



Global Disease Detection and Emergency Response Activities at CDC 2012



Center for Global Health
Division of Global Disease Detection and Emergency Response



“We need public health systems that can quickly diagnose outbreaks, whatever their source, and mobilize the right medical resources and personnel. By making any one country more secure, we make the international community more secure at the same time.”

– Secretary of State, Hillary Rodham Clinton, December 7th, 2011.
Remarks at the 7th Biological and Toxin Weapons Review Conference

“To stop disease that spreads across borders, we must strengthen our systems of public health. We will focus on the health of mothers and children. And we must come together to prevent, detect, and fight every kind of biological danger—whether it is a pandemic like H1N1, a terrorist threat, or a treatable disease...”

— President Barack Obama, September 21st, 2011.
Address to the United Nations General Assembly





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Dear Colleagues:

Global disease detection and emergency response has always been a core public health activity for CDC, ensuring the public health security of Americans and others around the world. Over the past year, the agency continued to formalize this by centralizing activities in the Division of Global Disease Detection and Emergency Response (DGDDER) that now span all facets of global health security. Our founding Global Disease Detection Program (GDD), was established in 2004 to promote global health security by building capacity to rapidly detect and contain emerging health threats. In the last eight years, the GDD Program has grown by establishing seven GDD Regional Centers and three GDD Regional Centers under development. With the formation of CDC's Center for Global Health in 2010, DGDDER was established not just to include GDD but also International Emergency and Refugee Health, Global Health Security, and Health Systems Reconstruction programs. This structure has led to increased collaborations among the programs as well as an increased network of partnerships throughout CDC.

In 2011, CDC coordinated and contributed to several high-profile and important responses including cholera in Haiti, famine in the Horn of Africa, and outbreaks of typhoid, Ebola, and dengue fever. In addition, CDC programs worked together to build host country capacity for global health security and the International Health Regulations (IHR), including developing surveillance and epidemiologic systems, strengthening laboratories, and increasing public health workforce overseas. The GDD Regional Centers have also continued to provide key field support and leadership for global disease threat and response, as highlighted by the 2011 monitoring and evaluation data in this report.

These events and outbreaks of 2011 reminded us that emerging health threats and humanitarian emergencies remain a complicated reality, yet they also highlight the value of our robust network of partners, which is essential for building capacity and rapidly responding to events. As the World Health Organization (WHO) Collaborating Center for Implementation of IHR National Surveillance and Response Capacity, and through ongoing work with our host country partners, we are making important progress towards building health security globally. In coordination with WHO, U.S. Agency for International Development, U.S. Department of State, U.S. Department of Defense, and others, CDC is strategically placing scientific expertise and resources in each of the WHO regions to build and strengthen national public health core capacities in host countries and throughout the region. Increased collaboration between CDC programs and global partner networks has meant that our efforts in 2011 were stronger and more meaningful than ever.

Thank you for your continued interest in CDC's work on global disease detection and emergency response. We hope you will enjoy reading and learning about the most recent accomplishments. We look forward to the coming year as CDC continues to work with global partners to ensure health security for our citizens by strengthening the global capacity to control emerging health threats.

Scott F. Dowell, MD, MPH
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Introduction

In recent years, the statement that diseases know no borders has become a truism, validated by infectious disease threats such as SARS, avian influenza, and drug-resistant tuberculosis. These diseases repeatedly cross national borders and pose immediate threats to the United States. Humanitarian emergencies, including the earthquake in Haiti, flooding in Pakistan, and famine in the Horn of Africa, are not isolated incidents but global crises which can sometimes have immediate and long-term effects throughout the world. It is also increasingly recognized that a one-time response is often not adequate and investments must be made in public health reconstruction in order to be better prepared for future emergencies. As emphasized in the Biological Weapons Convention Review Conference of 2011, the human and financial devastation of infectious diseases are still an ever-present danger to the world. In short: investments in global health security matter now more than ever.

The World Health Organization (WHO) defines global health security as the reduction in vulnerability of people around the world to new, acute or rapidly spreading risks to health, particularly those that threaten to cross international borders. President Obama's National Strategy for Countering Biological Threats (2009) similarly defines global health security as the reduction in threats from outbreaks of infectious disease whether natural, accidental or deliberate in nature.

While the U.S. has made substantial progress with partner nations to implement disease surveillance programs and respond at the source, the threats posed by emerging pandemics remain a challenge to global security, threatening economies and increasing political instability. CDC's global disease detection and emergency response activities help protect the global community from urgent public health threats and mitigate humanitarian emergencies. CDC health experts overseas collaborate with ministries of health (MOH) to not only keep their people safe, but also protect Americans against the spread of disease to the U.S.

CDC's global disease detection and emergency response activities have enhanced global health security since 2004 with current tasks focusing on:

- Detecting and containing emerging health threats
- Deploying CDC experts 24 hours a day, 7 days a week at country request
- Building capacity in support of the International Health Regulations (IHR)
- Promoting policies for public health and health security
- Responding to complex humanitarian emergencies

Partnerships

CDC's Division of Global Disease Detection and Emergency Response collaborates with centers and programs across CDC to accomplish its mission. This collaboration allows CDC to draw upon expertise from across the agency. The Division also works closely with a variety of in-country partners including MOHs, academic institutions, U.S. Agency for International Development (USAID), U.S. Department of State (DOS), U.S. Department of Defense (DOD), and international and non-government organizations. These partners contribute funding, expertise, and other resources towards CDC projects and goals. Therefore, the results of our work are shared accomplishments of CDC and its partners.

We view global health security as a continuum that covers the pre-emergency phase all the way through to recovery and can be divided into four sections: building capacity, monitoring and detecting threats, responding to international emergencies, and reconstructing health systems. The work of the Division of Global Disease Detection and Emergency Response covers all four components of the global health security emergency continuum. This also means that our branches and offices work closely together to coordinate efforts and ensure a seamless transition during emergencies.



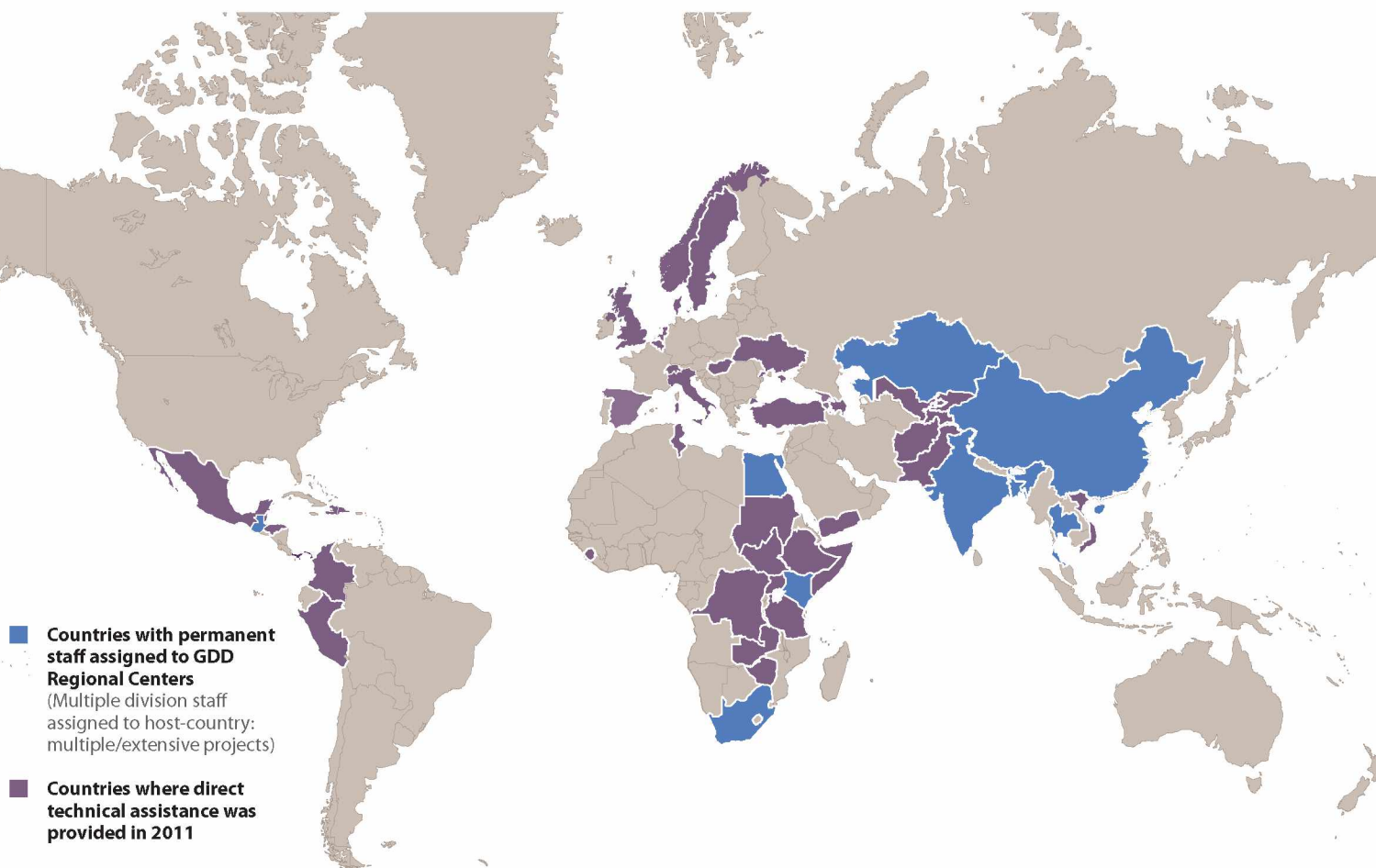
Contributions to the International Health Regulations

As the WHO collaborating center for implementation of the International Health Regulations (IHR) National Surveillance and Response Capacity, CDC's Division of Global Disease Detection and Emergency Response contributes to IHR capacity building as part of our mandate. With 194 member countries, the revised IHR is a legally binding international agreement which provides the world with a means for harmonizing action among member states and a framework for identifying, reporting, and responding to public health emergencies of international concern (PHEIC), regardless of their origin or source. The IHR requires member states to fulfill numerous obligations, which require political, financial, and technical commitment to prevent and control the spread of disease inside and outside of their borders.

We have made support and assistance for IHR implementation in partner countries a key driving force for our work, particularly our collaborations with host nations, other U.S. government agencies, and other partners. CDC's efforts are focused on (but not limited

to) to the four United States Government goals for IHR implementation: surveillance, response, human resources, and laboratory. CDC collaborates with U.S. embassies and U.S. Government partners in host countries to leverage current investments and efforts. For example, the GDD Regional Centers help develop key surveillance systems and train its workforce through various training programs. The GDD Operations Center conducts event-based surveillance and deployments to improve detection and response. The International Emergency and Refugee Health Branch is building surveillance and preparedness systems in host countries focusing on humanitarian activities and refugees, and the Health Systems Reconstruction Office is working to develop multiple surveillance and laboratory systems in Haiti. Finally, the Global Health Security Branch provides leadership in the development and implementation of high-level U.S. Government IHR planning frameworks and country toolkits. These are just a few examples of CDC's contributions, but with collaboration and support from our partners, CDC will continue to build IHR capacities worldwide.

Where we work





Building Capacity



Many countries lack the capacity and appropriate health infrastructure to effectively monitor, report, and respond to disease threats. CDC's activities reduce this risk by providing technical assistance to host countries to build on-the-ground capacity to detect deadly outbreaks, thereby protecting Americans at home and abroad.

Accomplishments in 2011

GDD Regional Centers

- 74 epidemiologists and laboratory scientists graduated from the Field Epidemiology Training Programs (FETP) associated with GDD Regional Centers
- 530 FETP graduates remained in public health positions in-country or within the region after graduation
- More than 15,000 people participated in short-term public health training. Instruction included a combination of advanced training for core public health personnel and more basic training for clinicians and others working in public health

Building Capacity

Figure 1. Building Human Resource Capacity

Over the last six years, 376 doctoral level epidemiologists have been trained in the GDD Regional Centers. This advances global public health towards the goal of 1 senior epidemiologist per 200,000 people.

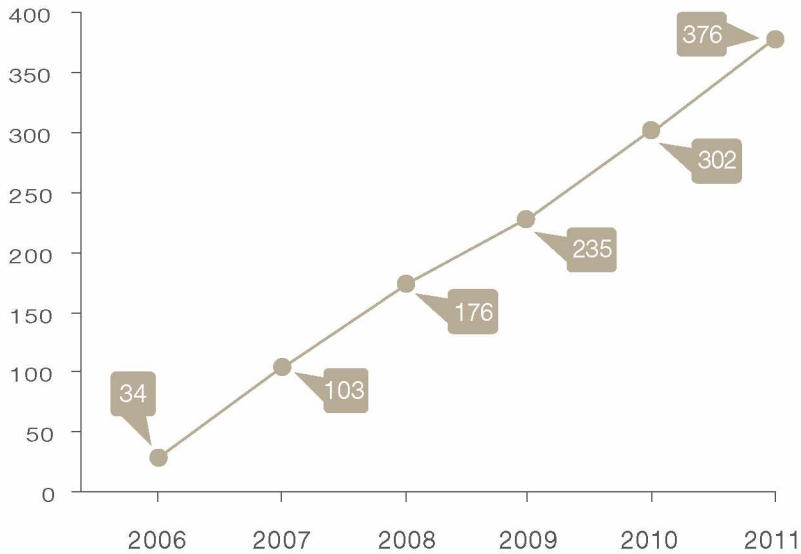
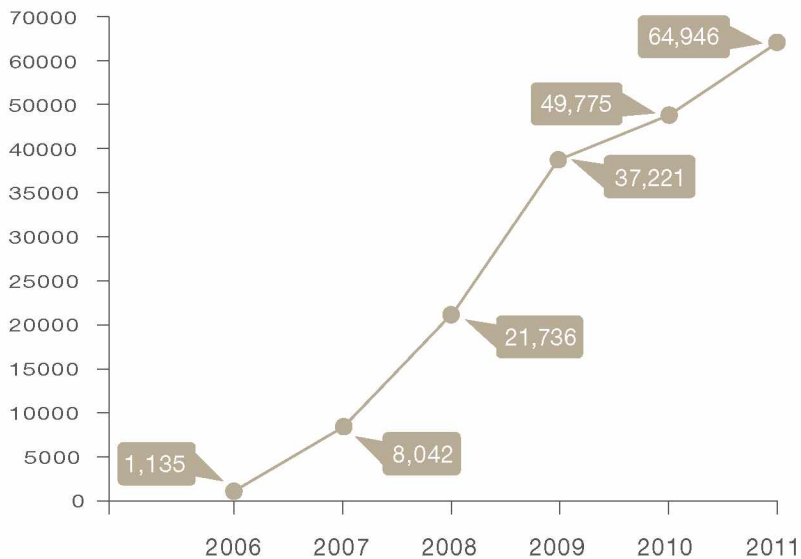


Figure 2. Cumulative Number of Training Participants

Nearly 65,000 people have participated in both formal and informal training.



Strengthening Influenza Vaccination in Thailand: 10 Years of Collaboration

Prevention of influenza remains an important global health challenge, particularly in largely populated regions such as Southeast Asia. Due to a large amount of global migration from Southeast Asia, influenza that originates in this region has a high risk of international transmission, including to the United States. CDC's Influenza Division has carried out influenza program activities in Thailand since 2001. At that time, investments in influenza prevention by the Government of Thailand were extremely limited, and mostly focused on giving fewer than 100,000 doses of influenza vaccine to a select group of Mecca pilgrims.

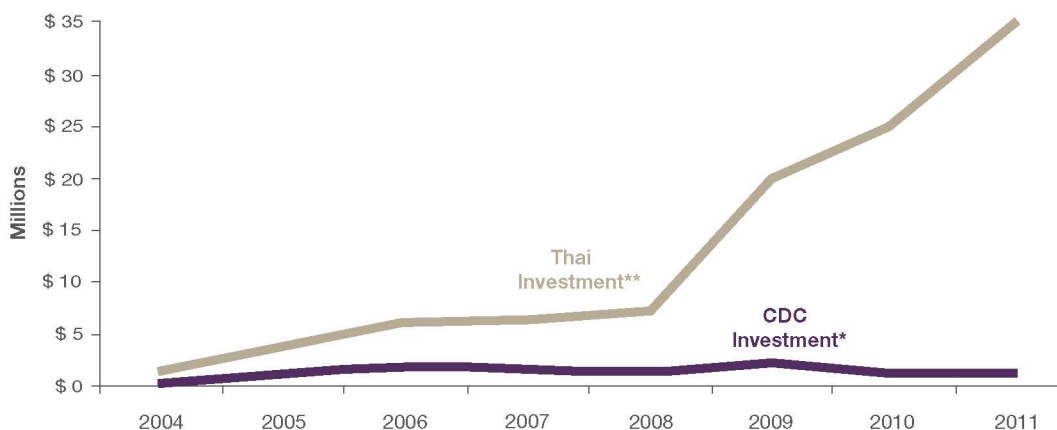
Since 2001, however, CDC and partners have worked with the Ministry of Public Health in Thailand to establish the foundation for and then implement the beginnings of an influenza public health program. Efforts began with a series of strategic activities related to influenza, including beginning surveillance for pneumonia and influenza, identifying risk factors for people hospitalized with influenza, defining seasonality, and estimating the burden and cost of influenza disease, including publication of the incidence of influenza pneumonia in the country.

By 2007, the Ministry of Public Health in Thailand had developed a pandemic influenza preparedness plan. In 2008, Thailand began providing influenza vaccination to adults 65 years or older and by 2011, the recommended target groups expanded and Thailand was giving approximately 2.8 million doses of influenza vaccine through the public sector.

The situation in Thailand shows how capacity building and relatively small investments provided by CDC can generate tremendous public health benefits. From 2001 to 2011, CDC influenza investments in Thailand totaled about \$10 million. During that same time period, the Government of Thailand investgradually increased its investment, ultimately providing more than \$97 million into its influenza program, benefiting more than 2.8 million people each year, and helping to prevent the global spread of disease.

Figure 3. The Catalyst Effect: Expansion of Influenza Investments in Thailand.

CDC investments helped Thailand to document the burden of influenza and make the case for increased use of flu vaccine. Since that time, Thailand has invested \$97 million into its influenza programs, protecting Thai citizens and others against the disease.



* CDC Activities are jointly supported by the Influenza Division and the Division of Global Disease Detection and Emergency Response

** Vaccine production and distribution estimated at \$12/dose.

Building Capacity

China Field Epidemiologists Grow in Numbers, Location and Knowledge Base

With a population of 1.3 billion, China has taken on an aggressive goal regarding its public health workforce. Although there are approximately 625,000 public health workers, fewer than 100 have graduated from the Chinese FETP. A key component of



GDD's Regional Centers is working closely with CDC's Division of Public Health Systems and Workforce Development to implement an applied epidemiology program to help foreign countries develop and strengthen their public health workforce. For the GDD Regional Center in China, developing partnerships with the Chinese government has been an important element of establishing, supporting and sustaining public health programs such as the FETP. The Chinese government, with technical assistance from CDC, supported an expansion plan of the FETP by providing new staff positions, office and training facilities. The main focus was to increase class size to at least 80 per year by 2015. The first success has been the increase in class size from 15 to 32 in 2011 along with an increase in FETP sites at the provincial and city level to a total of 19 sites. At this pace, FETP is poised to help the Chinese meet their goal by 2015.

Keeping Laboratories in Uganda Safe

In 2010, a congressional delegation and Pentagon officials visited laboratories at the Uganda Virus Research Institute. The delegation expressed concerns about what they saw: broken windows, simple padlocks, lack of basic laboratory equipment, insecure storage of dangerous pathogens, and other biosecurity hazards.

CDC's Global Health Security Branch maintains a productive relationship with the Ugandan Virus Research Institute. Following the delegation's visit, Ugandan colleagues were interested and willing to make the changes necessary to upgrade biosecurity and biosafety at their facilities. In 2011, CDC, DOD, and DOS combined their efforts and expertise to build a secure repository for pathogens such as Ebola fever, Marburg fever, and Bacillus Anthracis, and will provide a secure facility for dangerous pathogens.

Outside of Uganda, CDC, DOD and DOS are working together to create a framework for building a comprehensive regional biological security program in East Africa. This approach aims to improve biosecurity through multiple avenues, including secure physical facilities and by building a robust public health observation and communication network to improve public health and counter bioterrorism. Most importantly, this effort will merge the various U.S. government programs to ensure complete, proactive, and coordinated efforts towards global laboratory biosecurity. Ultimately, secure and safe laboratories internationally will mean increased compliance with the IHR and decreased risk of global biosecurity events.





Monitoring and Detecting Threats



Rapid detection at the source of an event saves vital time needed to deploy countermeasures and implement strategies to save lives and prevent the spread of disease across borders. CDC experts collaborate with MOHs to keep their citizens safe and protect Americans against the spread of disease. In addition, GDD Regional Centers help countries to establish or significantly improve laboratory testing capacity to confirm emerging health threats and implement appropriate response interventions more quickly.

Accomplishments in 2011

GDD Regional Centers

- Detected 7 pathogens new to their region
- Discovered 3 organisms new to the world
- Built host nation capacity for 17 new diagnostic tests

Monitoring and Detecting Threats

Figure 4. Cumulative Number of New Pathogens Detected and Testing Capacity

By transferring technology and laboratory expertise from CDC to the field, we are able to track new pathogens that are new to the region and the world.

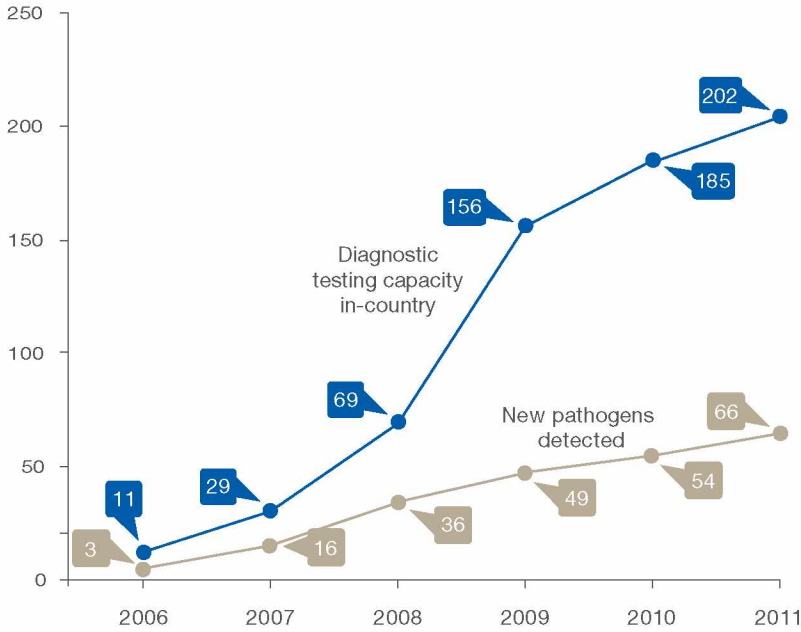


Table 1. Pathogens Detected, 2011

GDD Regional Center	Pathogen Name	New to
Bangladesh	Nipah virus	Mode of Transmission
Bangladesh	Avian Influenza A H9N2	New to Region
Guatemala	<i>Candidatus Bartonella desmodus</i> *	World
Guatemala	Influenza A/bat/Guat/09, bat conaviruses, bat adenoviruses, bat polyomavirus, bat paramyxoviruses, bat astroviruses, bat rotaviruses, bat herpesviruses, bat parvoviruses*	World
Kazakhstan	<i>Metapneumovirus</i>	Region
Kazakhstan	<i>Norovirus</i>	Region
Kenya	<i>Candidatus Rickettsia asemboensis</i> , bat conaviruses, bat adenoviruses, bat polyomaviruses, bat paramyxoviruses, bat rhabdoviruses*	World
Thailand	<i>Bartonella vinsonii</i>	Region
Thailand	<i>Aspergillus flavus</i>	Region
Thailand	<i>Streptococcus equi</i>	Region
Thailand	<i>Streptococcus difficilis</i>	Region
India	<i>Crimean-Congo hemorrhagic fever variant</i>	Region

¹ Isolate characterization is expected in 2012.

* Organisms new to the world typically require additional investigation to assess human pathogenicity.

Teaming up to address “Brain Fever” in India

While acute encephalitis, or brain infections, occur world-wide, they are especially prevalent in Asian countries with a high burden of the mosquito-borne disease Japanese encephalitis. India introduced vaccination for Japanese encephalitis in several states during 2006, resulting in a drop in cases; but several areas of the country continue to be plagued with large outbreaks of “brain fever” during the rainy season each year. These outbreaks affect over 5,000 people in India, most of them children. Many are permanently disabled and 700 people die each year.

At the request of the Government of India, the GDD Regional Center made strengthening encephalitis surveillance and outbreak investigation one of its priorities. CDC formed the Encephalitis Working Group to develop intensive sentinel surveillance in select hotspots to better characterize the incidence and causes of encephalitis in that area. The implementation of this surveillance system will build capacity to diagnose preventable and treatable causes of encephalitis and detect potential emerging pathogens that might be contributing to outbreaks. The results of this project will be critical to guiding effective control measures and will inform the approach to comprehensive encephalitis surveillance and control in other affected regions of India.

Reservoirs of Infectious Disease in Bats

In the movie *Contagion*, the deadly outbreak of a novel, fictitious virus, originating from bats, spread around the world in a matter of days. In real life, infectious diseases continue to emerge and re-emerge and bats are the real source for many of these. Despite the threat for serious consequences of outbreaks from viruses associated with bats, such as rabies, Nipah virus, and Marburg/Ebola hemorrhagic fever, far too little is known about the ecology of bat-borne viruses.

Bats are abundant in the tropics, and frequently roost in close proximity to people, sometimes forming large colonies of one or several species. Last year the GDD Regional Centers in Bangladesh, Guatemala, and Kenya along with the National Center for Emerging and Zoonotic Infectious Diseases, researched the threats that bats present to Americans abroad and the global community.

Bangladesh

For the past decade, the GDD Regional Center in Bangladesh has been coordinating with the Government of Bangladesh to respond to Nipah virus outbreaks caused by consuming raw sap from palm trees. Nipah virus causes inflammation of the brain and commonly leads to death. The sap can be contaminated with saliva, urine and feces from bats that carry the disease. In 2011, the Government of Bangladesh based their prevention strategy on CDC surveillance data and made recommendations via mass media to avoid consuming raw tree sap. The GDD Regional Center in Bangladesh continues to be involved in assessing the impact of the government’s recommendations to keep citizens and visitors safe from disease.



Monitoring and Detecting Threats

Guatemala

In 2011, the GDD Regional Center in Guatemala worked closely with CDC's Division of Vectorborne Diseases and Universidad del Valle de Guatemala in rural and urban regions of Guatemala to collect specimens from bats to determine the prevalence of pathogens, including novel types of Bartonella, known to be associated with bats. Bartonella is recognized as a significant cause of acute and chronic disease globally.



In 2011, a new Bartonella organism was found, highlighting the role that bats may play as a major reservoir for maintenance and transmission of Bartonella to other animals and humans. In collaboration with the Division of Viral Diseases, CDC has also detected many new novel viruses in bats including Influenza viruses (see Table 1). By identifying these novel agents of disease through laboratory testing, CDC and its partners can reduce the disease threat and improve clinical standards of care.

Rapidly Testing for Rabies in Kenya

Rabies is nearly always fatal if preventive measures are not taken after exposure. Worldwide, more than 55,000 people die from rabies every year. The ability to diagnose rabies in both animals and people is the cornerstone for rabies prevention and control. In Kenya, veterinary and public health agencies have limited capacity for conducting rabies diagnoses in their laboratories and overall, a more practical and cost-effective method for diagnosing rabies in Kenya and other developing countries is needed.

A Direct Rapid Immunohistochemical Test for rabies diagnosis was recently developed by CDC's Division of High-Consequence Pathogens. The technique offers a rapid, specific, sensitive and cost-effective tool for diagnosing the disease. The test is ideal for the field as it can be performed on a bench-top at ambient temperature, requires no specialized equipment, provides diagnostic results in one hour, and does not require electricity.

In August 2011, the GDD Regional Center in Kenya provided training in the use of the rapid test to multiple organizations including the Kenya Veterinary Association, Kenya Medical Research Institute, National Public Health Laboratories Services, and the Central Veterinary Laboratories. This training proved valuable as shortly after, the GDD Regional Center assisted the Kenyan laboratories in an investigation of human exposures to a rabid zebra at a safari lodge. The zebra was confirmed rabid at the GDD Regional Center in the Nairobi, Kenya laboratory using the rapid test technology. Nearly 200 tourists from 17 countries were identified as having potential exposure to the rabid zebra, including 30 U.S. tourists, with several requiring post-exposure prophylaxis. As a next step forward, the GDD Regional Center in Kenya will begin implementation of enhanced rabies surveillance with establishment of rabies diagnosis in veterinary and public health laboratories.

Millions of tourists travel to Africa and other regions for vacation and safari. Having readily available and easy-to-use technology in remote areas of the developing world will ultimately keep Americans safe as they travel. As a result of this technology transfer, Kenya is now better able to respond to cases of rabies and protect people, both Kenyans and foreign nationals, from sickness and death. In addition, this technology is being transferred to other developing countries, resulting in rapid diagnosis and protection from rabies worldwide.





Responding to International Emergencies



The threat posed by emerging pandemics remains a challenge to global security by putting economic and political stability at risk. In addition, populations affected by natural disaster, war, famine, and civil strife are vulnerable to diseases. This is compounded when health and other government infrastructure has been damaged or is not functioning. CDC seeks to diffuse these risks by providing scientific and technical expertise to protect and improve the health of emergency-affected populations.

Accomplishments in 2011

GDD Regional Centers help build national and regional capacity. In 2011, outbreak responses

Were Timely

- 81% received a response within 24 hours of the request

Were Comprehensive

- 84% involved laboratory support
- 52% included health communication support
- 29% included support to other countries

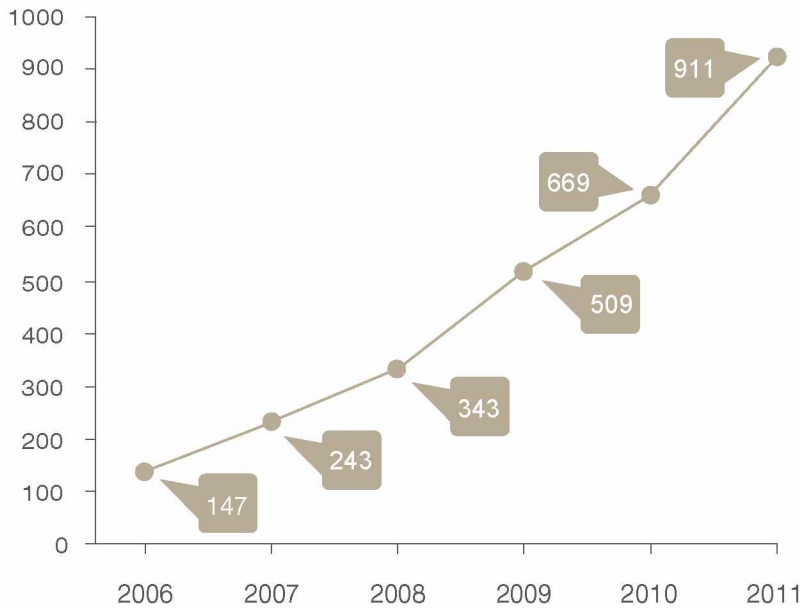
Achieved Public Health Impact

- 70% led to identification of modifiable risk factors
- 35% led to saving of lives, preventive action, or policy change

Responding to International Emergencies

Figure 5. Cumulative Number of Outbreak Responses

Over the past six years, GDD Regional Centers have responded to 911 disease outbreaks.



Headquarters Responses to Emergencies

Some outbreak responses supported through the GDD program are complex or cross national and regional boundaries and require a CDC headquarters-based response. Through its surveillance function, the GDD Operations Center in Atlanta is frequently the first to alert CDC staff (based in Atlanta and internationally) about a disease outbreak. The GDD Operations Center utilizes multiple sources of information about disease events, including internet-based media reports which scan for key words in more than 40 languages. To investigate and confirm the existence of these outbreaks, the GDD Operations Center relies on a global network, including CDC subject matter experts and their international networks, WHO Headquarters and regional offices, and other international partners. The GDD Operations Center is also a member of the Biosurveillance Indications and Warning Analytic Community, a U.S. government interagency collaboration that allows 12 agencies to exchange unclassified information through a secure Web-based portal. The GDD Operations Center is also CDC's liaison with the WHO's Global Outbreak Alert and Response Network, receiving and responding to requests for international assistance to control disease outbreaks. In 2011, the GDD Operations Center supported 20 outbreak investigations in 17 countries (see Table 2).

Table 2. List of Outbreaks Supported by GDD Operations Center, 2011

Disease	Country	CDC Staff Deployed	Laboratory Support	Equipment/Supplies/Support*	Actions Taken in 2011
Cholera	Haiti	✓	✓	✓	Continued emergency deployments and material support for controlling the cholera epidemic
Typhoid	Uganda	✓	✓	✓	Deployed a team to provide epidemiologic and laboratory technical assistance, provided equipment and supplies for training on typhoid case management, surveillance, and prevention, and provided startup supplies for blood culture and rapid diagnostic kits for serologic testing
Nodding Syndrome	South Sudan and Uganda	✓	✓	✓	Deployed a team to South Sudan to assist in a field investigation, verified the clinical illness as Nodding Syndrome, and conducted a case-control study in order to substantiate significant risk factors for Nodding Syndrome as identified in Uganda, DVD employed a panel of pan viral family or group PCR assays and a deep sequencing approach to further understanding of Nodding Syndrome
Polio	Republic of the Congo	✓		✓	Supported deployments for Supplemental Immunization Activities (SIAs), National Immunization Days (NIDs), Sub-National Immunization Days (SNIDs) and other immunization campaigns
Cholera	Dominican Republic	✓	✓	✓	Validated laboratory testing for proper diagnosis, assisted with the investigation into high hospital cholera mortality rates, and recommended improvements in the quality of clinical care
Yellow Fever	Uganda	✓	✓	✓	Deployed a team to assist in the epidemiologic and laboratory components of the outbreak investigation, including enhancing surveillance, characterization of the outbreak, and identifying risk factors unique to this particular outbreak of yellow fever
Unexplained Liver Disease	Ethiopia	✓		✓	Deployed staff and supplies to continue investigations into the etiology of the disease
Rabies (Bat)	Peru	✓	✓	✓	Deployed staff to assist with specimen collection and shipment, and other public health prevention measures including enhanced surveillance, health communications and surveys
Acute Gastrointestinal Syndrome	Thailand		✓	✓	Led an investigation into possible etiologies, including testing by of available tissue specimens and toxic agents
Ebola	Uganda	✓	✓	✓	Deployed staff to provide epidemiologic and surveillance assistance, laboratory support, clinical case management and infection control, social education and mobilization, and provided supplies of Personal Protective Equipment kits
Anthrax	Anthrax	✓		✓	Conducted a community-based survey focusing upon risk factors for exposure, with findings and potential interventions shared with the Ministry of Health
Nosocomial Klebsiella	Panama	✓		✓	Deployed a team to assist in the investigation, make recommendations on responding to the outbreak, and develop best practices to prevent future similar outbreaks
Hand, Foot, and Mouth Disease(HFMD)	Vietnam	✓			Deployed a team to investigate the outbreak, review laboratory and surveillance data, and provided recommendations for implementing improved surveillance and precautionary measures to reduce the spread of HFMD
Typhoid	Zimbabwe	✓	✓	✓	Deployed a team to investigate the source of the outbreak, provided technical consultation for confirmatory and additional laboratory testing including rapid tests, molecular subtyping, and antimicrobial susceptibility, tested wells to insure access to clean water
Acute Febrile Syndrome	Yemen		✓		Shipped laboratory specimens to CDC for testing
Acute Gastrointestinal Syndrome	Yemen		✓		Provided laboratory testing materials to more rapidly establish the etiology of the outbreak
Dengue	Marshall Islands	✓	✓	✓	Deployed a team to provide on-site technical assistance including epidemiologic investigation, clinical management, rapid diagnostic tests and vector control, supported shipment of samples to CDC labs
Guillain-Barre Syndrome	Mexico	✓	✓	✓	Deployed CDC staff to determine the etiologic source of the outbreak and support laboratory testing and needs
Dengue	Micronesia	✓	✓	✓	Supported shipment of samples to CDC labs, deployed a CDC investigation team, sent rapid diagnostic tests, and assisted in vector control efforts
Dengue	Pakistan	✓	✓	✓	Shipped laboratory specimens to CDC labs for testing

*Equipment and Supplies includes printing, contractual services, transportation of items, and communications

Responding to International Emergencies

Typhoid Fever: Multi-Region Responses in Africa

Typhoid fever is a forgotten scourge for most of the developed world. This disabling disease of poverty occurs most often in children from five to 19 years old and is responsible for an estimated 16-33 million cases and 210,000-600,000 deaths every year. While developing countries with poor sanitation and sewage treatment are especially vulnerable to typhoid outbreaks, typhoid fever is also a concern for developed countries. In the United States, over 75% of typhoid fever cases are acquired while traveling internationally.

In September 2011, the MOH in Uganda contacted CDC to report increasing cases of typhoid fever associated with intestinal perforation and formally requested assistance. This outbreak has been an ongoing struggle and was investigated by CDC in 2009, but in 2011 cases began to increase again and to spread to new areas in the country. CDC pooled resources from Atlanta, including the GDD Operations Center and enteric disease epidemiology and laboratory experts from the Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging Zoonotic and Infectious Diseases, along with staff from CDC-Uganda and CDC-Kenya to send an investigation team to Uganda. This team provided epidemiologic and laboratory expertise and training assistance to over 100 health facilities and indirectly supported the Ugandan MOH to develop response measures, improve laboratory diagnosis, increase water quality testing, implement health education messages, and conduct trainings on case management, surveillance, and prevention to 169 health workers from the health facilities.

In October 2011, the Ministry of Health and Child Welfare in Harare, Zimbabwe began reporting cases of typhoid fever to CDC-Zimbabwe. The response again combined resources from the Kenya GDD Regional Center Laboratory Program, the South African FETP, part of the GDD Regional Center in South Africa, and experts from CDC headquarters to respond to the outbreak with support from the GDD Operations Center contingency fund. CDC assisted with the epidemiologic and laboratory investigation, enhanced surveillance and water testing, and provision of laboratory supplies. Meeting with MOH officials, the outbreak response team also recommended community education interventions and health education messages. The international team significantly contributed to addressing this outbreak and the number of typhoid cases had decreased considerably by the time the team departed.

Responding to the Crisis in the Horn of Africa

Responding to the Deadliest Famine in Decades

A drought in 2011 in Somalia, northern Kenya, and eastern and southern Ethiopia resulted in widespread crop failure and livestock mortality. Coupled with political instability and conflict in Somalia, this led to the most severe food security emergency in decades. Large portions of the Somali population, a high percentage of them women and children, fled to Kenya and Ethiopia. These populations were vulnerable to malnutrition, life-threatening disease, and violence as they walked hundreds of miles in hopes of reaching refugee camps such as the Dadaab camp complex in northern Kenya. Many died during the exodus, and those who

arrived were often severely malnourished, sick, and traumatized. Throughout 2011, CDC's refugee health experts provided critical support to multi-lateral partners in responding to this humanitarian crisis.

Helping to Define the Magnitude of the Crisis

Early in the crisis, conditions were deteriorating rapidly. The worst affected areas were in the Al-Shabaab-controlled region of southern and central Somalia where humanitarian aid workers were not allowed. With limited access and information, the United Nations Food Security and Nutrition Analysis Unit struggled to determine whether conditions



constituted an official declaration of famine, an important step in mobilizing the international community and directing resources. Scientists from CDC received a request to help assess data quality and provide a scientific method for analyzing the available data in order to determine nutritional status, morbidity, and mortality. Famine is defined, in part, by a population-based mortality rate greater than 2 deaths per 10,000 people per day and global acute malnutrition exceeding 30%. Based on CDC data, conditions within Somalia were found to be above these emergency thresholds and on July 20th, 2011, the UN announced that a famine existed in two areas of southern Somalia and was expected to spread across the southern zone of the country. CDC's contributions were critical in establishing a famine declaration, thereby focusing the international community to increase its emergency response efforts to this crisis.



Photograph courtesy of
The United Nations Development Group



Reconstructing Public Health Systems



Once an emergency situation is stabilized, CDC's focus shifts from the emergency response phase to reconstruction. Public health challenges hinder developing economies and threaten the overall stability of vulnerable countries. By assisting countries to build or rebuild public health systems after disasters, CDC supports not only improved health outcomes, but also political and economic benefits. CDC leverages expertise across the agency to strengthen public health systems in need of reconstruction.

Reconstructing Public Health Systems

Rebuilding Haiti

On January 12, 2010, a massive, 7.0 magnitude earthquake struck Haiti, killing an estimated 200,000 people and destroying an already weak national infrastructure. Roads and ports were badly damaged, homes reduced to rubble, and remaining clinics overwhelmed by multitudes of people with severe traumatic injuries. There was an immense public health need in Haiti and a fragile health system unable to respond. CDC's response was immediate—soon after the earthquake struck, CDC supported the Haiti MOH and provided resources (including staff and funding) to strengthen and reconstruct Haiti's public health system. However, due to the uncertain political situation and magnitude of devastation, the risk for disease outbreaks remained high. On October 21 of that year, reports of rapidly increasing numbers of watery diarrhea cases in the Artibonite Department gained worldwide attention. A CDC field team composed of epidemiologists and laboratory scientists from the MOH began an immediate investigation and identified cholera as the pathogen. Within a month, the cholera outbreak had swept across Haiti and beyond its borders. The CDC's Health Systems Reconstruction Office (HSRO) played a substantial role in response to the public health needs for Haiti as well as cholera-affected nations elsewhere. From building laboratory capacity and public health professional capabilities, to community assessments, and establishing cholera treatment facilities throughout Haiti, CDC and other partners' efforts have worked to contribute in these areas. A sampling of CDC's accomplishments in reconstructing the public health systems in Haiti are summarized below.

Table 3. Public Health Legacy Goals for Haiti by 2015

Legacy goals are shared high-level public health goals that the U.S. government, the Haiti Ministry of Public Health and Population (MSPP), and other partners are working towards that will leave a lasting, improved public health legacy from post-earthquake reconstruction efforts. CDC contributes to these seven legacy goals, but cannot claim sole credit for, nor be held solely responsible for, their success or failure.

1. Eliminate mother to child transmission of HIV
2. Eliminate the threat of epidemic cholera
3. Eliminate Lymphatic Filariasis
4. Ensure a robust, sustainable, self-correcting public health system
5. Reduce the under-five mortality rate from vaccine preventable diseases by 35%
6. Reduce maternal mortality by 30%
7. Reduce the prevalence of tuberculosis (TB) by 25%

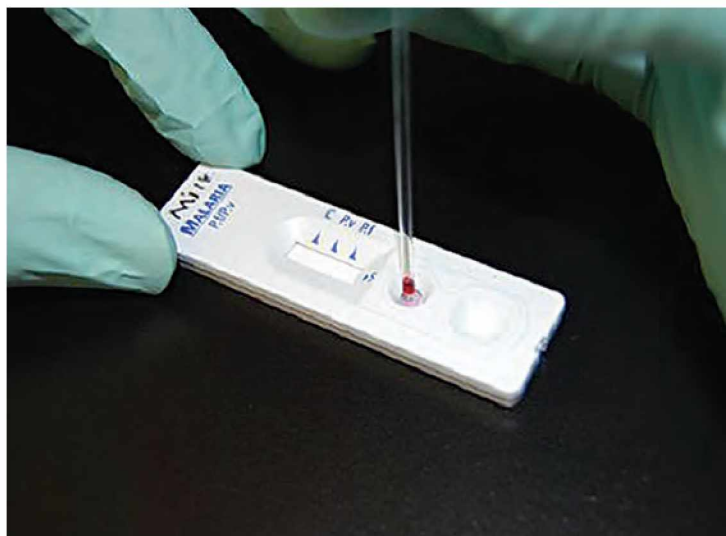
Strengthening and expanding national laboratory systems

Following the earthquake, laboratory scientists were left without both laboratory space and microscopes to perform necessary cultures, confirmatory tests, and strain identification. Medical professionals, without access to lab tests, could not provide appropriate care.

To address the diagnostic needs for TB, CDC provided funding and technical expertise to build a new lab space within Haiti's National Public Health Laboratory. CDC laboratory

subject matter experts also provided training to lab staff for bio-safety, culture, and drug susceptibility testing. Such action was important to address Haiti's TB incidence rate, the highest in the Western Hemisphere.

To address the diagnostic needs for malaria, CDC procured 5,000 rapid diagnostic tests and, in collaboration with the MOH, distributed the test kits and provided training to partners. After an assessment demonstrated the test kit's high performance and ease of use in resource-limited settings, the national policy was amended to include the three top performing test kits for malaria diagnostics. CDC subsequently procured 130,000 rapid diagnostic test kits which will be piloted in 90 facilities in 2012.



Cholera Treatment: CDC Efforts Save 7,000 Lives

One of the largest recent cholera epidemics to affect a single country began in Haiti in October 2010; just 10 months after the devastating earthquake had struck. Within a month, cholera had spread throughout Haiti and cases were being reported by its shared island neighbor, the Dominican Republic.

HSRO and partner program staff from across CDC responded beginning on the day of cholera detection. In partnership with colleagues from the Haiti MOH and the International Centre for Diarrheal Disease Research in Bangladesh, CDC developed education materials and a training course for the clinical management of cholera that reached over 500 clinical staff across Haiti's ten departments through a cascading training approach. In addition, CDC developed a training manual (in French, Creole and English) on cholera education and prevention for community health workers (CHWs), the backbone of the medical workforce in rural Haiti. CDC and the Haiti Ministry of Health conducted a training course for master trainers from all 10 departments, who subsequently trained more than 1,000 CHWs using the CDC cholera materials. CDC also coordinated resources and worked with partners to establish and support cholera treatment facilities throughout Haiti. As of December 2011, CDC was supporting 17 cholera treatment centers, 25 cholera treatment units, and 485 oral rehydration points. CDC also provided technical assistance to the MOH to establish and implement a cholera surveillance system to monitor the spread of disease and treatment efficacy. By reducing the mortality from 3-4% during the initial weeks of the outbreak to below the international target of 1%, these efforts are estimated to have saved more than 7,000 lives in the first year of the Haiti outbreak.

One year after the initial outbreak:

- Total cholera cases: 485,092
- Hospitalized cases: 259,549
- Total deaths: 6,712

Appendix A: Table of GDD Accomplishments: 2011 and Cumulative

This table contains summary statistics for each of the GDD Regional Center activities for 2011 as well as cumulative statistics covering 2006-2011. The shaded boxes reflect fields not applicable to the corresponding statistics.

	2011	2011 Percents	Cumulative Total 2006-2011	Cumulative Percents
Outbreak Response	Total number of outbreak responses	242	911	
	Number of outbreaks in which response time was within 24 hours [†]	195	585	77%
	Number of outbreaks in which epidemiological activities helped identify risk factors to control the outbreak [†]	170	439	57%
	Number of outbreak responses that achieved measurable health impact (saving lives, prevention of disease spread, or policy change)	85	345	45%
	Number of outbreak responses in which GDD lab support was provided	204	541	59%
	Number of outbreaks in which GDD lab support provided pathogen confirmation	195	481	89%
	Number of outbreaks in which communication support was provided [†]	125	344	45%
	Number of responses that included support to other countries*	71	222	38%
	Number of outbreaks that involved CDC headquarters support**†	21	131	17%
	Number of outbreaks that involved WHO or Global Outbreak Alert and Response Network (GOARN) partners**†	49	114	15%
Pathogen Discovery	Total number of new pathogens detected	12	66	
	Number of pathogens new to the region	7	53	80%
	Number of pathogens new to the world	4	10	15%
	Number of new modes of transmission	1	4	6%
	Number of pathogen-specific tests available in-country	17	202	
Training	Total number of participants in short-term public health training	15,171	64,946	
	Number of Field Epidemiology (and Laboratory) Training Program (FE(L)TP) graduates	74	376	
	Number of FE(L)TP graduates in public health positions within country	530		
Surveillance	Total population under surveillance for pneumonia	5,600,000		
	Total population under surveillance for other diseases and syndromes	72,455,166		
	Total number of other diseases and syndromes under surveillance	13		

* Also contributes to "Networking" activity area

† Indicator was not collected for all years. The denominator for these percentages are based on the number of outbreaks conducted during the years that indicator was collected, and not the total number of outbreaks from 2006-2010.

“ Supporting global health is good for Americans’ health. It’s good for Americans’ health because stopping epidemics and environmental and other threats to health overseas and foreign countries before they spread to our shores is not only the most ethical, but also the cheapest and most effective way to protect Americans.”

– Dr. Thomas R. Frieden, Director of the CDC. November 22nd, 2011.
Remarks at the UN Foundation Dinner

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Publication date: AUGUST 2012