PREVENTION

QUICK FACTS

Actions such as the Clean Air Act as well as anti-smoking campaigns have had a significant preventive impact on public health.[1,2,3]

States play a crucial role in promoting both local and federal prevention efforts and also contribute to prevention through their own initiatives.[2,3]

Beyond individual prevention efforts, local community actions can be particularly effective in bringing about changes that prevent or reduce environmentally-related illness and disease.[4]

Laws making workplaces, restaurants, and bars completely smoke-free can reduce heart attack hospitalizations by 8%–17% within a year.[3,5,6] Federal laws that address U.S. air quality have contributed to a decrease of 54% of six common air pollutants since 1980.[7]

INTRODUCTION

The health of the American public has improved on many fronts over the last decades—from decreasing incidence of lung cancer in men to large reductions in the number of childhood lead poisoning cases. But as previous modules highlight, many diseases and illnesses are increasing in frequency. Though the reasons for these increases are often unknown, to the extent that the causes are recognized or suspected, preventive measures are desirable. Public health focuses on prevention of disease and health promotion rather than the diagnosis and treatment of diseases.

WHAT IS PREVENTION?

Prevention activities are typically categorized by the following three definitions:

1. **Primary Prevention**—intervening before health effects occur, through measures such as vaccinations, altering risky behaviors (poor eating habits, tobacco use), and banning substances known to be associated with a disease or health condition.[8,9]
2. **Secondary Prevention**—screening to identify diseases in the earliest stages, before the onset of signs and symptoms, through measures such as mammography and regular blood pressure testing.[10]
3. **Tertiary Prevention**—managing disease post diagnosis to slow or stop disease progression through measures such as chemotherapy, rehabilitation, and screening for complications.[11]

Most prevention suggestions are primary or secondary prevention efforts for individuals. Yet, in the context of environmental health, prevention is much broader, because exposure to many contaminants is beyond the control of individuals and historically has been most effectively reduced by government programs and regulations[12] (e.g., Pollution Prevention Act[13]; Clean Air Act[1]). Traditionally, environmental public health has focused on reducing exposure to environmental hazards known to be related to disease. Increasing emphasis is placed on upstream interventions—eliminating the source of the hazard rather than just preventing or reducing exposure.[14] This type of elimination has often required action by individuals as well as governments at the federal, state, and local levels.

THE PREVENTION FRAMEWORK

LOCAL PREVENTION

Beyond individual prevention efforts, local community actions can be particularly effective in bringing about changes that prevent or reduce environmentally-related illness and disease. Strategies ranging from community education to neighborhood awareness around an environmental health issue are some of the actions that can be taken at the local level. Zoning laws that provide incentives for the creation of bike paths or that reduce the number or density of liquor stores are actions taken by local governments for the benefit of a community.[15] Information sharing between neighborhood associations, faith communities, community-based organizations, and other local groups can highlight gaps in service and facilitate coordinated efforts to achieve public health outcomes.

STATE PREVENTION

States play an important role in promoting both local and federal prevention efforts and also contribute to prevention through their own initiatives. For example, inspections and regulation enforcement at food service establishments, swimming pools, hazardous waste disposal sites, and other locations help prevent illness and disease statewide. State-sponsored efforts support health screening programs, anti-smoking campaigns, and health education. As partners with federal agencies, states assist in implementation of programs such as the CDC's Childhood Lead Poisoning Prevention Program and the CDC's National Heart Disease and Stroke Prevention Program.

Figure 1. The Spectrum of Prevention[8]

NATIONAL PREVENTION

National prevention activities include initiatives, regulatory programs, and policies that establish nationwide programs to reduce both the presence of and exposure to harmful agents in the environment (e.g., the Clean Water Act, National Tobacco Control Program, National Asthma Control Program). Many agencies are involved in activities that either directly or indirectly reduce public exposure. The Department of Health and Human Services, which includes the CDC and the U.S. Food and Drug Administration; the Environmental Protection Agency (EPA); the Department of Housing and Urban Development (HUD); and the Department of Agriculture (USDA) all have a hand in prevention efforts.

KEY COMPONENTS OF PREVENTION[16]

Individual, local, state, and federal efforts to prevent environmentally-caused illness and disease have had some success, but a more comprehensive effort would be useful in meeting the overall environmental health challenges facing the United States. The following activities and initiatives can lead to understanding and reducing the nation's incidence of environmentally-caused disease.

AWARENESS AND EDUCATION

- Inform and educate decision-makers, public health practitioners, health care providers, and individuals about science-based health prevention approaches that will have the greatest benefit and impact on public health.
- Provide information on effectiveness of interventions to inform policies.
- Educate workers both in and out of the health field who may have daily contact with people at high risk for disease and injury. These individuals can encourage healthy behaviors, screen for certain health risks, and contribute to education of the community.[17]
- Provide the public with health education information.
- Work with the media to highlight public health issues.

- Establish programs to proactively distribute information to targeted groups—those at high risk for disease or injury.

Research

- Identify and support an environmental public health research agenda at the national level. This research would address knowledge gaps in suspected and emerging links between exposure to harmful environmental agents and health outcomes.

Surveillance at all levels

- Monitor environmental risk areas or situations and determine the prevalence of environmentally-linked health outcomes. Identify national, state, or community environmental health issues; develop measures to track those issues; and implement widespread surveillance to help identify relationships between environmental hazards and health concerns.

Hazard evaluation at the national, state, and local levels

- Implement hazard assessments as needed. Respond to high-risk situations, identify and quantify hazardous agents, and facilitate exposure reduction.

Improvement of the public health system at the national, state, and local levels

- Enhance and revitalize the environmental health system at all levels. Build and improve long-term strategic partnerships, commitments by all stakeholders, and additional resources, as well as collaboration with environmental regulatory agencies and development of a competent and effective environmental public health workforce.[16]

Proactive behavior by individuals

- Make healthy lifestyle choices, choose environmentally-friendly products and services, and conscientiously try to minimize the environmental impact of yourself and your family. Become informed about the issues, and be proactive in prevention initiatives promoting health and preventing illness and disease.

THE NATIONAL ENVIRONMENTAL PUBLIC HEALTH TRACKING NETWORK

Many of the above activities are dependent on the availability of information to link diseases and environmental exposures. Laboratory studies contribute to our understanding, but without coordinated tracking of environmental hazards, exposures, and diseases, the picture is often fragmented and inconclusive. The CDC has responded to this need with the National Environmental Public Health Tracking Network.[18] This Network has established information-system standards to facilitate integration of local, state, and national databases of environmental hazards, environmental exposures, and health effects. These data allow federal, state, and local agencies, among others, to monitor and distribute information about environmental hazards and disease trends. As trends and linkage between environmental hazards and disease are uncovered, preventive actions can be taken to protect communities.

SUCCESSFUL PREVENTION INITIATIVES

Actions such as the Clean Air Act as well as anti-smoking campaigns have achieved a significant preventive impact on public health.[1,2,3] The following success stories demonstrate how these initiatives relate to the advancement of environmental public health.

CLEAN AIR PREVENTION INITIATIVES

One of the most substantial environmental pollution success stories has been the reduction in levels of air pollutants throughout the United States (see Outdoor Air Quality chapter). While national air quality has improved since the early 1990s, air quality problems still exist, presenting many challenges in protecting public health and the environment.

Air pollution is a major problem that can affect everyone.[19] Studies show links between air pollution and a number of health problems, such as an increased risk for heart attacks, and it can affect individuals with asthma and other lung conditions. Children and the elderly are often the most vulnerable to the effects of air pollution.[20]

Figure 2. Timeline of Key Federal Clean Air Initiatives

1955	**The Air Pollution Act of 1955** provides federal research funds for studying air pollution.
1963	**The Clear Air Act of 1963** establishes a federal program authorizing research for ways to monitor and control pollution.
1967	**The Air Quality Act of 1967** expands the federal government's activities to begin enforcing areas subject to interstate pollution transport and conducting ambient air monitoring studies and industrial source inspections.
1970	**The Clean Air Act of 1970** brings about a major shift in the government's role in controlling air pollution. Comprehensive federal and state regulations are developed to reduce emissions from industrial and mobile sources.
1970	**The U.S. Environmental Protection Agency (EPA)** is established to implement the requirements of the 1970 Clean Air Act.
1977 and 1990	Major amendments are added to the 1970 Clean Air Act ensuring continuation of the Air Quality Standards, increasing the federal government's air quality authority and responsibilities, and establishing new programs for acid rain and toxic air pollutants.[19]

Figure 2 provides a timeline that illustrates key federal initiatives designed and implemented to reduce air pollution and related illnesses across the nation.

The EPA has set national outdoor air quality standards for the following six common air pollutants:

- Particulate matter (PM)
- Ozone (O3)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Lead (Pb)

EPA monitors outdoor air quality concentrations of these pollutants and produces estimates of emissions based on monitored data plus calculations of pollutants emitted by vehicles, factories, and other sources. EPA air quality trends show that air quality has improved nationally since 1980.[7] Between 1980–2007, while increases were seen in the gross domestic product, the number of vehicle miles traveled, overall energy consumption, and the U.S. population, total emissions of these six common air pollutants decreased by 52%.[7] Other significant improvements since 1970 include a 70% reduction of air toxics from large industrial sources, new cars that are more than 90% cleaner, and the end of the production of most ozone-depleting chemicals.[20]

The CDC Air Pollution and Respiratory Health Branch in the National Center for Environmental Health works to prevent environmentally-related respiratory illnesses and studies indoor and outdoor air pollution. This CDC program collects and analyzes respiratory health data, implements asthma interventions to ensure scientific information is translated into public health practice, establishes and maintains partnerships to control asthma, works to prevent carbon monoxide poisoning, and studies the effects of forest fire smoke and other airborne contaminants.[21]

WHAT YOU CAN DO

In addition to national legislation and programs regarding clean air, individuals can also take a proactive approach to reduce air pollution as well as their exposure to harmful air pollutants.[20]

Practice energy conservation – using less energy and recycling reduces air pollution generated by power generating and manufacturing facilities.

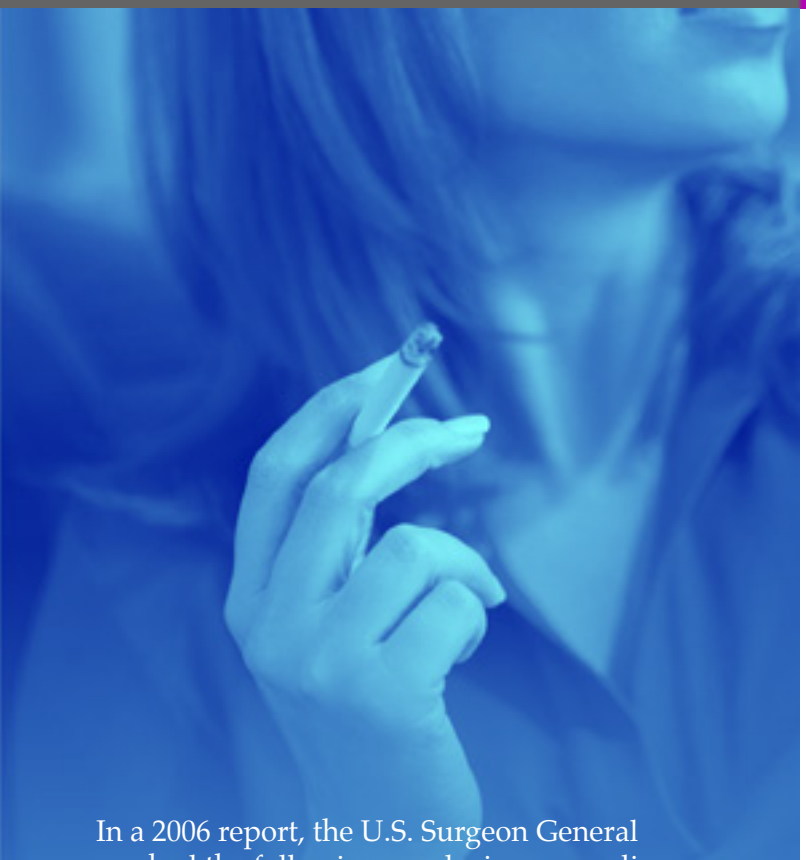
- Recycle paper, plastic, glass bottles, cardboard, and aluminum cans.
- Conserve energy by turning off appliances and lights when not in use.
- Buy ENERGY STAR products, such as energy-efficient lighting and appliances.
- Connect outdoor lights to a timer or use solar lighting to reduce your use of electricity.
- Use rechargeable batteries.
- Lower the thermostat on the water heater to 120°F.

Reduce your consumption of fossil fuels by driving less or using more efficient vehicles designed to burn less gasoline and oil.

- Choose efficient, low-polluting vehicles.
- Plan trips; save gasoline and reduce air pollution.
- Keep tires properly inflated and aligned and get regular engine tune-ups and car maintenance to increase your fuel efficiency.
- During summer, fill the gas tank during cooler evening hours to decrease evaporation and reduce the formation of ozone.
- Avoid waiting in long drive-through lines; park your car and go in.
- Use public transportation, walk, or ride a bike.
- Join a carpool or vanpool to get to work.

Reduce your personal exposure to air pollutants.

- Use low volatile organic compounds (VOC) or water-based paints, stains, finishes, and paint strippers.
- Choose not to smoke inside the home; ask visitors to smoke outside.
- Keep woodstoves and fireplaces well maintained.
- Test the home for radon.
- Avoid spilling gas; do not top off the tank and replace gas cap tightly.
- Check daily air quality forecasts and associated health concerns.



In a 2006 report, the U.S. Surgeon General reached the following conclusions regarding control of secondhand smoke exposure:[25]

- The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.
- Only eliminating smoking in indoor spaces fully protects nonsmokers from secondhand smoke exposure; separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot completely eliminate exposure.
- Workplace smoking restrictions are effective in reducing secondhand smoke exposure and lead to less smoking among covered workers.
- Establishing smoke-free workplaces is the only way to ensure secondhand smoke exposure does not occur in the workplace.
- The majority of workers in the United States are covered by smoke-free policies.
- Evidence from peer-reviewed studies shows that smoke-free policies do not have an adverse economic impact on the hospitality industry.

SECONDHAND SMOKE PREVENTION INITIATIVES

Secondhand smoke, also called environmental tobacco smoke (ETS), is the mixture of gases and particles given off by burning cigarettes, pipes, and cigars as well as the smoke exhaled by smokers.[22] Breathing secondhand smoke, even in small amounts, is dangerous to human health and can cause lung cancer and an increased risk of heart disease, including heart attack, in adult nonsmokers[22] (see Secondhand Smoke section in Homes chapter).

Laws and policies for smoke-free environments have been initiated at the national, state, and local levels. Nationally, several laws and policies restricting smoking in public places have been adopted.[23] Federal law prohibits smoking on domestic airline flights and interstate buses. Smoking is also banned in most federally-owned buildings, and the Pro-Children Act of 1994 prohibits smoking in buildings where federally-funded services are provided to children.[24]

While these federal smoking restrictions are important, the most comprehensive smoke-free laws have originated at the local level. Local initiatives engage communities in public education, raise awareness of the health risks of secondhand smoke, and increase public awareness of policies that provide protection from exposure risks.[25] As increasing numbers of communities successfully implemented comprehensive laws making workplaces, restaurants, and bars completely smoke-free, states began enacting similarly comprehensive laws.[25]

The first state laws restricting smoking in public places were passed in Arizona, Connecticut, and Minnesota between 1973–1975.[26] Over the years a number of other states enacted limited smoking restrictions. In the 1990s, California became the first state to restrict smoking in most indoor workplaces and places, including restaurants and bars.[25] From 2002–2005, Delaware, New York, Massachusetts, Rhode Island, and Washington state implemented comprehensive state smoke-free laws.[25] By April of 2014, 24 states and the District of Columbia had comprehensive laws in effect requiring all private workplaces, restaurants, and bars to be smoke-free.[27] According to the American Nonsmokers' Rights Foundation, over 49% of Americans live under comprehensive state

or local smoke-free laws.[27] The prevalence of U.S. nonsmokers' exposure to secondhand smoke dropped by half between 1988–1991, when most Americans were exposed, and 2007–2008. This decline was likely driven in large part by the widespread adoption of state and local laws and voluntary business policies prohibiting smoking in indoor workplaces and public places.[25]

A number of studies conducted in a range of communities, states, regions, and countries have reported substantial and rapid reductions in heart attack hospitalizations following the implementation of smoke-free laws.[28] In 2010, the Institute of Medicine, after reviewing these studies and related evidence, concluded that smoke-free laws reduce heart attacks.[28] In addition, three meta-analyses of studies on this topic have estimated pooled effect sizes of 8%,[3] 10%,[5] and 17%.[6]

WHAT YOU CAN DO

There are steps individuals can take to protect themselves and their family from exposure to secondhand smoke[25]:

- Make the home and car smoke-free.
- Visit smoke-free restaurants and public places.
- Ask people not to smoke around you and your children.
- Use a smoke-free daycare center.

CONTINUED PREVENTION SUCCESS

Clean air and secondhand smoke prevention are just two examples of the many successes that have occurred through the use of proactive preventive measures. Many more success stories will emerge as individuals, communities, and other stakeholders take on a more active role in environmental public health.

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