Ten Great Public Health Achievements — United States, 2001–2010

During the 20th century, life expectancy at birth among U.S. residents increased by 62%, from 47.3 years in 1900 to 76.8 in 2000, and unprecedented improvements in population health status were observed at every stage of life (*1*). In 1999, *MMWR* published a series of reports highlighting 10 public health achievements that contributed to those improvements. This report assesses advances in public health during the first 10 years of the 21st century. Public health scientists at CDC were asked to nominate noteworthy public health achievements that occurred in the United States during 2001–2010. From those nominations, 10 achievements, not ranked in any order, have been summarized in this report.

Vaccine-Preventable Diseases

The past decade has seen substantial declines in cases, hospitalizations, deaths, and health-care costs associated with vaccine-preventable diseases. New vaccines (i.e., rotavirus, quadrivalent meningococcal conjugate, herpes zoster, pneumococcal conjugate, and human papillomavirus vaccines, as well as tetanus, diphtheria, and acellular pertussis vaccine for adults and adolescents) were introduced, bringing to 17 the number of diseases targeted by U.S. immunization policy. A recent economic analysis indicated that vaccination of each U.S. birth cohort with the current childhood immunization schedule prevents approximately 42,000 deaths and 20 million cases of disease, with net savings of nearly $14 billion in direct costs and $69 billion in total societal costs (*2*).

The impact of two vaccines has been particularly striking. Following the introduction of pneumococcal conjugate vaccine, an estimated 211,000 serious pneumococcal infections and 13,000 deaths were prevented during 2000–2008 (*3*). Routine rotavirus vaccination, implemented in 2006, now prevents an estimated 40,000–60,000 rotavirus hospitalizations each year (*4*). Advances also were made in the use of older vaccines, with reported cases of hepatitis A, hepatitis B, and varicella at record lows by the end of the decade. Age-specific mortality (i.e., deaths per million population) from varicella for persons age <20 years, declined by 97% from 0.65 in the prevaccine period (1990–1994) to 0.02 during 2005–2007 (*5*). Average age-adjusted mortality (deaths per million population) from hepatitis A also declined significantly, from 0.38 in the prevaccine period (1990–1995) to 0.26 during 2000–2004 (*6*).

Prevention and Control of Infectious Diseases

Improvements in state and local public health infrastructure along with innovative and targeted prevention efforts yielded significant progress in controlling infectious diseases. Examples include a 30% reduction from 2001 to 2010 in reported U.S. tuberculosis cases and a 58% decline from 2001 to 2009 in central line–associated blood stream infections (*7,8*). Major advances in laboratory techniques and technology and investments in disease surveillance have improved the capacity to identify contaminated foods rapidly and accurately and prevent further spread (*9–12*). Multiple efforts to extend HIV testing, including recommendations for expanded screening of persons aged 13–64 years, increased the number of persons diagnosed with HIV/AIDS and reduced the proportion with late diagnoses, enabling earlier access to life-saving treatment and care and giving infectious persons the information necessary to protect their partners (*13*). In 2002, information from CDC predictive models and reports of suspected West Nile virus transmission through blood transfusion spurred a national investigation, leading to the rapid development and implementation of new blood donor screening (*14*). To date, such screening has interdicted 3,000 potentially infected U.S. donations, removing them from the blood supply. Finally, in 2004, after more than 60 years of effort, canine rabies was eliminated in the United States, providing a model for controlling emerging zoonoses (*15,16*).

Tobacco Control

Since publication of the first Surgeon General's Report on tobacco in 1964, implementation of evidence-based policies and interventions by federal, state, and local public health authorities has reduced tobacco use significantly (*17*). By 2009, 20.6% of adults and 19.5% of youths were current smokers, compared with 23.5% of adults and 34.8% of youths 10 years earlier. However, progress in reducing smoking rates among youths and adults appears to have stalled in recent years. After a substantial decline from 1997 (36.4%) to 2003 (21.9%), smoking rates among high school students remained relatively unchanged from 2003 (21.9%) to 2009 (19.5%) (*18*). Similarly, adult smoking prevalence declined steadily from 1965 (42.4%) through the 1980s, but the rate of decline began to slow in the 1990s, and the prevalence remained relatively unchanged from 2004 (20.9%) to 2009 (20.6%) (*19*). Despite the progress that has been made, smoking still results in an economic burden, including medical costs and lost productivity, of approximately $193 billion per year (*20*).

Although no state had a comprehensive smoke-free law (i.e., prohibit smoking in worksites, restaurants, and bars) in 2000, that number increased to 25 states and the District of Columbia (DC) by 2010, with 16 states enacting comprehensive smoke-free laws following the release of the 2006 Surgeon

General's Report (*21*). After 99 individual state cigarette excise tax increases, at an average increase of 55.5 cents per pack, the average state excise tax increased from 41.96 cents per pack in 2000 to $1.44 per pack in 2010 (*22*). In 2009, the largest federal cigarette excise tax increase went into effect, bringing the combined federal and average state excise tax for cigarettes to $2.21 per pack, an increase from $0.76 in 2000. In 2009, the Food and Drug Administration (FDA) gained the authority to regulate tobacco products (*23*). By 2010, FDA had banned flavored cigarettes, established restrictions on youth access, and proposed larger, more effective graphic warning labels that are expected to lead to a significant increase in quit attempts (*24*).

Maternal and Infant Health

The past decade has seen significant reductions in the number of infants born with neural tube defects (NTDs) and expansion of screening of newborns for metabolic and other heritable disorders. Mandatory folic acid fortification of cereal grain products labeled as enriched in the United States beginning in 1998 contributed to a 36% reduction in NTDs from 1996 to 2006 and prevented an estimated 10,000 NTD-affected pregnancies in the past decade, resulting in a savings of $4.7 billion in direct costs (*25–27*).

Improvements in technology and endorsement of a uniform newborn-screening panel of diseases have led to earlier life-saving treatment and intervention for at least 3,400 additional newborns each year with selected genetic and endocrine disorders (*28,29*). In 2003, all but four states were screening for only six of these disorders. By April 2011, all states reported screening for at least 26 disorders on an expanded and standardized uniform panel (*29*). Newborn screening for hearing loss increased from 46.5% in 1999 to 96.9% in 2008 (*30*). The percentage of infants not passing their hearing screening who were then diagnosed by an audiologist before age 3 months as either normal or having permanent hearing loss increased from 51.8% in 1999 to 68.1 in 2008 (*30*).

Motor Vehicle Safety

Motor vehicle crashes are among the top 10 causes of death for U.S. residents of all ages and the leading cause of death for persons aged 5–34 years (*30*). In terms of years of potential life lost before age 65, motor vehicle crashes ranked third in 2007, behind only cancer and heart disease, and account for an estimated $99 billion in medical and lost work costs annually (*31,32*). Crash-related deaths and injuries largely are preventable. From 2000 to 2009, while the number of vehicle miles traveled on the nation's roads increased by 8.5%, the death rate related to motor vehicle travel declined from 14.9 per 100,000 population to 11.0, and the injury rate declined from 1,130 to 722; among children, the number of pedestrian deaths declined by 49%, from 475 to 244, and the number of bicyclist deaths declined by 58%, from 178 to 74 (*33,34*).

These successes largely resulted from safer vehicles, safer roadways, and safer road use. Behavior was improved by protective policies, including effective seat belt and child safety seat legislation; 49 states and the DC have enacted seat belt laws for adults, and all 50 states and DC have enacted legislation that protects children riding in vehicles (*35*). Graduated drivers licensing policies for teen drivers have helped reduce the number of teen crash deaths (*36*).

Cardiovascular Disease Prevention

Heart disease and stroke have been the first and third leading causes of death in the United States since 1921 and 1938, respectively (*37,38*). Preliminary data from 2009 indicate that stroke is now the fourth leading cause of death in the United States (*39*). During the past decade, the age-adjusted coronary heart disease and stroke death rates declined from 195 to 126 per 100,000 population and from 61.6 to 42.2 per 100,000 population, respectively, continuing a trend that started in the 1900s for stroke and in the 1960s for coronary heart disease (*40*). Factors contributing to these reductions include declines in the prevalence of cardiovascular risk factors such as uncontrolled hypertension, elevated cholesterol, and smoking, and improvements in treatments, medications, and quality of care (*41–44*)

Occupational Safety

Significant progress was made in improving working conditions and reducing the risk for workplace-associated injuries. For example, patient lifting has been a substantial cause of low back injuries among the 1.8 million U.S. health-care workers in nursing care and residential facilities. In the late 1990s, an evaluation of a best practices patient-handling program that included the use of mechanical patient-lifting equipment demonstrated reductions of 66% in the rates of workers' compensation injury claims and lost workdays and documented that the investment in lifting equipment can be recovered in less than 3 years (*45*). Following widespread dissemination and adoption of these best practices by the nursing home industry, Bureau of Labor Statistics data showed a 35% decline in low back injuries in residential and nursing care employees between 2003 and 2009.

The annual cost of farm-associated injuries among youth has been estimated at $1 billion annually (*46*). A comprehensive childhood agricultural injury prevention initiative was established to address this problem. Among its interventions was the development by the National Children's Center for Rural Agricultural Health and Safety of guidelines for parents

to match chores with their child's development and physical capabilities. Follow-up data have demonstrated a 56% decline in youth farm injury rates from 1998 to 2009 (National Institute for Occupational Safety and Health, unpublished data, 2011).

In the mid-1990s, crab fishing in the Bering Sea was associated with a rate of 770 deaths per 100,000 full-time fishers (*47*). Most fatalities occurred when vessels overturned because of heavy loads. In 1999, the U.S. Coast Guard implemented Dockside Stability and Safety Checks to correct stability hazards. Since then, one vessel has been lost and the fatality rate among crab fishermen has declined to 260 deaths per 100,000 full-time fishers (*47*).

Cancer Prevention

Evidence-based screening recommendations have been established to reduce mortality from colorectal cancer and female breast and cervical cancer (*48*). Several interventions inspired by these recommendations have improved cancer screening rates. Through the collaborative efforts of federal, state, and local health agencies, professional clinician societies, not-for-profit organizations, and patient advocates, standards were developed that have significantly improved cancer screening test quality and use (*49,50*). The National Breast and Cervical Cancer Early Detection Program has reduced disparities by providing breast and cervical cancer screening services for uninsured women (*49*). The program's success has resulted from similar collaborative relationships. From 1998 to 2007, colorectal cancer death rates decreased from 25.6 per 100,000 population to 20.0 (2.8% per year) for men and from 18.0 per 100,000 to 14.2 (2.7% per year) for women (*51*). During this same period, smaller declines were noted for breast and cervical cancer death rates (2.2% per year and 2.4%, respectively) (*52*).

Childhood Lead Poisoning Prevention

In 2000, childhood lead poisoning remained a major environmental public health problem in the United States, affecting children from all geographic areas and social and economic levels. Black children and those living in poverty and in old, poorly maintained housing were disproportionately affected. In 1990, five states had comprehensive lead poisoning prevention laws; by 2010, 23 states had such laws. Enforcement of these statutes as well as federal laws that reduce hazards in the housing with the greatest risks has significantly reduced the prevalence of lead poisoning. Findings of the National Health and Nutrition Examination Surveys from 1976–1980 to 2003–2008 reveal a steep decline, from 88.2% to 0.9%, in the percentage of children aged 1–5 years with blood lead levels ≥10 μg/dL. The risks for elevated blood lead levels based on socioeconomic status and race also were reduced significantly. The economic benefit of lowering lead levels among children by preventing lead exposure is estimated at $213 billion per year (*53*).

Public Health Preparedness and Response

After the international and domestic terrorist actions of 2001 highlighted gaps in the nation's public health preparedness, tremendous improvements have been made. In the first half of the decade, efforts were focused primarily on expanding the capacity of the public health system to respond (e.g., purchasing supplies and equipment). In the second half of the decade, the focus shifted to improving the laboratory, epidemiology, surveillance, and response capabilities of the public health system. For example, from 2006 to 2010, the percentage of Laboratory Response Network labs that passed proficiency testing for bioterrorism threat agents increased from 87% to 95%. The percentage of state public health laboratories correctly subtyping *Escherichia coli* O157:H7 and submitting the results into a national reporting system increased from 46% to 69%, and the percentage of state public health agencies prepared to use Strategic National Stockpile material increased from 70% to 98% (*54*). During the 2009 H1N1 influenza pandemic, these improvements in the ability to develop and implement a coordinated public health response in an emergency facilitated the rapid detection and characterization of the outbreak, deployment of laboratory tests, distribution of personal protective equipment from the Strategic National Stockpile, development of a candidate vaccine virus, and widespread administration of the resulting vaccine. These public health interventions prevented an estimated 5–10 million cases, 30,000 hospitalizations, and 1,500 deaths (CDC, unpublished data, 2011).

Existing systems also have been adapted to respond to public health threats. During the 2009 H1N1 influenza pandemic, the Vaccines for Children program was adapted to enable provider ordering and distribution of the pandemic vaccine. Similarly, President's Emergency Plan for AIDS Relief clinics were used to rapidly deliver treatment following the 2010 cholera outbreak in Haiti.

Conclusion

From 1999 to 2009, the age-adjusted death rate in the United States declined from 881.9 per 100,000 population to 741.0, a record low and a continuation of a steady downward trend that began during the last century. Advances in public health contributed significantly to this decline; seven of the 10 achievements described in this report targeted one or more of the 15 leading causes of death. Related *Healthy People 2010* data are available at http://www.cdc.gov/mmwr/preview/

mmwrhtml/mm6019a5_addinfo.htm. The examples in this report also illustrate the effective application of core public health tools. Some, such as the establishment of surveillance systems, dissemination of guidelines, implementation of research findings, or development of effective public health programs, are classic tools by which public health has addressed the burden of disease for decades.

Although not new, the judicious use of the legal system, by encouraging healthy behavior through taxation or by shaping it altogether through regulatory action, has become an increasingly important tool in modern public health practice and played a major role in many of the achievements described in this report (*55*). The creative use of the whole spectrum of available options, as demonstrated here, has enabled public health practitioners to respond effectively. Public health practice will continue to evolve to meet the new and complex challenges that lie ahead.

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