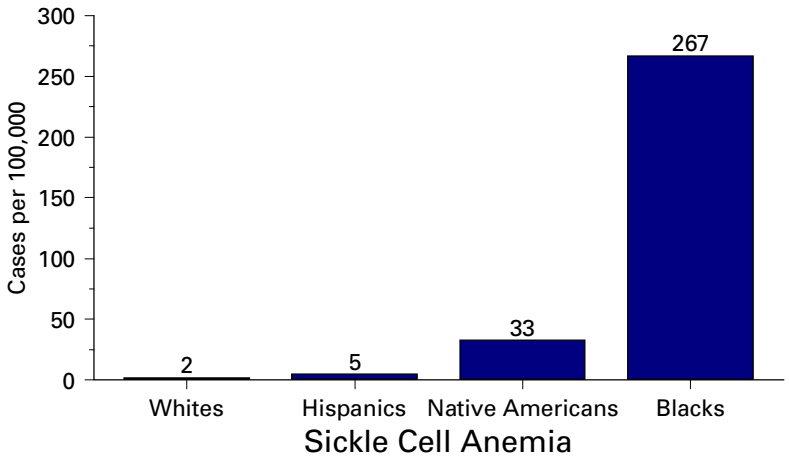

SICKLE CELL DISEASE

An estimated 50,000 Americans have sickle cell anemia, which results in a substantial decrease in life expectancy (*SC-1–SC-4*). Sickle cell disease affects persons in all racial and ethnic groups. However, blacks are at highest risk, with 1 in every 375 newborns affected, compared with 1 in 3,000 Native Americans, 1 in 20,000 Hispanics, and 1 in 60,000 whites (*SC-1, SC-4*). The death rate for children with sickle cell disease peaks between 1 to 3 years of age, and death is chiefly attributable to sepsis caused by *Streptococcus pneumoniae*. Trials indicate screening and treating infants and young children can reduce the incidence of pneumococcal septicemia and related deaths by up to 84%. Neonatal screening for sickle cell, followed by treatment to prevent sepsis, is recommended, particularly for those at high risk (*SC-1*).

The cost of sickle cell disease in the United States is $2.44 million a year per 1 million black infants, and $1.71 million a year per 1 million nonblack infants in a low-prevalence population (US$ 1987) (*SC-5*). A one-time screening of black infants and treatment of affected infants would cost $3,100 (US$ 1987) to $206,000 (US$ 1993) for every life saved. Screening in a low-prevalence population is dramatically more costly — $2 million (US$ 1993) *(SC-6)* to $450 billion (US$ 1987) for every life saved (*SC-5*).

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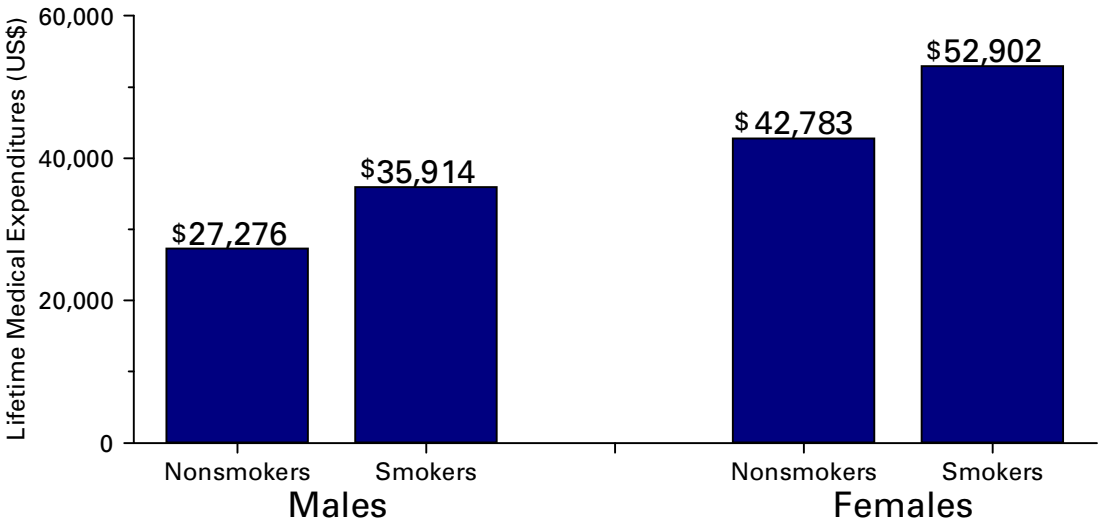

SMOKING

Smoking is the leading cause of preventable death in the United States, causing an estimated 420,000 deaths per year (*SM-1*). In 1993, approximately 48 million adults were smokers (*SM-2*). Every day, an estimated 3,000 young persons start smoking, and of those who continue smoking regularly, approximately 50% will eventually die from smoking-related illness (*SM-3*). Clinical trials have demonstrated that certain forms of clinician and group counseling are effective in changing smoking behavior. An analysis of 39 clinical trials found an average 6% higher cessation rate after 1 year for those who received different combinations of counseling, literature, and nicotine replacement therapy compared with those who did not. Tobacco cessation counseling on a regular basis is recommended for all persons who use tobacco products (*SM-4*).

In 1993, estimated medical care costs attributed to smoking totaled $50 billion (*SM-2*). A male smoker incurs approximately $9,000 more in medical care costs over his lifetime than a male who has never smoked, and a female smoker incurs approximately $10,000 more than a female nonsmoker (US$ 1990) (*SM-5*). Given a 2.7% cessation rate, brief advice and counseling by a physician about quitting smoking costs $705 to $988 per life-year gained for men and $1,204 to $2,058 for women, depending on the patient's age (US$ 1984) (*SM-6*).

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TUBERCULOSIS

A total of 19,851 new cases of tuberculosis (TB) were reported in the United States in 1997 (*TB-1*). Another 10 million to 15 million persons are latently infected with TB and are at risk for developing clinically active TB. Persons also infected with HIV are more than 100 times as likely to develop active TB as those with competent immune systems (*TB-2*).

Screening for infection with tuberculin skin testing is recommended for asymptomatic persons at high risk (*TB-3*). Persons with a positive skin test should be evaluated for preventive therapy with isoniazid. Among persons at high-risk who completed 6-month or 1-year treatments with isoniazid, the percentages who developed TB were reduced 69% and 93%, respectively (*TB-4*).

The average cost of caring for a patient with TB is about $20,000 per year (US$ 1992) (*TB-5*). Medical expenditures nationwide for TB in 1991 were estimated at $703.1 million (US$ 1991) (*TB-6*). Among patients at a TB clinic, a 6-month program of screening and preventive therapy with isoniazid costs $7,112 per case prevented (US$ 1983) (*TB-7*). A program to prevent new TB cases by screening kindergartners and high school entrants at high risk, followed by treatment with isoniazid, would save $1.20 for every $1 spent (US$ 1993) (*TB-8*).

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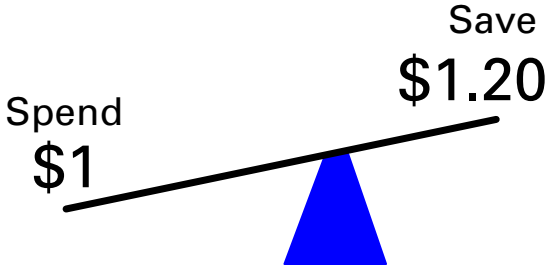

Tuberculosis Screening and Isoniazid Treatment

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SUMMARY TABLE

Literature Inclusion Criteria

The criteria for including specific cost-effectiveness studies were derived from articles, textbooks, and expert opinion describing appropriate methods for cost-effectiveness analysis.* To be selected for inclusion, studies had to

- ✓ be written in the English language,
- ✓ be published after 1980,
- ✓ be relevant to U.S. population-based strategies, and
- ✓ present results in U.S. dollars.

In addition, only those studies most closely adhering to the following guidelines were selected:

Guideline	Definition	Preferred Analytic Approach
Strategy Effectiveness	Improvement in health outcome produced by a prevention strategy as used in routine practice	Consistent with the *Guide to Clinical Preventive Services*† recommendations
Health Outcome	Measurement of health consequence used to determine a strategy's effectiveness	Analysis reports of quality-adjusted life-years or life-years gained, incorporating the impact of a health condition on morbidity and premature mortality
Target Population	Persons to whom the prevention strategy was applied in the study, grouped by risk factor	Consistent with the *Guide to Clinical Preventive Services* recommendations
Perspective	Determines which costs and benefits are included in the analysis	Societal perspective including all benefits and costs, regardless of recipients or who pays
Cost-Effectiveness	Economic analysis of all costs related to the health effect	Incremental ratios that rank strategies by effectiveness and costs; given in terms of additional costs incurred by a strategy to produce an additional unit of the health outcome as compared with the next most closely ranked strategy
Costs Included	Costs associated with the prevention and treatment of a disease, disability, or health outcome	Considers both expenditures for prevention activities and health care, plus resources foregone either to participate in a strategy or as the result of a health condition; not aggregated
Analytic Horizon	Time period over which the costs and benefits that result from the strategy and the health outcome of interest are considered	Captures all of the costs and effects that accrue from the strategy and the health outcome of interest during a person's lifetime
Discount Rate/Year	Rate and year at which future costs and benefits are converted to present value to account for time preference, expressed in U.S. dollars	Discounts both future costs and health outcomes at 3% or 5%, with sensitivity analysis performed over a range of discount rates, including zero
Sensitivity Analysis	Mathematical calculations indicating the degree of influence each factor has on the outcome of the analysis	Provides univariate and multivariate sensitivity analyses on all important variables

Limitations: The literature review of cost-effectiveness analyses under the criteria chosen indicates that the existing literature does not adhere well to basic analytic guidelines. The accuracy of the information presented in this report is limited to the accuracy of data and assumptions in the original analysis. The lack of a clear definition of assumptions compromises the scientific integrity of a study and severely limits the comparison of results. The cost-effectiveness analyses examined in this literature review are based on a variety of assumptions and contain data of inconsistent quality. As a result, duplication of results and comparison of the costs per health outcome of one strategy to another are problematic.

* The criteria were derived in part from

1. Haddix AC, Teutsch SM, Shaffer PA, Duñet DO, eds. Prevention effectiveness: a guide to decision analysis and economic evaluation. New York: Oxford University Press, 1996.
2. U.S. Preventive Services Task Force. Guide to clinical preventive services. 2nd ed. Baltimore: Williams & Wilkins, 1996.
3. Tengs TO, Adams ME, Pliskin JS, et al. Five-hundred life-saving interventions and their cost-effectiveness. Risk Anal 1995;15:369–90.
4. Gold MR, Siegel JE, Russell LB, Weinstein MC. Cost-effectiveness in health and medicine. New York: Oxford University Press, 1996.

† The *Guide to Clinical Preventive Services* is an updated and expanded version of the 1989 report of the U.S. Preventive Services Task Force. This report serves as a reference source on the effectiveness of clinical preventive services, screening tests for early detection of disease, immunizations to prevent infections, and counseling for risk reduction.

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Table 3. Summary of Assumptions and Variables Used in Each Economic Study

	Reference	Strategy Effectiveness	Health Outcome	Target Population
Bicycle-Related Head Injuries	9	Program — Legislative, 38% Reduction; Community, 25% Reduction	Bicycle-Related Head Injuries Prevented	Children, Aged 5 to 16 Years
Breast Cancer	15	Screening — Reduction in Breast Cancer Mortality, Health Insurance Plan Study, 24% to 27%; Breast Cancer Detection Demonstration Project, 67% to 70%; and Specificity of Mammography, 98% to 99%	Life-Years Gained	Women, Aged 40 to 75 Years
Cervical Cancer	18	Screening — Reduction in Cumulative Rate of Invasive Cervical Cancer, Annual Screening, 93.3%; Screening Every 3 Years, 91.2%	Life-Years Gained	Average-Risk Asymptomatic 20-Year-Old Woman (First Screen)
Childhood Lead Poisoning	22	Assumption — Each Microgram-per-Deciliter–Change in Blood-Lead Level Results in a 0.25 Point Change in IQ; Abatement of Lead in Homes —Decrease in Children's Blood-Lead Levels, 25%	Poisonings, Cognitive Deficits, and Neonatal Mortality Prevented	Children and Pregnant Women Living in Pre-1950 Homes with Lead-Based Paint
Childhood Vaccine-Preventable Diseases	27	Vaccine — Reduction in Measles Cases and Deaths, 99%; Reduction in Mumps Cases and Deaths, 97%; Reduction in Rubella Cases and Deaths, 99%	Cases of and Deaths from Measles, Mumps, and Rubella and Adverse Vaccine Reactions Prevented	1992 U.S. Birth cohort (4.1 Million)
	28	Vaccine — Reduction in Diphtheria Cases and Deaths, 99%; Reduction in Tetanus Cases, 90%; Reduction in Tetanus Deaths, 92%; Reduction in Pertussis Cases, 98%; Reduction in Pertussis Deaths, 97%	Cases, Hospitalizations, and Deaths Resulting from Diphtheria, Tetanus, and Pertussis and Adverse Vaccine Reactions Prevented	
	29	Vaccine — Reduction in Future Varicella (Chickenpox) Cases, 94%	Cases of Varicella Prevented and Life-Years Gained	Children Under Age 6 Years
Chlamydia-Related Infertility	34	Screening — Sensitivity of Selective Screening Criteria, 74% in Family Planning Clinics and 94% in Sexually Transmitted Disease Clinics; Sensitivity of Direct Flourescent Antibody Test, 75%	Cases of Untreated Cervical Chlamydia Infection Prevented	Women Aged 15 Through 20 years Attending Family Planning and Sexually Transmitted Disease Clinics
Colorectal Cancer	36	Screening — Not Available	Life-Years Gained	Persons Aged 65 to 85 Years and 1989 65-Year-Old U.S. Birth Cohort (2.1 Million)
Coronary Heart Disease	38	Reducing Fat Intake from 1% to 3% — Declines in Coronary Events, 32,000 to 99,700, Respectively	First-Time Coronary Events Prevented	Men and Women Aged 35 to 69 Years
	40	Program — Reduction in Disease from Exercise That Consumes 2,000 kcal/wk, 50%	Life-Years Gained and Quality-Adjusted Life-Years Gained	Men Aged 35 Years
Dental Caries	42	Assumption — One Dental Caries Prevented for Each Year of Fluoride Use	Dental Caries Prevented	General Public
Diabetic Retinopathy	44	Screening — Reduction in Progression to Blindness from Proliferative Retinopathy, 60% to 90%; Sensitivity and Specificity of Dilated Opthalmoscopy, 80% and 97%, Respectively	Quality-Adjusted Life-Years Gained and Life-Years of Sight Gained	Americans with Insulin-Dependent and Noninsulin-Dependent Diabetes Mellitus
HIV/AIDS Transmission	51	Screening — Reduction in Rate of Development of Initial and Recurrent Episodes of *Pneumocystis carinii* Pneumonia, 50%	Life-Years Gained	High-Risk Groups**
	52	Program — Among Persons Testing HIV-Positive, Reduction of Risky Behavior To Prevent at Least One Other Infection, 20% to 80%	HIV Infections Prevented	General Public and Groups at High Risk**
	53	Treatment — Reduction in HIV Transmission Using Zidovudine, 50%		Pregnant Women and Infants
Influenza Among Elderly Persons	55	Vaccine — Fewer Hospitalizations for Pneumonia and Influenza, 48% to 57%; Reduction in Mortality, 39% to 54%	Influenza and Influenza-Related Illness Prevented	Men and Women Aged ≥65 Years
	56	Vaccine — Reduction in Pneumonia Hospitalization and Deaths for Mild and Severe InfluenzaYears, 40%	Life-Years Gained	
Low Birthweight	59	Screening — Not Available	Low-Birthweight Deliveries Prevented	New Hampshire Resident Births from 1981 Through 1984
	61	Program — Reduction in Low-Birthweight Babies <2,500 gm, 22% to 31%; Reduction in Low-Birthweight Babies <1,500 gm, 44% to 57%		Medicaid-Eligible Pregnant Women in North Carolina in 1988
Neural Tube Defects	64	Screening — For Women Who Consume 4 mg/day of Folic Acid, Reduction in Risk for Neural Tube Defect-Affected Pregnancy, 50%	Quality of Life-Years Gained; Life-Years Gained; Neural Tube Defects Prevented	All U.S. Women Capable of Becoming Pregnant
Perinatal Hepatitis B	65	Screening — Efficiency in Preventing Perinatal Hepatitis B Cases, 69%; Preventing Infant Hepatitis B Cases, 68%; and Preventing Adolescent Hepatitis B, 42% to 45%	Hepatitis B Infections Prevented	Women, Infants, and Adolescents
Pneumococcal Disease	70	Vaccine — Reduction in Pneumococcal Pneumonia Cases, 60%	Healthy Life-Years Gained	Men and Women Aged ≥65 Years
	71	Vaccine — Reduction in Pneumococcal Pneumonia Cases, 69%	Net Savings§§	Men and Women Aged ≥50 Years
Sickle Cell Disease	75	Treatment — Reduction in Pneumococcal Sepsis Using Penicillin Prophylaxis, 84%	Lives Saved	Black and Nonblack Infants with Low- and High-Prevalence Rates of Hemoglobin S Genes
	76	Screening — Prevention of Sickle Cell Disease Deaths in Infants Identified and Treated, 50%	Deaths Prevented	Newborns in Alaska (1995 Birth Cohort)
Smoking	81	Counseling — Cessation Rate Increase, 2.7%	Life-Years Gained	Men and Women Aged 35 Through 69
Tuberculosis	87	Treatment — Reduction in Tuberculosis Cases Using Isoniazid, 75%	Quality-Adjusted Life-Years Gained	Clinic Patients with Tuberculosis
	88	Screening — Reduction in Tuberculosis Cases Using Isoniazid Treatment, 70%	Tuberculosis Infections Prevented¶¶	Children in Kindergarten and High School Students in Large Urban and Rural Counties

* Laboratory charges are known to vary widely.
† Effectiveness of child-restraint seats in reducing motor vehicle injuries is not stated in this study.
§ Low and high estimates of savings.
¶ Including managed care administration costs.
**E.g., injecting-drug users.

Table 3. Summary of Assumptions and Variables Used in Each Economic Study (Cont'd.)

Perspective	Type of Economic Study	Costs Included	Analytic Horizon	Discount Rate/ Base Year	Sensitivity Analysis
Societal	Cost-Benefit	Program Costs for Start-Up, Maintenance, and Helmets; Medical Cost of Head Injuries Associated with Emergency Department Visit or Hospitalization	4 Years	5% 1992	All Important Variables
Societal	Incremental	Program Costs of $75 for Mammography and $25 for Clinical Breast Exam; Medical Costs of Treating Different Stages of Breast Cancer	Lifetime	5% 1984	All Variables
Health-Care Systems	Incremental	Program Costs of $76 for Pap Test and $150 for False-Positive Test; Medical Costs of Treating Cervical Lesions; Terminal Care	Lifetime	5% 1988	Most Variables Except Costs and Savings*
Societal	Cost-Benefit	Screening and Treatment; Lead Abatement in Homes; Costs Prevented for Special Education and Medical Care; Productivity Losses	Lifetime of Birth Cohort	5% 1989	Some Variables
Societal	Cost-Benefit	Vaccines and Administration; Adverse Reactions and Costs of Illness Prevented, Including Medical Costs and Productively Losses for Disability, Premature Mortality, and Sick-Child Caregivers	Birth to Age 40 Years	3% 1992	All Variables
			Lifetime	3% 1992	All Important Variables
Health-Care Systems and Societal	Cumulative and Cost-Benefit	Program Costs of $35 for Vaccine and $5 to $10 for Administration; Costs of Illness Prevented, Including Medication, Outpatient, and Hospitalization;¶ Productivity Losses for Sick-Child Caregivers, Sick Adult Work Loss, and Death	Lifetime	5% 1990	All Variables
Societal	Cumulative	Direct Costs, Including Program; Cost of Illness Prevented, Including Pelvic Inflammatory Disease and Its Sequelae, Neonatal Disease, and Disease in Male Partners	10 Years	5% 1993	All Important Variables
Health-Care Systems	Cumulative	$3.58 for Fecal Occult Blood Test; $98 for Sigmiodoscopy; $411 for Diagnostic Colonoscopy; $653 for Colonoscopy with Polypectomy; $51 for Pathology; Cost of Treatment of Early Cancer, Complications, and Late Cancer	Lifetime	5% 1989	Most Uncertain Assumptions
Societal	Cost-of-Illness	Medical Costs and Productivity Losses Associated with the Disease	Lifetime	5% 1993	All Important Variables
	Cumulative	$75 for Physician Visit; $100 for Exercise; Cost of Illness Prevented; Value of Time and Productivity Lost as a Result of Exercise and Injury	30 Years	3% 1985	
Individual	Cost-Benefit	National Average Cost per Tooth Restoration ($40) and a Mean National Weighted Cost of Fluoridated Drinking Water ($0.51/person)	Lifetime	None 1988	None Performed
Health-Care Systems	Cumulative and Cost-Utility	Program Costs of $62/Dilated Fundus Screening and $1,980 for Photocoagulation Treatment of Both Eyes, Including Fluorescein Angiogram; Cost of Illness Prevented ($14,296 and $32 Annual Cost to U.S. Government per Diabetes Mellitus Patient Aged <65 Years and ≥65 Years, Respectively)	Lifetime	5% 1990	Quality of Life-Years
Societal	Incremental	Screening Costs of $67 for Seronegative and $115 for Seropositive Persons; Follow-Up Care for Various Levels of T4 Cell Count (Ranges from $258 to $4,000)	Lifetime	5% 1990	All Important Variables
	Cost-Benefit	Program, Ancillary, and Treatment Costs Prevented; Productivity Losses		6% 1990	
Health-Care Systems		Counseling, Testing, and Zidovudine Treatment; Cost of HIV/AIDS Prevented		5% 1994	
Societal	Cumulative	Vaccination Program; Hospitalization	3 Years	Not Applicable 1990 to 1993	None
	Cumulative and Cost-Benefit	Vaccine and Administration, $0.80 and $1.15, Respectively; Cost of Illness Prevented, $5,308/Pneumonia and Influenza Admission	10 Years	Not Specified 1990	Vaccine Effectivenes
Health-Care Systems	Incremental	Medical Costs of Prenatal and Morbidity Care	4 Years	Not Applicable 1984	None
Societal	Cost-Benefit	WIC†† Program and Hospitalizations Associated with Low Birthweight	60 Days Following Birth	Not Applicable 1988	None
Societal	Incremental	Fortification Costs of $4.5 Million for Label Changes, $2.5 Million for Analytic Testing, $2 Million for Fortification; Supplementation Costs; Cost of Anencephaly, Spina Bifida, and Neurological Complications Associated with Delayed Diagnosis of Vitamin B-12 Deficiency, Including Medical, Caregiver, Special Education, Social Services, and Long-Term–Care Costs	Lifetime	3% 1993	Univariate and Multivariate on All Important Variables
Societal	Cumulative	Vaccination Program Costs; Cost of Hepatitis B Infections, Cirrhosis, and Primary Hepatocellular Carcinoma Prevented; Productivity Losses	13 Years	5% 1993	All Variables
Health-Care Systems	Cumulative	Direct Costs, Including Program Costs of $14.65 for Vaccination and $3.80 for Public Health Provision of Vaccine; Costs of Illness, Not Available	8 Years	5% 1983	Limited
	Cost-Benefit	Direct Costs, Including $18.53 for Total Program Cost of Vaccine; Cost of Illness Prevented, Both Outpatient and Inpatient	1 Year	Not Applicable 1986 Through 1988	
Health-Care Systems	Incremental	Program Costs of $0.64 for Screening Battery, $0.42 for Consumable Supplies, and $0.42 for Technician Time; Costs of Illness Prevented, Including Hospitalization for Sepsis and Anaphylaxis	≥3 Years, 3 Months	5% 1987	All Important Variables
		Program Costs of $47,803/100 Abnormal Tests; Costs of Illness Prevented, Including Hospitalization for Sepsis and Meningitis, Treatment, Special Education, Home Care, and Mental Retardation Care	Lifetime	5% 1993	
Health-Care Systems	Cumulative	Physician Costs	Lifetime	5% 1984	All Important Variables
Health-Care Systems	Cost-Utility	Program Costs of Isoniazid Treatment; Medical Costs of Illness Prevented	20 Years	5% 1983	All Variables
Health-Care Systems	Cumulative and Cost-Benefit	Program Costs of $166.85 for Screening, Chest Radiograph, and Prevention Therapy; Medical Costs of Illness Prevented, Including $16,392 for Treatment	5 Years	3% 1993	All Variables

†† Special Supplemental Nutrition Program for Women, Infants, and Children operated by the U.S. Department of Agriculture. WIC provides nutritious food, individual counseling, nutrition education, and referrals to health care for high-risk, low-income women and children aged 5 years.
§§ Costs compared in prevaccination and postvaccination.
¶¶ Targeted screening and screen-all strategies compared to no screening.

SUMMARY TABLE

Assumptions and Variables Used in Each Economic Study

	Reference	Strategy Effectiveness	Health Outcome	Target Population		Perspective	Type of Economic Study	Costs Included	Analytic Horizon	Discount Rate/ Base Year	Sensitivity Analysis
Bicycle-Related Head Injuries	BR-6	Program — Legislative, 38% Reduction; Community, 25% Reduction	Bicycle-Related Head Injuries Prevented	Children, Aged 5 to 16 Years		Societal	Cost-Effectiveness	Program Costs for Start-Up, Maintenance, and Helmets; Medical Cost of Head Injuries Associated with Emergency Department Visit or Hospitalization	4 Years	5% 1992	All Important Variables
Breast Cancer	BC-7	Screening — Reduction in Breast Cancer Mortality, Health Insurance Plan Study, 24% to 27%; Breast Cancer Detection Demonstration Project, 67% to 70%; and Specificity of Mammography, 98% to 99%	Life-Years Gained	Women, Aged 40 to 75 Years		Societal	Cost-Effectiveness	Program Costs for Mammography and Clinical Breast Exam; Medical Costs of Treating Different Stages of Breast Cancer	Lifetime	5% 1984	All Variables
Cervical Cancer	CC-5	Screening — Reduction in Cumulative Rate of Invasive Cervical Cancer, Annual Screening, 93.3%; Screening Every 3 Years, 91.2%	Life-Years Gained	Average-Risk Asymptomatic 20-Year-Old Woman (First Screen)		Health-Care Systems	Cost-Effectiveness	Program Costs of $76 for Pap Test and $150 for False-Positive Test; Medical Costs of Treating Cervical Lesions; Terminal Care	Lifetime	5% 1988	Most Variables Except Costs and Savings*
Childhood Lead Poisoning	CL-4	Assumption — Each Microgram-per-Deciliter–Change in Blood-Lead Level Results in a 0.25 Point Change in IQ; Abatement of Lead in Homes —Decrease in Children's Blood-Lead Levels, 25%	Poisonings, Cognitive Deficits, and Neonatal Mortality Prevented	Children and Pregnant Women Living in Pre-1950 Homes with Lead-Based Paint		Societal	Cost-Benefit	Screening and Treatment; Lead Abatement in Homes; Costs Prevented for Special Education and Medical Care; Productivity Losses	Lifetime of Birth Cohort	5% 1989	Some Variables
Childhood Vaccine-Preventable Diseases	CV-5	Vaccine — Reduction in Measles Cases and Deaths, 99%; Reduction in Mumps Cases and Deaths, 97%; Reduction in Rubella Cases and Deaths, 99%	Cases of and Deaths from Measles, Mumps, and Rubella and Adverse Vaccine Reactions Prevented	1992 U.S. Birth Cohort (4.1 Million)		Societal	Cost-Benefit	Vaccines and Administration; Adverse Reactions and Costs of Illness Prevented, Including Medical Costs and Productivity Losses for Disability, Premature Mortality, and Sick-Child Caregivers	Birth to Age 40 Years	3% 1992	All Variables
	CV-6	Vaccine — Reduction in Diphtheria Cases and Deaths, 99%; Reduction in Tetanus Cases, 90%; Reduction in Tetanus Deaths, 92%; Reduction in Pertussis Cases, 98%; Reduction in Pertussis Deaths, 97%	Cases, Hospitalizations, and Deaths Resulting from Diphtheria, Tetanus, and Pertussis and Adverse Vaccine Reactions Prevented						Lifetime	3% 1992	All Important Variables
	CV-7	Vaccine — Reduction in Future Varicella (Chickenpox) Cases, 94%	Cases of Varicella Prevented and Life-Years Gained	Children Under Age 6 Years		Health-Care Systems and Societal	Cost-Effectiveness	Program Costs of $35 for Vaccine and $5 to $10 for Administration; Costs of Illness Prevented, Including Medication, Outpatient, and Hospitalization;† Productivity Losses for Sick-Child Caregivers, Sick Adult Work Loss, and Death	Lifetime	5% 1990	All Variables
Chlamydia-Related Infertility	CY-6	Screening — Sensitivity of Selective Screening Criteria, 74% in Family Planning Clinics and 94% in Sexually Transmitted Disease Clinics; Sensitivity of Direct Flourescent Antibody Test, 75%	Cases of Untreated Cervical Chlamydia Infection Prevented	Women Aged 15 Through 20 Years Attending Family Planning and Sexually Transmitted Disease Clinics		Societal	Cost-Effectiveness	Direct Costs, Including Program; Cost of Illness Prevented, Including Pelvic Inflammatory Disease and Its Sequelae, Neonatal Disease, and Disease in Male Partners	10 Years	5% 1993	All Important Variables
Colorectal Cancer	CR-3	Screening — Not Available	Life-Years Gained	Persons Aged 65 to 85 Years and 1989 65-Year-Old U.S. Birth Cohort (2.1 Million)		Health-Care Systems	Cost-Effectiveness	Medical costs of $3.58 for Fecal Occult Blood Test; $98 for Sigmoidoscopy; $411 for Diagnostic Colonoscopy; $653 for Colonoscopy with Polypectomy; $51 for Pathology; Cost of Treatment of Early Cancer, Complications, and Late Cancer	Lifetime	5% 1989	Most Uncertain Assumptions
Coronary Heart Disease	CH-4	Program — Reduction in Disease from Exercise That Consumes 2,000 kcal/wk, 50%	Life-Years Gained and Quality-Adjusted Life-Years Gained	Men Aged 35 Years		Societal	Cost-Effectiveness	Medical costs of $75 for Physician Visit; $100 for Exercise; Cost of Illness Prevented; Value of Time and Productivity Lost as a Result of Exercise and Injury	30 Years	3% 1985	All Important Variables
	CH-5	Reducing Fat Intake from 1% to 3% — Declines in Coronary Events, 32,000 to 99,700, Respectively	First-Time Coronary Events Prevented	Men and Women Aged 35 to 69 Years			Cost-of-Illness	Medical Costs and Productivity Losses Associated with the Disease	Lifetime	5% 1993	
Dental Caries	DC-2	Assumption — One Dental Caries Prevented for Each Year of Fluoride Use	Dental Caries Prevented	General Public		Individual	Cost-Benefit	National Average Cost per Tooth Restoration ($40) and a Mean National Weighted Cost of Fluoridated Drinking Water ($0.51/person)	Lifetime	None 1988	None Performed
Diabetic Retinopathy	DR-2	Screening — Reduction in Progression to Blindness from Proliferative Retinopathy, 60% to 90%; Sensitivity and Specificity of Dilated Opthalmoscopy, 80% and 97%, Respectively	Quality-Adjusted Life-Years Gained and Life-Years of Sight Gained	Americans with Insulin-Dependent and Noninsulin-Dependent Diabetes Mellitus		Health-Care Systems	Cost-Utility	Program Costs of $62/Dilated Fundus Screening and $1,980 for Photocoagulation Treatment of Both Eyes, Including Fluorescein Angiogram; Cost of Illness Prevented ($14,296 and $32 Annual Cost to U.S. Government per Diabetes Mellitus Patient Aged <65 Years and ≥65 Years, Respectively)	Lifetime	5% 1990	Quality of Life-Years
HIV/AIDS Transmission	HA-8	Screening — Reduction in Rate of Development of Initial and Recurrent Episodes of *Pneumocystis carinii* Pneumonia, 50%	Life-Years Gained	High-Risk Groups§		Societal	Cost-Effectiveness	Screening Costs of $67 for Seronegative and $115 for Seropositive Persons; Follow-Up Care for Various Levels of T4 Cell Count (Ranges from $258 to $4,000)	Lifetime	5% 1990	All Important Variables
	HA-9	Program — Among Persons Testing HIV-Positive, Reduction of Risky Behavior To Prevent at Least One Other Infection, 20% to 80%	HIV Infections Prevented	General Public and Groups at High Risk§			Cost-Benefit	Program, Ancillary, and Treatment Costs Prevented; Productivity Losses		6% 1990	
	HA-10	Treatment — Reduction in HIV Transmission Using Zidovudine, 50%		Pregnant Women and Infants		Health-Care Systems	Cost-Effectiveness	Counseling, Testing, and Zidovudine Treatment; Cost of HIV/AIDS Prevented		5% 1994	
Influenza Among Elderly Persons	IE-3	Vaccine — Fewer Hospitalizations for Pneumonia and Influenza, 48% to 57%; Reduction in Mortality, 39% to 54%	Influenza and Influenza-Related Illness Prevented	Men and Women Aged ≥65 Years		Societal	Cost-Effectiveness	Vaccination Program; Hospitalization	3 Years	Not Applicable 1990 to 1993	None
	IE-4	Vaccine — Reduction in Pneumonia Hospitalization and Deaths for Mild and Severe InfluenzaYears, 40%	Life-Years Gained				Cost-Effectiveness	Vaccine and Administration, $0.80 and $1.15, Respectively; Cost of Illness Prevented, $5,308/Pneumonia and Influenza Admission	10 Years	Not Specified 1990	Vaccine Effectiveness
Low Birthweight	LB-3	Screening — Not Available	Low-Birthweight Deliveries Prevented	New Hampshire Resident Births from 1981 Through 1984		Health-Care Systems	Cost-Benefit	Medical Costs of Prenatal and Morbidity Care	4 Years	Not Applicable 1984	None
	LB-5	Program — Reduction in Low-Birthweight Babies <2,500 gm, 22% to 31%; Reduction in Low-Birthweight Babies <1,500 gm, 44% to 57%		Medicaid-Eligible Pregnant Women in North Carolina in 1988		Societal	Cost-Benefit	WIC¶ Program and Hospitalizations Associated with Low Birthweight	60 Days Following Birth	Not Applicable 1988	None
Neural Tube Defects	NT-3	Screening — For Women Who Consume 0.4 mg/day of Folic Acid, Reduction in Risk for Neural Tube Defect-Affected Pregnancy, 50%	Quality of Life-Years Gained; Life-Years Gained; Neural Tube Defects Prevented	All U.S. Women Capable of Becoming Pregnant		Societal	Cost-Effectiveness	Fortification Costs of $4.5 Million for Label Changes, $2.5 Million for Analytic Testing, $2 Million for Fortification; Supplementation Costs; Cost of Anencephaly, Spina Bifida, and Neurological Complications Associated with Delayed Diagnosis of Vitamin B-12 Deficiency, Including Medical, Caregiver, Special Education, Social Services, and Long-Term–Care Costs	Lifetime	3% 1993	Univariate and Multivariate on All Important Variables
Perinatal Hepatitis B	PH-2	Screening — Efficiency in Preventing Perinatal Hepatitis B Cases, 69%; Preventing Infant Hepatitis B Cases, 68%; and Preventing Adolescent Hepatitis B, 42% to 45%	Hepatitis B Infections Prevented	Women, Infants, and Adolescents		Societal	Cost-Effectiveness	Vaccination Program Costs; Cost of Hepatitis B Infections, Cirrhosis, and Primary Hepatocellular Carcinoma Prevented; Productivity Losses	13 Years	5% 1993	All Variables
Pneumococcal Disease	PD-6	Vaccine — Reduction in Pneumococcal Pneumonia Cases, 60%	Healthy Life-Years Gained	Men and Women Aged ≥65 Years		Health-Care Systems	Cost-Effectiveness	Direct Costs, Including Program Costs of $14.65 for Vaccination and $3.80 for Public Health Provision of Vaccine; Costs of Illness, Not Available	8 Years	5% 1983	Limited
	PD-7	Vaccine — Reduction in Pneumococcal Pneumonia Cases, 69%	Pneumococcal Episodes Prevented	Men and Women Aged ≥50 Years			Cost-Benefit	Direct Costs, Including $18.53 for Total Program Cost of Vaccine; Cost of Illness Prevented, Both Outpatient and Inpatient	1 Year	Not Applicable 1986 Through 1988	
Sickle Cell Disease	SC-5	Treatment — Reduction in Pneumococcal Sepsis Using Penicillin Prophylaxis, 84%	Lives Saved	Black and Nonblack Infants with Low- and High-Prevalence Rates of Hemoglobin S Genes		Health-Care Systems	Cost-Effectiveness	Program Costs of $0.64 for Screening Battery, $0.42 for Consumable Supplies, and $0.42 for Technician Time; Costs of Illness Prevented, Including Hospitalization for Sepsis and Anaphylaxis	≥3 Years, 3 Months	5% 1987	All Important Variables
	SC-6	Screening — Prevention of Sickle Cell Disease Deaths in Infants Identified and Treated, 50%	Deaths Prevented	Newborns in Alaska (1995 Birth Cohort)				Program Costs of $47,803/100 Abnormal Tests; Costs of Illness Prevented, Including Hospitalization for Sepsis and Meningitis, Treatment, Special Education, Home Care, and Mental Retardation Care	Lifetime	5% 1993	
Smoking	SM-6	Counseling — Cessation Rate Increase, 2.7%	Life-Years Gained	Men and Women Aged 35 Through 69		Health-Care Systems	Cost-Effectiveness	Physician Costs	Lifetime	5% 1984	All Important Variables
Tuberculosis	TB-7	Treatment — Reduction in Tuberculosis Cases Using Isoniazid, 75%	Quality-Adjusted Life-Years Gained	Clinic Patients with Tuberculosis		Health-Care Systems	Cost-Utility	Program Costs of Isoniazid Treatment; Medical Costs of Illness Prevented	20 Years	5% 1983	All Variables
	TB-8	Screening — Reduction in Tuberculosis Cases Using Isoniazid Treatment, 70%	Tuberculosis Infections Prevented**	Children in Kindergarten and High School Students in Large Urban and Rural Counties		Health-Care Systems	Cost-Benefit	Program Costs of $166.85 for Screening, Chest Radiograph, and Prevention Therapy; Medical Costs of Illness Prevented, Including $16,392 for Treatment	5 Years	3% 1993	All Variables

* Laboratory charges are known to vary widely.
† Including managed care administration costs.
§ E.g., injecting-drug users.
¶ Special Supplemental Nutrition Program for Women, Infants, and Children operated by the U.S. Department of Agriculture. WIC provides nutritious food, individual counseling, nutrition education, and referrals to health care for high-risk, low-income women and children aged ≤5 years.
**Targeted screening and screen-all strategies compared with no screening.

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