
PROGRESS REPORT ON

A CDC FRAMEWORK FOR PREVENTING INFECTIOUS DISEASES:
Sustaining the Essentials and Innovating for the Future



OCTOBER 2011 – MAY 2013

CENTERS FOR DISEASE CONTROL AND PREVENTION

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PROGRESS REPORT ON CDC'S ID FRAMEWORK

October 2011 – May 2013

INTRODUCTION

A CDC Framework for Preventing Infectious Diseases: Sustaining the Essentials and Innovating for the Future (CDC's [ID Framework](#)) was issued in October 2011 as a roadmap for improving our ability to prevent known infectious diseases and to recognize and control rare, highly dangerous, and newly emerging threats. Although its primary purpose is to guide CDC's infectious disease activities, the document was also designed to guide collective public health action at a time of resource constraints and difficult decisions, while advancing opportunities to improve the nation's health.

This *Progress Report* is intended to provide a brief update on the status of CDC's work since October 2011 to advance the three elements of the *ID Framework*:

- Strengthen public health fundamentals, including infectious disease surveillance, laboratory detection, and epidemiologic investigation
- Identify and implement high-impact public health interventions to reduce infectious diseases
- Develop and advance policies to prevent, detect, and control infectious diseases

Over the past year, CDC programs in the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID); National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP); National Center for Immunization and Respiratory Diseases (NCIRD); and Center for Global Health (CGH) have made significant progress in preventing and controlling infectious diseases. This *Progress Report* provides a few, selected examples of these accomplishments, organized by *Framework* element. The examples illustrate how CDC is creating new partnerships and using new ideas and scientific findings to advance public health goals. They also reflect the broad range of infectious disease issues addressed by CDC and its public and private partners, including the issues of special concern highlighted in the *ID Framework*: antimicrobial resistance, chronic viral hepatitis, food safety, healthcare-associated infections (HAIs), HIV/AIDS, respiratory infections, safe water, vaccine-preventable diseases, and zoonotic and vectorborne diseases. The *Progress Report* also provides examples of ongoing work in areas that involve new directions, alliances, and innovations, a particular need highlighted in the *ID Framework*.

More comprehensive information on CDC's infectious disease accomplishments and activities is available through the following websites and reports:

- [CDC Vital Signs](#) and [Public Health Grand Rounds](#) websites (Box 1)
- [NCEZID: Our Work, Our Stories 2011–2012](#)
- [NCHHSTP Annual Report 2012](#)
- [CDC Global Health Strategy 2012–2015](#).

A report on CDC's laboratory activities, including infectious disease laboratory activities, is available at http://www.cdc.gov/osels/lspppo/senate_report.html.

Box 1. CDC Public Health Grand Rounds

The CDC [Public Health Grand Rounds](#) is a monthly webcast created to foster discussion on major public health issues. Each session focuses on key challenges related to a specific health topic, and explores cutting-edge scientific evidence and the potential impact of different interventions.

Recent CDC Grand Rounds that have addressed infectious disease topics include the following:

- **Explaining the Unexplained: Discovering New Diseases Using Advanced Detection Tools.** As our world increases in interconnectivity of both technology and people, the rapid identification of emerging infectious diseases becomes more important for disease treatment, control, and prevention. CDC has an ongoing role in the laboratory diagnosis of infectious illnesses and collaborates 24/7 with state, local, and international partners to track emerging pathogens and explain the unexplained.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2012/September2012.htm>

- **High-Impact HIV Prevention.** Recent scientific breakthroughs in prevention, treatment, and monitoring disease have provided new tools for HIV/AIDS prevention. CDC's High-Impact HIV Prevention initiative seeks the most effective distribution of limited resources to bring these tools to affected communities. This initiative advances the implementation of the *National HIV/AIDS Strategy* to improve HIV prevention and care.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2012/August2012.htm>

- **Unsafe Injection Practices in the U.S Healthcare System.** Unsafe injection practices that put patients at risk of infection are associated with a wide variety of healthcare procedures and settings. CDC is working with medical and public health partners to improve injection safety.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2012/November2012.htm>

- **The Growing Threat of Multidrug-Resistant Gonorrhea.** The bacteria that cause gonorrhea—*Neisseria gonorrhoeae*—have progressively developed resistance to antibiotic drug treatments, including sulfonilamides, penicillin, tetracycline, and ciprofloxacin. Currently, CDC treatment guidelines recommend dual therapy with a cephalosporin antibiotic (ceftriaxone is preferred) and either azithromycin or doxycycline. CDC and partners are working together to monitor emerging antibiotic resistance in *N. gonorrhoeae* and encourage research and development of new treatment regimens.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2012/May2012.htm>

- **Reducing the Burden of Human Papillomavirus (HPV)-associated Cancer and Disease through Vaccination.** An estimated 26,000 HPV-attributable cancers occur in the United States each year, including cervical cancers in women and oropharyngeal cancers in men. HPV vaccine has been recommended for routine vaccination of 11–12-year-old girls since 2006 and for 11–12-year-old boys since 2011.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2013/february2013.htm>

- **Childhood Immunization as a Tool to Address Health Disparities.** Immunization has helped reduce infectious disease disparities among U.S. children, contributing to health equity across race/ethnicity.

Video available at <http://www.cdc.gov/about/grand-rounds/archives/2013/April2013.htm>

EXAMPLES OF INFECTIOUS DISEASE ACCOMPLISHMENTS

Element 1. Strengthen public health fundamentals, including infectious disease surveillance, laboratory detection, and epidemiologic investigation

Strong public health fundamentals at the local, state, and national levels—including disease surveillance, laboratory detection, and epidemiologic investigation—are the bedrock of U.S. capacity to protect the public from infectious diseases and to save lives during outbreaks and other unusual health events.

Efforts to sustain and strengthen public health fundamentals include modernizing infectious disease surveillance to drive public health action, expanding the role of public health and clinical laboratories in disease control and prevention, building capacity for epidemiologic investigations and public health response, and advancing workforce development and training.

Examples of ID Accomplishments

- Helped ensure that HIV-infected patients receive ongoing and effective care, by implementing a new strategy for monitoring HIV, based on reporting and use of CD4 cell counts and viral loads. Partners include state and local health departments and the Health Resources and Services Administration.
- Expanded nationwide surveillance for HAIs, antimicrobial drug use, and adverse reactions associated with blood and blood products by creating new surveillance modules for the [National Healthcare Safety Network](#). The HAI modules monitor a wide range of infections in a variety of healthcare settings.
- Improved the detection and control of imported TB cases—including drug-resistant cases—by revising procedures for contact-tracing commercial aviation passengers during extended flights. The new procedures are expected to reduce the number of contact investigations by approximately 50% while still enabling effective detection of infected passengers.
- Made nationwide collection of infectious disease data faster, cheaper, and more accurate by increasing to 54% the percentage of clinical and public health facilities that use electronic laboratory reporting (ELR) to report nationally notifiable diseases.
- Created an interactive, web-based tool—the [NCHHSTP Atlas](#)—that allows public access to surveillance data on HIV/AIDS, viral hepatitis, STDs, and TB. State and local health departments can use this tool to observe geographic patterns and local trends by creating detailed reports, maps, and other graphics. CDC also issued [guidelines for data security and confidentiality](#) for the collection, storage, sharing, and use of information on these diseases.
- Strengthened CDC laboratory capacity to respond to large-scale infectious disease events by streamlining procedures for receipt and processing of high numbers of samples, including high-priority clinical specimens that require immediate testing (e.g., for influenza, pox viruses, rabies, and viral hemorrhagic fevers).

- In collaboration with NIH and FDA, developed a comprehensive Lyme disease serum panel to assist diagnostic-test developers in industry and academia in validating and achieving FDA clearance of new assays for the diagnosis of Lyme disease.
- Advanced implementation of the 2011 [Food Safety Modernization Act](#) by designating five state health departments and their university partners—in Colorado, Florida, Minnesota, Oregon, and Tennessee—as Integrated Food Safety Centers of Excellence that will train food-safety practitioners and identify and implement best practices and policies for disease surveillance and outbreak response.
- Developed a toolkit to support state and local investigations of infections transmitted via blood transfusions, including babesiosis, a parasitic infection carried by ticks.
- Built local capacity for detection, reporting, and investigation of waterborne diseases by providing seven states with “Spark Plug” grants designed to jump-start new and innovative projects. Waterborne diseases such as Legionnaires’ disease, cryptosporidiosis, and giardiasis cause 40,000 annual hospitalizations resulting in healthcare costs of nearly \$1 billion a year.¹
- Developed tools for fast and accurate detection of infectious diseases of global public health importance. Examples of activities include the following:
 - Patented innovative methods for detection of drug-resistant HIV strains and three species of parasites that cause human malaria
 - Received FDA approval of a dengue diagnostic test that uses molecular technology and instrumentation developed for the CDC Human Influenza Virus Real-Time RT-PCR Diagnostic Panel
 - Developed a rapid, inexpensive bedside diagnostic dipstick test to reduce the time and cost of diagnosing plague
 - Distributed multi-pathogen testing platforms for detection of respiratory pathogens to selected National Influenza Centers, Pan American Health Organization (PAHO) sites, and [CDC Global Detection Centers](#). PAHO sites in Brazil, Canada, and Chile also received tests for detection of a new SARS-like coronavirus that has emerged in the Middle East (Box 2).

Examples of Ongoing Work

- Developing a strategic roadmap to enhance U.S. public health capacity for bioinformatics, in accordance with the recommendations of a 2011 CDC Blue Ribbon Panel, and establishing training fellowships with academic partners to address future bioinformatics workforce needs.
- Modernizing procedures for processing surveillance data provided to the National Notifiable Disease Surveillance System by state health departments.
- Advancing public health use of state-of-the-art diagnostic technologies, including
 - *Multi-pathogen testing platforms* for the detection of viral, bacterial, and fungal agents
 - *“Non-culture” technologies* for detection of foodborne outbreaks and assessment of drug resistance
 - *Whole-genome sequencing and cloud-computing* for global influenza surveillance

¹ Collier SA, Stockman LJ, Hicks LA, Garrison LE, Zhou FJ, Beach MJ. Direct healthcare costs of selected diseases primarily or partially transmitted by water. *Epidemiol Infect* 2012 Nov;140(11):2003–13.

Box 2. Recent Outbreak Investigations and Their Public Health Implications

Over the past year, CDC has assisted state and local health departments in investigating hundreds of infectious disease outbreaks, including several multistate outbreaks, as well as clusters or cases of unusual diseases. CDC has also assisted ministries of health and WHO in responding to over 220 international disease outbreaks and provided consultation and technical support to 24 Field Epidemiology Training Programs covering 40 countries whose staff and trainees helped respond to hundreds of local outbreaks.

A few recent examples include the following:

- **A healthcare-associated outbreak of fungal meningitis affecting patients in 20 states who received contaminated steroid injections prepared by a compounding pharmacy in Massachusetts.** Fungal disease acquired by this unusual route caused epidural abscesses and other medical complications that, as of March 2013, have affected more than 700 patients and led to 50 deaths. The investigation highlights the importance of CDC's role in bringing together scientific experts to fill gaps in clinical expertise and knowledge and in supporting the state-level healthcare-associated infection (HAI) programs that were critical to the response. It also underscores the need for better regulation of compounding pharmacies.
- **Hantavirus pulmonary syndrome (HPS) among visitors to Yosemite National Park.** First identified in 1993 in the southwestern United States, HPS is a severe, often fatal, respiratory disease carried by rodents. The outbreak response in Yosemite demonstrates the importance of maintaining expertise in rare but highly dangerous diseases. Unlike in the 1993 HPS outbreak, where the death rate was 78%, in the 2012 outbreak 75% of patients survived after HPS was confirmed in the first two cases.
- **The second largest West Nile virus outbreak in the United States since the disease was first detected in New York City in 1999.** Thirty-eight states were affected during summer 2012, with three-fourths of the cases reported in Texas, Mississippi, Louisiana, South Dakota, and Oklahoma. Texas was at the epicenter of the outbreak, with 586 confirmed cases and 21 deaths. This outbreak underscores the importance of maintaining programs for detection and control of disease-carrying mosquitos.
- **Emergence of an avian influenza virus infecting poultry in China that causes severe human illness.** Within 1 month of the first reports, the avian influenza A(H7N9) strain had sickened more than 100 people with a case-fatality ratio of more than 20%. CDC assisted the Chinese government and WHO in investigating the outbreak, developed diagnostic assays for the new strain, and developed candidate viruses to speed vaccine development. The detection of human infection with A(H7N9)—which thus far has not resulted in ongoing person-to-person spread—illustrates the need to monitor the emergence and spread of animal influenza viruses that could have pandemic potential. This lesson is further reinforced by the detection in 11 U.S. states in 2012 of more than 300 cases of mild human illness caused by influenza A(H3N2) variant virus, mostly associated with prolonged exposure to pigs at agricultural fairs.
- **Emergence in the Middle East of a novel coronavirus—distinct from the SARS coronavirus—that causes severe acute respiratory illness.** Through May 2013, 50 cases, including 30 deaths, have been reported in Saudi Arabia, Qatar, Jordan, the United Kingdom, the United Arab Emirates, France, and Tunisia. Several clusters of cases, including in hospitals, have occurred, although no sustained person-to-person transmission has been observed. CDC has developed real-time PCR diagnostic assays and deployed them to partners around the world; provided epidemiologic and laboratory support to WHO and the ministries of health of Saudi Arabia and Jordan; and alerted the U.S. public health and medical communities to prepare for possible importation of the novel virus. This outbreak—like the SARS outbreak in 2003—underscores the ongoing need for international vigilance and cooperation to avert the spread of new and dangerous diseases.

- *Optical mapping* for faster physical mapping and genomic sequencing of the genomes of foodborne and waterborne pathogens
- *Pathogen discovery techniques and high-quality reference databases* like MicrobeNet for identifying previously unknown pathogens.
- Establishing or strengthening regional diagnostic laboratories as a cost-effective way to provide specialized disease-detection services and ensure laboratory surge capacity during outbreaks, working in partnership with state public health laboratories and the Association of Public Health Laboratories (APHL). Examples include
 - Creating four molecular diagnostics reference centers for vaccine-preventable diseases (e.g., measles, mumps, rotavirus, pertussis, and pneumococcal disease), in California, Minnesota, New York, and Wisconsin
 - Partnering with public health laboratories in California, Idaho, New York, Tennessee, and Wisconsin that serve as state-wide and regional CaliciNet Outbreak Support Centers, to provide strain-typing services during foodborne disease outbreaks caused by noroviruses—the leading cause of acute gastroenteritis in the United States.²
- Advancing applied research on medical countermeasures against anthrax and smallpox, and continuing to evaluate and update recommendations for their use.
- Providing guidance to medical and public health partners on meaningful use of electronic health records (EHRs) to advance [CDC Winnable Battles](#) to improve food safety and reduce HIV/AIDS and HAIs.
- Upgrading state-level prevention, detection, and control of mosquito-borne and tickborne diseases such as West Nile virus, Lyme disease, and Rocky Mountain spotted fever. CDC and state health departments have also identified two new tickborne pathogens—an *Ehrlichia muris*-like agent in Minnesota and Heartland virus in Missouri—whose impact and prevention are the subject of ongoing study.
- Responding to the resurgence of pertussis in the United States by providing outbreak assistance to affected states, establishing enhanced surveillance in six [Active Bacterial Core surveillance](#) (ABCs) sites, monitoring vaccine effectiveness over time in children and adolescents, and identifying ways to protect infants who are too young to vaccinate. Partners include the Infectious Diseases Society of America (IDSA), the National Foundation for Infectious Diseases (NFID), the Pediatric Infectious Diseases Society (PIDS), and the HHS National Vaccine Program Office (NVPO).
- Providing international partners with laboratory training to strengthen infectious disease detection, treatment, and control. Examples include advancing
 - Rapid diagnosis of Ebola and other viral hemorrhagic fevers (VHFs), in partnership with the newly renovated VHF laboratory at the Uganda Viral Research Institute. In 2012, the VHF laboratory provided diagnostic support for investigations of Ebola outbreaks in Uganda and the Democratic Republic of the Congo (DRC) and a Marburg outbreak in Uganda

² Hall AJ, Eisenbart VG, Etingue AL, Gould LH, Lopman BA, Parashar UD. Epidemiology of foodborne norovirus outbreaks, United States 2001–2008. *Emerg Infect Dis* 2012 Oct;18(10):1566–73.

- Use of new diagnostic tools, including
 - The Xpert MTB/RIF test, which enables national TB programs around the world to identify drug resistance in TB patient samples within hours instead of weeks
 - A rapid test for rabies that can help clinicians make life-saving decisions about whether to treat persons who have been bitten by dogs
 - Molecular assays for rapid detection of dengue and other arboviral diseases by public health laboratories in the United States and overseas.

Element 2. Identify and implement high-impact public health interventions to reduce infectious diseases

CDC works with public and private sector partners to develop, validate, and implement high-impact tools that can prevent and control infectious diseases within a short timeframe, reducing disease burden and health inequities while saving lives and reducing healthcare costs.

Examples of ID Accomplishments

- Advanced [CDC Winnable Battles](#) to improve food safety and reduce HIV/AIDS and healthcare-associated infections, using proven tools and interventions (Boxes 3–5).
- Translated new scientific findings into clinical guidance on treatment of [latent tuberculosis](#), [Group A streptococcal pharyngitis](#), and Chagas disease³ acquired via organ transplantation, working with professional societies and other partners.
- Issued new recommendations for treatment of drug-resistant gonorrhea (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6131a3.htm>) in response to increasing rates of drug-resistant gonorrhea detected via the [Gonococcal Isolate Surveillance Project](#).
- Created the [CRE Toolkit](#), which provides step-by-step instructions for preventing carbapenem-resistant Enterobacteriaceae (CRE), untreatable and hard-to-treat infections that are increasing among patients in medical facilities.
- Developed a highly effective natural repellent and insecticide against mosquitoes and ticks and licensed it to commercial partners to develop products for consumer purchase.
- Recommended that all Americans born from 1945 through 1965 be tested for hepatitis C and referred to care, as needed, to prevent thousands of premature deaths from cirrhosis and liver cancer (http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6104a1.htm?s_cid=rr6104a1_w).
- Provided the evidence base for Advisory Committee on Immunization Practices (ACIP) recommendations on administration of human papillomavirus (HPV) vaccine to boys aged 11 or 12 years, to prevent the spread of HPV, a sexually transmitted infection that is a major cause of cervical cancer (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a3.htm>; Box 6).

³ Chin-Hong PV, Schwartz BS, Bern C, Montgomery SP, Kontak S, Kubak B, Morris MI, Nowicki M, Wright C, Ison MG. Screening and treatment of Chagas disease in organ transplant recipients in the United States: Recommendations from the Chagas in Transplant Working Group. *Am J Transplant* 2011 Apr;11(4):672–80.

Box 3. CDC Winnable Battle: Food Safety

Forty-eight million Americans, or 1 in 6, become sick each year from contaminated food, and about 3,000 Americans die every year because of a food-related illness.* Better prevention and control of foodborne infections will not only prevent illness but also save billions of dollars in healthcare-related and industry costs.†

As described in *CDC Vital Signs: Making Food Safer to Eat*, CDC and partners are making food safer to eat by reducing contamination from such foodborne pathogens as *E. coli* O157, which has been responsible for the recall of millions of pounds of ground beef, and *Salmonella*, which causes more hospitalizations and deaths than any other type of foodborne infection. Other foodborne illnesses of public health concern include norovirus infections, which are the most common cause of acute gastroenteritis, and toxoplasmosis, which causes an estimated 400 to 4,000 congenital infections per year.

Recent actions to advance food safety include

- Investigating more than 20 multistate foodborne disease outbreaks and tracking more than 150 clusters of suspected food-related illness. CDC has developed a standardized questionnaire for interviewing patients during foodborne or waterborne disease outbreaks. One site that used the questionnaire reported an 86% drop in the time it took to interview outbreak patients, falling from 21 days to 3 days
- Testing more than 5,000 microbial samples collected by the National Antimicrobial Resistance Monitoring System—including *Salmonella*, *Shigella*, *Campylobacter*, *E. coli*, and *Vibrio*—to document emerging drug resistance in foodborne pathogens
- Providing FDA with infectious disease data to guide development of food safety policies that fulfill provisions in the 2010 Food Safety Modernization Act.

Ongoing work includes

- Developing innovative tools, methods, and analytics that allow faster and more complete identification of foodborne outbreaks and their causes. New tools include next-generation “non-culture” tests for use by laboratories that participate in PulseNET, the nation’s outbreak detection system for foodborne diseases
- Building state and local capacity to detect foodborne disease outbreaks by strengthening diagnostic laboratories and training partners in outbreak detection, investigation, and response
- Tracking disease trends and sharing data with public health partners, regulatory agencies, industry, and the public to guide development and implementation of policies that strengthen food safety.

More information available at <http://www.cdc.gov/winnablebattles/foodsafety/index.html>

* Scallan E, Hoekstra RM, Angulo FJ, Tauxe RV, Widdowson M-A, Roy SL, Jones JL, and Griffin PM. Foodborne illness Acquired in the United States—major pathogens. *Emerg Infect Dis* 2011 January;17(1):7–15.

† Hoffmann S, Batz MB, Morris JG Jr. Annual cost of illness and quality-adjusted life year losses in the United States due to 14 foodborne pathogens. *J Food Prot* 2012 Jul;75(7):1292–302.

Box 4. CDC Winnable Battle: HIV in the United States

Despite major advances in prevention and treatment, HIV infection remains a significant national and global public health challenge. More than 1 million Americans live with HIV, and approximately 50,000 become newly infected each year.

In accordance with the *National HIV/AIDS Strategy*, CDC is pursuing a High-Impact Prevention approach to reducing new HIV infections that targets proven, cost-effective, and scalable interventions to high-risk groups. In these efforts, CDC has

- Identified and linked 18,000 HIV-positive persons to care, by conducting nearly 2.8 million HIV tests as part of the Expanded HIV Testing Initiative. This program has prevented an estimated 3,400 new HIV infections and achieved a return of \$1.97 for every dollar invested
- Intensified public health efforts to reach at-risk youth in minority communities, as described in *CDC Vital Signs: HIV Among Youth in the US: Protecting a Generation*
- Provided clinical guidance on providing integrated prevention services for HIV infection, viral hepatitis, STDs, and TB among injecting-drug users and on the use of pre-exposure prophylaxis for the prevention of HIV infection in heterosexually active adults
- Evaluated the best use of an FDA-approved rapid home test for HIV and developed a new assay for HIV-1 incidence that can be used to identify high-risk populations, target prevention efforts, and track the global impact of HIV prevention and treatment programs.

Ongoing work includes

- Implementing innovative health education campaigns sponsored by the White House and CDC, including *Let's Stop HIV Together*—an HIV awareness and anti-stigma campaign that features individuals with HIV who share their personal stories
- Supporting Care and Prevention in the United States (CAPUS) demonstration projects that expand HIV prevention services in communities with a high burden of disease, using individual and community-level data to improve diagnosis, linkage to care, retention in care, and provision of antiretroviral therapy
- Issuing a National HIV Prevention Report that monitors progress toward eliminating HIV/AIDS.

More information available at <http://www.cdc.gov/winnablebattles/hiv/index.html>

- Improved monitoring of the publicly funded *Vaccines for Children* supply chain by deploying a second-generation version of the [CDC Vaccine Tracking System](#). CDC is also implementing a barcoding pilot project that allows vaccine information (e.g., the manufacturer and lot number) to be read directly into the patient's EHRs, in the physician's office. Partners include pharmaceutical companies, FDA, and vaccine-provider sites.
- Worked towards an AIDS-free generation through the President's Emergency Plan for AIDS Relief (PEPFAR) by supporting life-saving treatment for men, women, and children; antiretroviral drugs to prevent mother-to-child HIV transmission; and voluntary medical male circumcisions to reduce the risk of contracting HIV.

Box 5. CDC Winnable Battle: Eliminating Healthcare–Associated Infections

CDC is working to eliminate healthcare-associated infections (HAIs), using a *detect and protect* approach to detect infections, such as deadly drug-resistant pathogens, and protect patients across healthcare settings. In these efforts, CDC has issued national calls to action to

- Stop carbapenem-resistant Enterobacteriaceae (CRE), which cause hard-to-treat infections that are on the rise among patients in medical facilities
- Prevent the spread of *C. difficile*, a healthcare-associated pathogen that causes serious diarrhea, in hospitals, nursing homes, and outpatient clinics.

CDC's **National Healthcare Safety Network** (NHSN) serves as the nation's HAI tracking system, providing data to

- Healthcare facilities, to monitor and prevent HAIs
- States, to facilitate public reporting and advance regional prevention efforts
- The Centers for Medicare and Medicaid, to ensure quality reporting from healthcare facilities
- The Department of Health and Human Services, to measure national progress in HAI prevention.

NHSN data document dramatic reductions in HAIs between 2008 and 2011, including a 41% reduction in central line-associated bloodstream infections (CLABSIs) and a 17% reduction in surgical site infections (SSIs). In addition, the Emerging Infections Program reported that 26% fewer people developed healthcare-associated invasive methicillin-resistant *Staphylococcus aureus* (MRSA) infections.

CDC actions to make healthcare safer also include

- Disseminating a *CRE Toolkit* that provides step-by-step instructions to healthcare facilities for preventing CRE
- Helping states build capacity to monitor HAIs, respond to HAI outbreaks, and implement regional initiatives to improve adherence to infection control practices in healthcare settings
- Working with key partners to implement HAI initiatives, such as HAI standards setting, state program and policy evaluation, education, and development of tools that help clinicians implement CDC guidelines.

Ongoing work includes

- Using NHSN data to target interventions across healthcare settings, assess the impact of HAI prevention activities, and support early detection of *C. difficile* and multidrug-resistant organisms in healthcare facilities
- Working with the Healthcare Infection Control Practices Advisory Committee (HICPAC) to develop HAI prevention tools and guidelines that help healthcare facilities, states, and federal partners improve the quality of care in hospital and non-hospital settings
- Conducting innovative research, through the [Prevention Epicenters](#), to detect and prevent HAIs in specific healthcare settings and patient populations.

A state-by-state breakdown of HAIs and reductions in infection-rates across the country can be found in the [2011 National and State Healthcare-associated Infections Standardized Infection Ratio Report](#).

More information available at

<http://www.cdc.gov/winnablebattles/healthcareassociatedinfections/index.html>

Box 6. The Health Impact of U.S. Vaccine Policies: Selected Examples

- **Rotavirus.** Rotavirus vaccine has been recommended for routine use since 2006 to prevent the most common cause of severe diarrhea among infants and young children. Data obtained during the 2010–2011 rotavirus season indicate that the decline in severe rotavirus disease first documented in 2008 has held steady,^{*} and that babies who are vaccinated at 2–6 months exhibit no waning of vaccine protection through the first 3 years of life.[†]
- **Invasive pneumococcal disease.** In 2009, despite dramatic declines following use of pneumococcal conjugate vaccine 7 (PCV7), *Streptococcus pneumoniae* still caused an estimated 44,000 cases of invasive pneumococcal disease each year. The introduction in 2010 of pneumococcal conjugate vaccine 13 (PVC13) further reduced invasive pneumococcal disease in children younger than 2 years of age (by 59%) and adults older than 65 years of age (by 28%) (CDC, unpublished data). Over 2,000 cases have been prevented among all ages in 10 areas that conduct active, population-based surveillance as part of the Emerging Infections Program.
- **Varicella (chickenpox).** Since 2006, when CDC recommended that children routinely receive a second dose of varicella before the age of 12, varicella infections have declined by 67–76%.[‡] In collaboration with state and local health departments, CDC has also completed two studies that demonstrate high effectiveness (~95%) of two doses of varicella vaccine.
- **Human papillomavirus (HPV) infection.** HPV, the most common sexually transmitted infection, can cause cervical cancer, some other anogenital and oropharyngeal cancers, and genital warts. Since mid-2006, CDC has recommended HPV vaccine for routine vaccination of girls aged 11 or 12 years and through age 26 years for those not previously vaccinated (<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5602a1.htm>). In 2011, routine vaccination was also recommended for boys aged 11 or 12 years (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a3.htm?s_cid=mm6050a3_w). Recent U.S. data have shown a decrease in genital warts[§] and vaccine-type HPV prevalence among females aged 14–19 years,^{||} as well as a reduction in the percentage of precancerous cervical lesions due to vaccine-type HPV among women who initiated vaccination at least 24 months before their diagnosis.[¶]

* Tate JE, Haynes A, Payne DC, Cortese MM, Lopman BA, Patel MM, Parashar UD. Trends in national rotavirus activity before and after introduction of rotavirus vaccine into the National Immunization Program in the United States, 2000–2012. *Pediatr Infect Dis J* 2013 Feb 19 (Epub ahead of print).

† Hoffmann S, Batz MB, Morris JG Jr. Annual cost of illness and quality-adjusted life year losses in the United States due to 14 foodborne pathogens. *J Food Prot* 2012 Jul;75(7):1292–302.

‡ Payne DC, Boom JA, Staat MA, Edwards KM, Szilagyi PG, Klein EJ, Selvarangan R, Azimi PH, Harrison C, Moffatt M, Johnston SH, Sahni LC, Baker CJ, Rench MA, Donauer S, McNeal M, Chappell J, Weinberg GA, Tasslimi A, Tate JE, Wikswo M, Curns AT, Sulemana I, Mijatovic-Rustempasic S, Esona MD, Bowen MD, Gentsch JR, Parashar UD. Effectiveness of pentavalent and monovalent rotavirus vaccines in concurrent use among US children <5 years of age, 2009–2011. *Clin Infect Dis* 2013 Jul;57(1):13–20.

§ Flagg E, Schwartz R, Weinstock H. Prevalence of anogenital warts among participants in private health plans in the United States, 2003–2010: Potential impact of human papillomavirus vaccination. *Am J Public Health* 2013 (in press).

|| Markowitz L, Hariri S, Lin C, Dunne E, Steinau M, McQuillan C; Unger E. Reduction in HPV prevalence among young women following vaccine introduction in the United States, National Health and Nutrition Examination Surveys, 2003–2010. *J Infect Dis* 2013 (in press).

¶ Powell SE, Hariri S, Steinau M, Bauer HM, Bennett NM, Bloch KC, Niccolai LM, Schafer S, Unger ER, Markowitz LE. Impact of human papillomavirus (HPV) vaccination on HPV 16/18-related prevalence in precancerous cervical lesions. *Vaccine* 2012 Dec;31(1):109–13.

- Partnered with PAHO and ministries of health in using proven tools and procedures to
 - Ensure readiness to detect and control the mosquito-borne virus that causes Chikungunya fever, if this virus is imported into the Americas, as occurred with West Nile virus in 1999
 - Keep the Americas free from measles, by identifying imported cases and tracing their contacts. Most cases were imported from Western Europe, which experienced outbreaks in 2011 and 2012.
- In 2012, CDC submitted a [report to PAHO](#) documenting the continued absence of measles, rubella, and congenital rubella syndrome in the United States since their elimination in 2000.
- Completed successful trials of a veterinary vaccine against Rift Valley fever, a mosquito-borne zoonotic disease. Vaccination of livestock will eliminate one of the most significant sources of Rift Valley fever in people living in Africa and the Arabian Peninsula.

Examples of Ongoing Work

- Enhancing pandemic preparedness in the United States by developing candidate influenza strains for emergency vaccine development; exercising and evaluating CDC pandemic response capabilities; and updating guidance on the use of non-pharmaceutical interventions such as school closures and cancellation of mass gatherings.
- Releasing updated *Public Health Service Guideline for Reducing Transmission of HIV, HBV, and HCV through Organ Transplantation*, in collaboration with professional partner organizations and other HHS agencies (*Public Health Reports*, July/August 2013).
- Launching a joint initiative with the Veterans Health Administration (VHA) to update VHA procedures for prevention of healthcare-associated Legionnaires' disease, using lessons learned from the response to a 2011–12 outbreak associated with VHA hospital facilities in Pittsburgh.
- Assessing the effectiveness and cost-effectiveness of public health tools, including vaccines and testing procedures. Examples include estimating the public health impact of
 - Annual influenza vaccination in preventing hospitalizations and medical visits
 - Integration of point-of-care testing for HCV into HIV programs to increase the number of HCV-infected persons who are referred for care.
- Intensifying efforts to eliminate polio in the three countries where it remains endemic—Nigeria, Pakistan, and Afghanistan—with scientific and logistical support from the CDC Emergency Operations Center. India was removed from the WHO endemic list for polio in February 2012, marking a major milestone in polio eradication.
- Advancing elimination of parasitic infections that cause filariasis (transmitted by mosquitoes), Guinea Worm disease (transmitted through drinking water), and river blindness (transmitted by black flies). For example, in 2012 CDC helped the Haitian Ministry of Health complete the first round of nationwide mass drug treatment to eliminate filariasis.

Element 3. Develop and advance policies to prevent, detect, and control infectious diseases

CDC facilitates development and use of effective, evidence-based policies by identifying emerging issues, obtaining input from groups of experts, filling data gaps, developing consensus, and monitoring policy implementation and impact. Policy aims include integrating clinical infectious disease preventive practices into U.S. healthcare; reducing health disparities; increasing individual, community, and clinician engagement in disease prevention efforts; and strengthening global capacity to detect and respond to outbreaks with the potential to cross borders.

Examples of ID Accomplishments

- Saved state public health departments millions of dollars through improved TB screening and treatment of immigrants and refugees prior to their arrival in the United States.
- Assisted the CMS Center for Medicare and Medical Innovation in developing financial incentives for healthcare providers and hospitals to encourage
 - Accelerated reduction of HAIs through expanded reporting and greater adherence to recommended infection control practices by hospitals and other healthcare facilities
 - Faster and more complete reporting of vaccine coverage data to state immunization registries, through increased use of EHRs.
- Assisted states and localities in developing administrative mechanisms that allow public health clinics to bill health insurance plans for immunization services for newly insured children, in accordance with the 2010 [Affordable Care Act](#).
- Updated [A Public Health Action Plan to Combat Antimicrobial Resistance](#), which provides a policy blueprint for coordinated federal action. The plan was issued by the Interagency Task Force on Antimicrobial Resistance, which is co-chaired by CDC, FDA, and NIH.
- Advanced the use of mathematical modeling to support development of effective public health policies for disease prevention and outbreak response. Examples include
 - Evaluating the potential impact of a vaccine against cytomegalovirus (CMV) on the U.S. burden of congenital CMV disease (<http://www.cdc.gov/cmvtrends-stats.html>). CMV in newborns can cause neurologic abnormalities such as psychomotor retardation and deafness
 - Evaluating the potential impact of a novel influenza strain (H3N2v) on the U.S. population, in terms of illnesses, hospitalizations, and deaths, if it were to become readily transmissible from human to human. Thus far, transmission has been primarily swine to human.
- Launched a CDC Travel Health Twitter Channel (@CDCtravel) that helps U.S. residents traveling and/or living abroad protect themselves and their families from infectious diseases. CDC is also developing a mobile app that will provide access to the information in *CDC Health Information for International Travel 2014 (The Yellow Book)*, working in partnership with the Oxford University Press.

- Partnered with medical experts to improve communications and ensure the accuracy of treatment guidance during a recent outbreak of healthcare-associated fungal meningitis. Over the past year, CDC has also developed communication strategies and tools to help physicians
 - Educate parents about the benefits of ACIP-recommended childhood vaccines (<http://www.cdc.gov/vaccines/hcp/patient-ed/conversations/index.html>)
 - Educate adolescents and young adults about healthy behaviors to prevent STDs and promote sexual health (<http://www.cdc.gov/std/sam/>).
- Established the **PROTECT Initiative** to keep children safe from unintentional medication overdoses, working with public health agencies, private sector companies, professional organizations, consumer/patient advocates, and academic experts.
- Worked with international partners to strengthen global capacity for laboratory-based detection of infectious diseases. For example, CDC helped launch the **African Society for Laboratory Medicine** and provided technical assistance to ministries of health in the WHO/AFRO Region in developing National Laboratory Strategic Plans. CDC is also assisting WHO in strengthening disease detection and diagnosis in Cameroon, the Central African Republic, and the DRC, with support from the Bill and Melinda Gates Foundation (<http://www.cdcfoundation.org/what/program/strengthening-disease-surveillance-and-response-central-africa>).
- Helped WHO establish a global influenza vaccine donation program that in 2012 enabled the Lao Ministry of Health to launch its first seasonal influenza vaccination program, using vaccines provided by Walgreens (<http://www.cdc.gov/flu/spotlights/vaccination-program-launch-lao.htm>). The program’s goal was to protect pregnant women and other persons at high risk for serious flu-related complications.

Examples of Ongoing Work

- Assessing the U.S. burden of cervical cancer preventable by HPV vaccination.
- Working with FDA and USDA to draft a “State of the Nation” report on antimicrobial resistance that provides data on emerging drug-resistance issues in foodborne pathogens that can be transmitted from animals to humans. CDC is also working with FDA to implement the Generating Antibiotic Incentives Now (GAIN) provisions of the 2012 FDA Safety and Innovation Act, including the establishment of antimicrobial stewardship programs and the identification of antimicrobial-resistant pathogens of public health significance (<http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm320643.htm>).
- Evaluating strategies for improving drug therapy regimens (directly observed or self-administered) among persons with latent TB infection, conducted by the Tuberculosis Epidemiologic Studies Consortium (TBESC; <http://www.cdc.gov/tb/topic/research/TBESC/default.htm>). These studies will use the new TBESC II Data Management System, which facilitates patient enrollment into TB research projects.

- Developing social media tools that
 - Facilitate two-way communication with individuals (especially young adults and teenagers) during public health emergencies (e.g., Facebook messages, blogs, and on-line surveys)
 - Allow individuals to assess their risk of acquiring viral hepatitis and other infectious diseases and determine whether they should be tested and/or vaccinated (<http://www.cdc.gov/hepatitis/riskassessment/start.html> and <http://www2.cdc.gov/nip/adultimmsched/>)
 - Help physicians tailor infectious disease treatment to fit the needs of specific patient populations (e.g., a smartphone application that provides customized recommendations for preventing group B streptococcus in newborns).
- Working with swimming-pool industry representatives and public health officials to finalize a [Model Aquatic Health Code](#), a set of science-based recommendations that communities can use to help prevent the spread of waterborne illnesses at public swimming pools, spas, and other man-made aquatic venues.
- Advancing implementation of the 2005 [International Health Regulations](#) (IHR), by strengthening national capacities to rapidly recognize, report, and contain the spread of infectious diseases. Partners include ministries of health, WHO, PAHO, the Bioengagement Program of the U.S. Department of State, and the Defense Threat Reduction Agency of the U.S. Department of Defense.
- Working with ministries of health and WHO to adapt the WHO/AFRO [Integrated Disease Surveillance and Response system](#) (IDSR) as a potential model for IHR implementation in Asia and the Middle East.
- Working with international partners to provide the science base for global health policies that improve child and maternal health and increase neonatal survival rates. Examples include
 - Evaluating the health impact and cost-effectiveness of new vaccines against rotavirus, pneumococcal pneumonia, and meningococcal A meningitis
 - Identifying barriers to childhood immunization and developing strategies to overcome them, working with ministries of health in India, Ethiopia, Indonesia, Uganda, South Sudan, and the DRC
 - Working with countries in the African meningitis belt (e.g., Burkina Faso, Niger, Nigeria, Ghana, and Mali) to enhance disease surveillance and document the effectiveness and impact of the new [meningococcal conjugate A vaccine](#)
 - Identifying risk factors for community-acquired infections, including drug-resistant infections, in young infants (<http://www.chrfbd.org/ongoing-studies/>)
 - Evaluating the benefits and costs of integrating immunization services with other public health interventions, such as distribution of bednets, vitamin A supplements, or deworming tablets (http://jid.oxfordjournals.org/content/205/suppl_1.toc).

CONCLUSION

The accomplishments highlighted in this *Progress Report* illustrate ongoing progress in sustaining and strengthening a modern public health system that is flexible, vigilant, and ready to meet new challenges, including outbreaks of new and re-emerging diseases. Moving forward, CDC and partners will continue to generate new ideas and make use of new knowledge, technologies, and alliances to strengthen public health fundamentals, implement high-impact interventions, and advance cost-effective policies to prevent, detect, and control infectious diseases.

