

GLOBAL DISEASE DETECTION PROGRAM



2009
Monitoring & Evaluation Report



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Dear Colleagues:

The Global Disease Detection (GDD) program of the Centers for Disease Control and Prevention (CDC) was established in 2004 to rapidly detect and contain emerging health threats. Through our work with the World Health Organization (WHO) and host countries, CDC has made measurable progress toward building global public health capacity in support of the International Health Regulations (IHR). During 2009, the program realized notable achievements, which are highlighted in this most recent Monitoring and Evaluation Report.

CDC experienced challenges and opportunities in 2009. The 2009 H1N1 influenza (H1N1) pandemic served as a reminder that emerging infectious disease threats remain a reality, despite the progress that has been made in global public health. It also highlighted the value of existing global health networks in responding to emerging health threats; CDC and many health partners around the world were able to quickly mobilize as part of the global response efforts. GDD's contributions to the response are highlighted throughout this report.

Congress appropriated funding for an additional site in 2009. After a competitive process, Delhi, India, was selected as the location for a seventh GDD Regional Center. The additional GDD Center represents an important step forward in achieving the long-term goal of global health security through our contribution and eventual establishment of 18 GDD Regional Centers. It also enhances the geographic coverage of the GDD program and further strengthens global public health capacity-building activities, particularly in the South Asia Region. CDC is working with its counterparts in India to establish the Regional Center and begin initial activities as part of this collaboration.

In December 2009, CDC's Division of Global Disease Detection and Emergency Response was officially designated by WHO as a Collaborating Center for Implementation of the International Health Regulations National Surveillance and Response Capacity. The tenure will be effective through 2013, and marks a significant step for the program. As a WHO Collaborating Center, GDD will coordinate a full range of expertise and resources in each of the WHO regions and build national core capacities to meet the minimal IHR requirements in surveillance and response.

The 2009 GDD Monitoring and Evaluation Report highlights the collective achievements of the GDD Regional Centers, other CDC programs, and partners in building global public health capacity. I hope you will enjoy reading and learning about these activities and accomplishments.

Scott F. Dowell, MD, MPH
Director, Division of Global Disease Detection and Emergency Response
Center for Global Health
Centers for Disease Control and Prevention

Global Disease Detection Program

GDD is CDC's principal and most visible program for developing and strengthening global public health capacity to rapidly identify and contain disease threats from around the world. The program comprises both field-based and CDC headquarters components.

GDD Regional Centers

A central focus of GDD is establishing and expanding GDD Regional Centers that build broad-based public health capacity in support of the IHR. CDC currently operates seven GDD Regional Centers (see map on page 5) at varying levels of capacity. GDD Regional Centers work with the host country and within the region to develop six core capacities (see appendix for detailed descriptions):

- Emerging infectious disease detection and response
- Training in field epidemiology and laboratory methods
- Pandemic influenza preparedness and response
- Zoonotic disease research and containment at the human-animal interface
- Health communication and information technology
- Laboratory systems and biosafety

Technical Support Corps

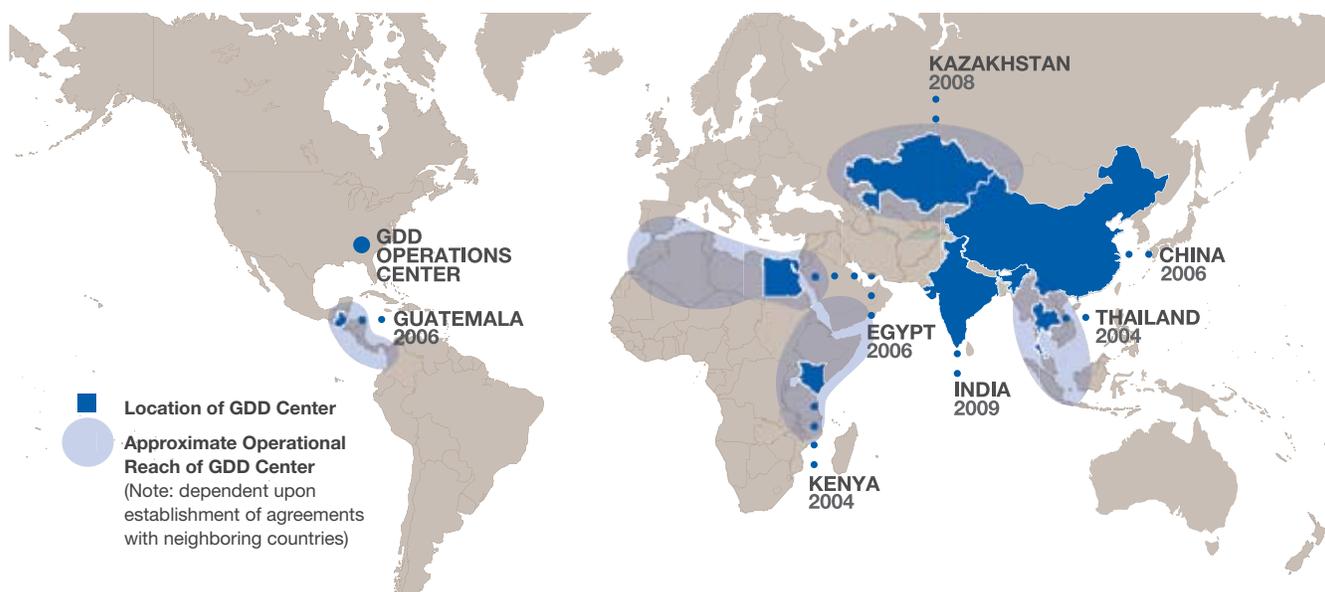
CDC is one of the world's leading public health agencies and the only U.S. government agency that can rapidly access the in-depth scientific expertise required to respond to complex disease outbreaks. GDD provides tactical support through its Technical Support Corps, a cadre of scientists based at CDC headquarters who provide 24/7 direct support to GDD Regional Centers and facilitate aid to the field in prolonged or complex emergencies. In 2009, 14 Technical Support Corps members collectively possess a range of expertise in each of the GDD core capacities listed above.

GDD Operations Center

The GDD Operations Center is an innovative epidemic intelligence and response operations unit located at CDC headquarters. It uses nontraditional surveillance methods to provide early warning about international disease threats so CDC can respond rapidly to protect public health in the United States and the global community. The unit is staffed with experts in infectious diseases, veterinary medicine, medical microbiology, epidemiology, and information technology, and an emergency coordinator to facilitate deployment of international teams.

H1N1 Highlight

GDD provided over \$16 million to 10 countries to develop and enhance infrastructure in support of the global response to the 2009 H1N1 influenza pandemic.



Site Selection Process for GDD Regional Centers:

Placement of a new GDD Regional Center is carefully determined by consulting with potential host countries, internal experts, and national and international partners, using five criteria:

- **Public health significance:** The country has a high population density, history of infectious diseases, or expected potential for emerging diseases
- **Country commitment:** The country supports and values partnership with CDC and will actively engage in collaborative activities and identify new partners
- **Established CDC presence in-country:** The country has an established, effective working relationship with CDC and supports CDC staff in-country
- **Regional reach:** The country has the infrastructure and regional stature to serve as a regional resource or is already acting as a regional leader in other arenas
- **International partner presence in-country:** The country has partnerships with other U.S. government agencies and international partners operating in-country

Site Selection in Action:

India was selected as the site of the seventh Regional Center in August 2009, ending a thorough selection process that started in April 2009 with an initial list of proposed countries. A panel of CDC experts used the selection criteria to identify, assess, and narrow a list of countries that indicated their interest in placement of a new Center. GDD then contacted CDC staff, ambassadors, and other relevant government health agencies operating in these countries for input. After site visits were conducted with the top two candidates, India was selected as the seventh GDD Regional Center. A Memorandum of Intent was signed on November 24, 2009, to officially recognize the selection and establish areas of collaboration.

President Obama and Prime Minister Singh, on November 24, 2009, noted that “the two countries plan to establish a Regional Global Disease Detection Center in India and to build a partnership with the U.S. Centers for Disease Control and Prevention.”

GDD Monitoring and Evaluation

Beginning in 2006, GDD developed and implemented a comprehensive monitoring and evaluation framework to measure progress in building capacity to rapidly detect and contain emerging disease threats. As of 2009, GDD monitors and evaluates capabilities and progress on a quarterly basis using a framework that includes both quantitative and qualitative information on five key activities:

- **Outbreak Response:** Improve the timeliness and reliability of outbreak investigations and responses
- **Pathogen Discovery:** Advance public health knowledge through innovative research into the epidemiology and biology of emerging infections and identify novel threats before they spread
- **Training:** Build capacity and improve the quality of epidemiology and laboratory science through training
- **Surveillance:** Strengthen surveillance systems capable of detecting, assessing, and monitoring the occurrence and public health significance of infectious disease threats
- **Networking:** Enhance collaboration through shared resources and synergy

The GDD activities directly or indirectly contribute to the core capacities outlined in the IHR. For a visual representation, see the table below.

GDD Activities and IHR Core Capacities

Key		GDD Activities				
		Outbreak Response	Pathogen Discovery	Training	Surveillance	Networking
International Health Regulations Core Capacities	Legislation, Policy, and Financing	Indirect GDD Contribution		Indirect GDD Contribution	Indirect GDD Contribution	
	Coordination	Indirect GDD Contribution		Direct GDD Contribution		Direct GDD Contribution
	Surveillance*	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution
	Response*	Direct GDD Contribution	Indirect GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution
	Preparedness	Direct GDD Contribution	Indirect GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution
	Risk Communication	Direct GDD Contribution		Direct GDD Contribution	Indirect GDD Contribution	Direct GDD Contribution
	Human Resource Capacity	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution
	Laboratory	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution	Direct GDD Contribution

* In December 2009, CDC's Division of Global Disease Detection and Emergency Response was officially designated by WHO as a Collaborating Center for Implementation of the International Health Regulations National Surveillance and Response Capacity.

Summary of GDD Accomplishments: 2009 and Cumulative

This table contains summary statistics for each of the GDD activities for 2009 as well as cumulative statistics for all years of monitoring and evaluation data (2006-2009)

		2009	2009 Percents	Cumulative Total 2006-2009	Cumulative Percents
Outbreak Response	Total number of outbreak responses	162		505	
	Number of outbreaks in which response time was within 24 hours	113	70%	276	55%
	Number of outbreaks in which GDD lab support was provided	121	75%	205	41%
	Number of outbreaks for which GDD lab support provided pathogen confirmation	110	91%	175	85%
	Number of outbreaks for which communication support was provided	81	50%	113	22%
	Number of responses that included support to other countries*	30	19%	112	22%
	Number of outbreaks that involved CDC headquarters*	51	31%	83	16%
	Number of outbreaks that involved WHO or Global Outbreak Alert and Response Network (GOARN) partners*	25	15%	52	10%
	Number of outbreaks in which epidemiological activities helped identify risk factors to control the outbreak	83	51%	146	29%
	Number of outbreaks that achieved measurable health impact (saving lives, prevention of disease spread, or policy change)	101	62%	167	33%
Pathogen Discovery	Total number of new pathogens detected	13		49	
	Number of pathogens new to the region	12	92%	43	88%
	Number of pathogens new to the world	1	8%	4	8%
	Number of pathogens with a new mode of transmission	0	0%	2	4%
	Number of pathogen-specific tests available in-country	85		154	
Training	Total number of participants in short-term public health training	15,396		37,132	
	Number of Field Epidemiology Training Program (FETP) graduates	59		225	
	Number of FETP graduates in public health positions within country	350		896	
Surveillance	Total population under surveillance for pneumonia	5.5M		5.5M	
	Total population under surveillance for other syndromes	2.5M		2.5M	
	Total number of syndromes under surveillance	19		19	
*Also contributes to "Networking" activities					

Activities

Outbreak Response

Pathogen Discovery

Training

Surveillance

Networking





OUTBREAK RESPONSE

GDD Responds to the 2009 H1N1 Influenza Pandemic

Beginning in early April, when CDC analysts received the first reports of unusual outbreaks of pneumonia in parts of Mexico, experts across the agency monitored the irregularity. Over the following months, GDD's network tracked, connected, and analyzed vital clues that helped guide effective global response to the novel strain of influenza, known as 2009 H1N1 influenza.

At the height of the outbreak, CDC staff assigned to more than 50 countries, including GDD countries with extensive regional coverage, provided daily reports on global influenza trends. These staff offered clues and connections that helped CDC and the United States government make decisions.

The GDD Regional Center in China worked together with the China CDC and country partners, to focus detection, training, and mitigation efforts on the most important port cities. The China influenza surveillance network grew exponentially in a matter of months from 197 to 556 sentinel hospitals sites and from 63 to 411 laboratories.

The GDD Regional Center in Kenya enhanced outbreak response capacity through documenting spread, impact, and transmission of H1N1. In three months, the number of sentinel sites to monitor transmission throughout Kenya increased from 10 to 27, enhanced by H1N1 trainings for over 1,200 healthcare workers in six provinces.

The GDD Regional Center in Kazakhstan provided consultation to Ministries of Health and led a regional effort to acquire and distribute H1N1 test kits from CDC Atlanta, followed by regional training with the assistance of the U.S. Naval Medical Research Unit No. 3 (NAMRU-3).

The GDD Regional Center in Egypt helped develop a surveillance system for the Hajj (annual pilgrimage to Mecca that draws millions), examining influenza-like illness and severe acute respiratory illness (SARI), and in conjunction with NAMRU-3's Virology Program, conducted laboratory training on H1N1 diagnostics for 30 countries from the Middle East and North Africa.

The GDD Regional Center in Thailand utilized data from an ongoing Household Influenza Transmission Study (see story on page 23) examining secondary infection rates in children with influenza to help inform pandemic control measures and assess rapid point of care testing for early detection of the H1N1 virus.

The GDD Regional Center in Guatemala coordinated its response efforts with regional partners as highlighted in the story on page 11.

The GDD Operations Center in Atlanta deployed responders and supported the GOARN as described in the H1N1 Highlight on page 27.

Outbreak Response

GDD Regional Centers participate in outbreak response activities at the invitation of the Ministry of Health by providing technical assistance, epidemiology expertise, laboratory support, and health communications support. In addition, GDD Centers can call upon the scientific experts at CDC headquarters when additional assistance, such as specialized laboratory testing or field deployment, is needed.

Accomplishments in 2009

GDD Regional Centers assisted in 162 outbreak investigations and other public health emergencies including H1N1 (all GDD Centers); Hand, Foot, & Mouth Disease and *Salmonella enteritidis* (China); human H5N1 influenza and Q Fever (Egypt, see story on page 13); Dengue, respiratory syncytial virus, and febrile encephalitis (Guatemala); anthrax, typhoid fever, and Crimean-Congo hemorrhagic fever (Kazakhstan); viral hemorrhagic fever, cholera, and polio (Kenya), and meningococemia and tuberculosis (Thailand).

GDD helps build national and regional capacity. In 2009, outbreak responses:

Were Faster

- 70% received a response within 24 hours of the request

Were More Comprehensive

- 75% involved lab support, and of these, 91% led to a confirmed cause
- 50% involved communications support
- 31% involved CDC headquarters support
- 19% occurred in other countries of the region

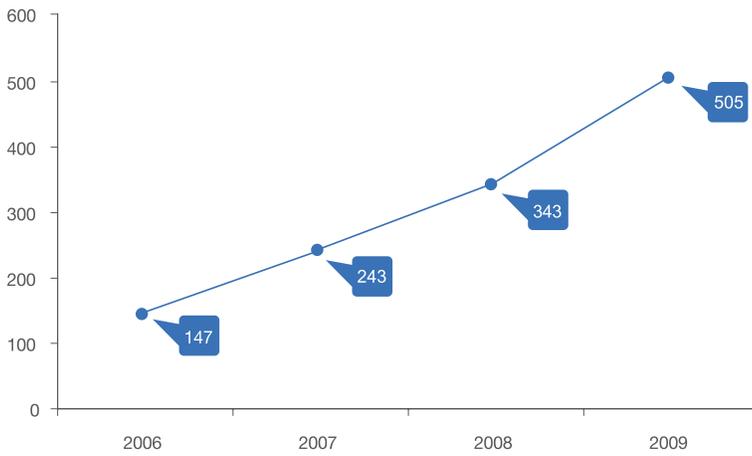
Achieved Greater Health Impact

- 62% led to saving lives, prevented disease spread, or resulted in policy change

H1N1 Highlight

GDD Regional Centers participated in 32 outbreak investigations in 13 countries related to H1N1.

Cumulative Number of Outbreak Responses 2006 - 2009



GDD Guatemala: Regional Coordination in Response to the 2009 H1N1 Influenza Pandemic

The GDD Regional Center in Guatemala, covering eight countries, was at the center of the initial response. Costa Rica, providing some of the first critical evidence the virus had migrated south of Mexico, was supplied with laboratory diagnostic supplies through CDC's Influenza Division to enhance detection of unsubtypable strains. Assistance was provided to the Guatemalan National Laboratory to process all H1N1 tests from May to August until the laboratory developed the capacity to process its own samples on equipment purchased and donated by CDC. In partnership with the Pan American Health Organization (PAHO) and Ministries of Health, the collaborative efforts of the Center helped increase diagnostic capability for the virus from three to seven countries in four months—leaving long-term diagnostic capability in place.

In addition, the Center supported the critical need for rapid and open sharing of H1N1 information and communication throughout the region by building a web-based platform to track regional surveillance information and conducting regional communication training at the request of Ministries of Health.



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PATHOGEN DISCOVERY

Q fever Discovered in Baku, Azerbaijan

Laboratory testing at the GDD center at NAMRU-3 in Egypt recently revealed the presence of Q fever, a highly infectious respiratory disease, in Baku, Azerbaijan. The disease was not thought to be prevalent in urban populations, so the in-country study team quickly alerted health officials. This discovery was made through an ongoing surveillance study conducted in collaboration with the Walter Reed Army Institute of Research and United States Army Medical Research Institute for Infectious Diseases. The study consists of teams of physicians and nurses who conduct interviews and collect blood samples in Baku outpatient clinics and, when necessary, in patient homes. These samples are then tested to determine the prevalence of antibodies indicating previous exposure to infections including Q fever, typhoid fever, hepatitis A, West Nile, brucellosis, and leptospirosis. The results are cross-checked against patient medical histories to identify potential risk factors associated with these infections. As a result of this study, local capacity in epidemiologic research, data analysis, and laboratory study has increased, and physicians are becoming more aware of Q fever and are able to identify cases earlier and prevent spread of the disease.

Pathogen Discovery

GDD Regional Centers are working to identify new pathogens (in the region or world, or with new modes of transmission) and develop testing capacity that enables more rapid confirmation of emerging health threats and quicker implementation of appropriate response interventions.

Accomplishments in 2009

GDD Regional Centers:

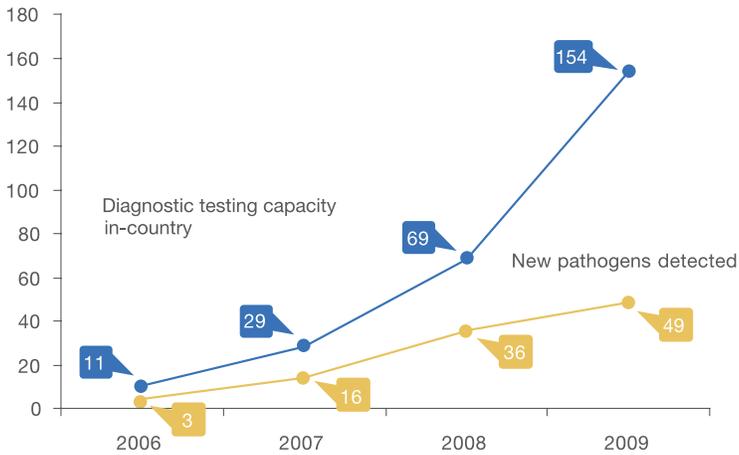
- Detected thirteen pathogens that were new to the region
- Discovered one pathogen that was new to the world (see table on page 15)
- More than doubled in-country testing capacity since 2008: GDD Centers have helped build capacity for 85 pathogen-specific tests (see graph on page 15)

H1N1 Highlight

GDD Regional Centers contributed to bringing advanced testing capacity for 2009 H1N1 influenza to 52 countries.



Cumulative Number of New Pathogens Detected and Testing Capacity, 2006 - 2009



Pathogens Detected, 2009

GDD Center	Pathogen Name	New to
5 Centers	2009 H1N1 influenza	Region*
Egypt	<i>Coxiella Burnetii</i>	Region (detected in Azerbaijan)
Guatemala	Multi drug-resistant <i>Shigella</i>	Region
Kenya	Nodavirus	World
Kenya	<i>Legionella pneumophila</i>	Region
Kenya	<i>Rickettsia felis</i>	Region
Thailand	<i>Legionella longbeacheae</i>	Region
Thailand	<i>Salmonella enterica</i> Stanley	Region
Thailand	<i>Salmonella enterica</i> Weltevreden	Region

* Afghanistan, Djibouti, Egypt, Ethiopia, Guatemala, Kuwait, Kazakhstan, Kenya, Kyrgyzstan, Lebanon, Tanzania, Thailand

Global Impact in Rural Kenya

New viruses can enter the human population with devastating effects. This is especially true when an unknown infectious disease occurs in a country that lacks a strong health system and communication infrastructure. Kenya, a country that has struggled to attain basic health services, has made significant progress in attaining measurable laboratory capacity.

In 2009, the steady transfer of diagnostic capacity in Kenya reached a new marker—detection of a pathogen, *Rickettsia felis*, previously unknown in this semi-arid North Eastern region, at a remote provincial hospital. Through samples taken at the hospital to determine potential causes of nonmalaria acute febrile illnesses, researchers detected the new pathogen, contracted from fleas and ticks, with potentially life-threatening effect. Not much has been known about this disease, and findings could sensitize clinicians both in Kenya and in other countries, to the possibility and severity of infection.



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TRAINING

Regional Training by GDD Egypt

Disease outbreaks are rarely simple or straightforward. Tackling these problems often requires experts from multiple scientific disciplines to respond in concert, working together to contain and mitigate the health threat. That is why scientists at the GDD Center in Egypt, in collaboration with the U.S. Department of State, developed a comprehensive two-week integrated public health training workshop for epidemiologists and laboratorians.

This course, pilot-tested in Cairo in March 2009 with an audience of 57 international epidemiologists and laboratorians from Egypt, Sudan, Morocco, Libya, Jordan, Afghanistan, and Djibouti, addresses the basics of epidemiology, biosafety, infection control, and laboratory science. To promote integration and also allow for in-depth learning, the workshop was divided into joint lectures (general sessions attended by both epidemiologists and laboratorians aimed at bringing each group to a basic knowledge level) and specialized seminars (smaller sessions during which participants were divided by area of expertise to receive more in-depth and practical instruction). Each week concluded with an outbreak investigation case study allowing participants to employ their scientific skills and emphasizing the importance of an integrated epidemiologic and laboratory approach to public health.

Due to its success, this model was replicated and conducted in Aman, Jordan, for a group of 42 Iraqi/Kurdish scientists. Future training is planned in the region.

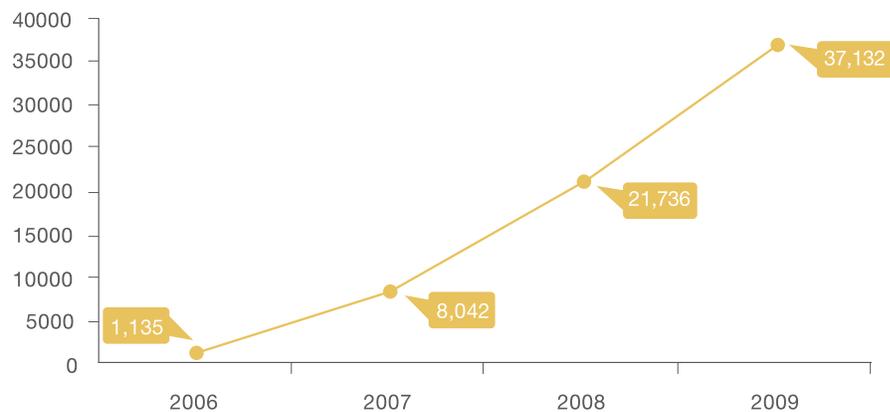
Training

GDD Regional Centers strengthen in-country and regional public health capacity for outbreak detection and response through short-term, classroom-based instruction and more rigorous, in-depth instruction and training of senior epidemiologists through the Field Epidemiology Training Program (FETP).

Accomplishments in 2009

- Fifty-nine senior epidemiologists and laboratorians graduated from FETP at GDD Centers (see graph on page 19).
- A majority of these epidemiologists remain in public health positions in their country after completion of the training program.
- More than 15,000 persons participated in short-term public health training (see graphs below). Instruction included a combination of advanced training for senior public health staff and introductory training for those with limited public health experience.

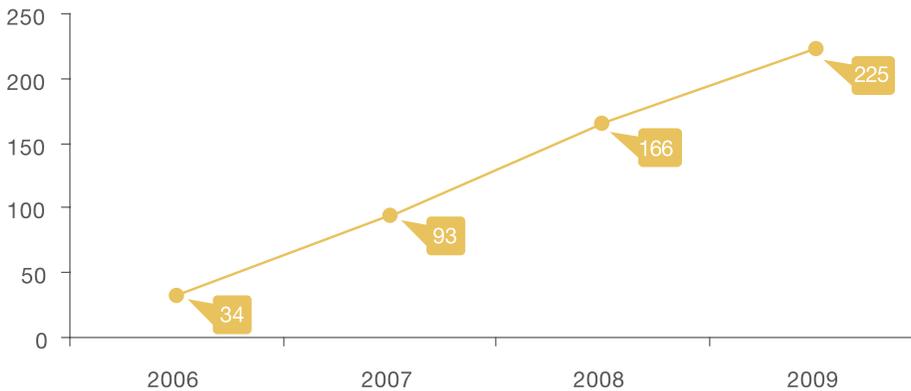
Cumulative Number of Training Participants, 2006–2009



Number of Participants Trained by Topic†, 2009



Cumulative Number of Senior Epidemiologists (FETP), 2006–2009



Building Influenza Testing Capacity in Central Asia

Being prepared for a pandemic disease requires many things, beginning with the ability to recognize the disease when it appears. This capacity was missing when avian influenza A (H5N1) was first recognized in Kazakhstan in 2005. At that time, no laboratory in Central Asia could accurately diagnose H5N1 and the tests used for influenza were classical methods that, while inexpensive and easy to perform, were insensitive, missing up to 50% of infections. To increase the sensitivity and accuracy of influenza diagnosis in Central Asia, CDC sent a resident advisor to the region in 2007 to coordinate with other donors the introduction of a newer and better testing technology, real-time polymerase chain reaction (PCR).

By early 2009, two of the five Central Asian republics had both PCR and sentinel surveillance in place. Sentinel clinics collect specimens from persons with acute respiratory disease and send them to a central laboratory for PCR testing. The substantial investment in laboratory equipment, supplies, and training paid off when H1N1 reached the region and the Ministries of Health of Kazakhstan and the Kyrgyz Republic were able to identify and report cases and track the epidemic.

Impact of Enterovirus Outbreak on Treatment Policy Changes in China

In 2008, members of the China Field Epidemiology Training Program (C-FETP) presented data collected during an enterovirus outbreak investigation that showed treatment with steroid hormones or with aminopyrine, an antipyretic drug used to reduce fever and banned in most other countries, had contributed to severe disease and death. As a result of the C-FETP data, the China CDC issued a recommendation in 2009 prohibiting the use of these drugs in treating fever.

Established in 2001, C-FETP, a two-year in-service training program in applied epidemiology, provides hands-on program training for public health leaders while offering epidemiologic services to health authorities in China. Because of the proven value of the C-FETP, the Chinese government is proposing to expand the size and scope of the program.

H1N1 Highlight

In 2009, GDD Regional Centers conducted 46 H1N1-related training sessions for a total of 4,305 participants.

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SURVEILLANCE

Urban Disease Surveillance in Kibera, Kenya

GDD's disease detectives are on the front lines of improving health globally through monitoring and containing disease spread in one of the largest slums in the world, Kibera, located in Nairobi, Kenya. With Personal Digital Assistants (PDAs) in hand, this well-trained workforce fans out every morning and asks standard questions in Swahili to a study group of approximately 25,000 residents to find out who in the household may be experiencing pneumonia, diarrhea, jaundice, and fever.

Through rigorous tracking and analysis of critical information uncovered from this population-based surveillance system, the GDD Center in Kenya identified and monitored cases of cholera, typhoid, and influenza in 2009—successfully containing the outbreaks before widespread contagion. This kind of rigorous surveillance and response requires a state-of-the-art microbiology and immunology laboratory facility, which in Kibera, is located in the heart of the slum and staffed by country nationals.

Surveillance in Kibera is providing global decision makers with the clues to predict, observe, and minimize the harm caused by outbreak, epidemic, and pandemic situations in one of the most crowded areas in the world. The use of PDAs has resulted in higher quality data that can be rapidly shared to identify risk factors contributing to communicable health threats.

Information is used to advise health practitioners how to better manage sick children and families, linking services and scarce resources to Kenya's most significant health problems. This is the first step to better prevention, treatment policies, and practices not only for Kibera and Kenya, but for the region, continent, and crowded urban populations around the world.

Surveillance

GDD Regional Centers follow a step-wise approach to develop sophisticated surveillance capacity. This begins with an accurate case definition and is followed by population-based surveillance and more sophisticated lab testing. The objective is to accurately define disease burden to influence public health policy that assists in decreasing morbidity and mortality.

Accomplishments in 2009

- 5.5 million persons are under population-based surveillance for pneumonia in five GDD regions
- 2.5 million persons are under population-based surveillance for other syndromes in four GDD regions (see table on page 23)

Epidemiology and Burden of Pneumococcus in Thailand

In Thailand, population-based surveillance for pneumococcal bacteremia among hospitalized persons is laying the groundwork to inform policy discussions related to introduction of pneumococcal conjugate vaccine for children. To accomplish this, the GDD Regional Center in Thailand, with support from the Bill and Melinda Gates Foundation and Johns Hopkins Bloomberg School of Public Health, has worked with the Ministry of Public Health to describe the epidemiology and burden of pneumococcal disease in Thailand. The surveillance system has provided vital data to support this policy decision. Data from this surveillance system has shown disease rates in Thailand are higher than previously thought and equal to disease rates in countries that implement the vaccine. Once they were able to determine the distribution of pneumococcal bacteremia, epidemiologists could calculate the potential impact of the vaccine. Surveillance data has also shown a high burden of disease in adults. Epidemiologists argue that the benefits of vaccinating children are doubled, because doing so helps protect the adult population from the disease.



Household Influenza Transmission Study in Thailand

Research conducted by scientists at the GDD Regional Center in Thailand has revealed important information regarding public health interventions to prevent the spread of influenza to members of the same household. The Household Influenza Transmission Study (HITS) enrolls Bangkok families with children who have laboratory-confirmed influenza infection to determine the effectiveness of hand washing and facemask use to reduce influenza transmission. Of the 499 households enrolled as of October 2009, secondary transmission of influenza occurred in 37% of all households and 18% of all family members.

The results may be due to the fact that most children enrolled in HITS are younger than five years old, a group known to shed high quantities of influenza virus for sometimes prolonged periods. Other factors that may explain the high secondary transmission rates include the poor compliance with facemask use for this age group and the fact that more than 90% of influenza-infected children in the HITS study sleep in the same room as their parents. The findings of this study have significant implications for public health recommendations to prevent the spread of disease during influenza season and will be used to develop future recommendations.



Syndromes Under Population-Based Surveillance at GDD Centers in 2009

- Adenovirus infections
- Bacterial blood stream infections
- Diarrheal disease
- Febrile illness of unknown origins
- Influenza
- Influenza-like illnesses
- Invasive neurological disease
- Jaundice
- Meningitis
- Pneumococcal infections
- Pneumonia
- Respiratory disease
- Respiratory syncytial virus infections
- *Salmonella* and other enteric infections
- Tuberculosis
- West Nile virus infections

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NETWORKING

Solving Mysterious Outbreak Yields New Knowledge

Tracking disease trends and readying teams of experts to investigate outbreaks can save valuable time—especially when diagnosis is difficult and the location remote. Through a network of information and expertise around the globe, the GDD Operations Center is able to rapidly position teams with the right combination of knowledge and logistics to support complex disease outbreaks. In 2009, the GDD Operations Center helped to solve an investigation labeled “mystery illness” in a remote border village straddling Malawi and Mozambique. Through this response, scientists uncovered new clues about the genome *Salmonella* Typhi, a discovery with the potential to save lives through earlier diagnosis and treatment.

On July 15, 2009, the Malawi Ministry of Health sought CDC’s assistance investigating a mysterious and fatal illness that had first surfaced in March in villages along the border of Mozambique. The illness had already affected 115 people and resulted in 14 deaths. Symptoms, including headaches, convulsions, fever, neck pain, abdominal pain, slurred speech, and difficulty walking, could have resulted from a wide range of potential causes. CDC staff in Malawi had alerted the GDD Operations Center about the situation a week earlier, providing lead time to assemble CDC experts in infectious diseases and neurology to nutrition and virology to discuss the case and plan deployment.

Over several months, CDC scientists conducted over 600 tests to rule out many disease agents. All tests were negative, and the cause of the puzzling outbreak remained unclear. Finally, in September 2009, serum specimens from affected patients tested positive for antibodies to *Salmonella* Typhi or typhoid fever. Mitigation efforts continue into 2010, providing critical new knowledge about the unusual presentation of an age old disease, typhoid.



Networking

Rapid detection and response to disease threats anywhere in the world requires a strong network with global reach. In addition to the GDD Regional Centers that work closely with host countries and regional partners, other headquarter-based components play a significant role in working with other international organizations such as WHO and the Global Outbreak Alert and Response Network (GOARN), other U.S. government agencies, and other partners.

GDD Operations Center

Through its surveillance function, the GDD Operations Center is often the first to alert CDC U.S.-based programs or CDC international staff about a disease outbreak. A key source of information about disease events is internet-based media reports, scanned for key words in over 40 languages. To facilitate rapid response, the GDD Operations Center has an outbreak fund to support travel, supplies, and shipping specimens. In 2009, this fund was used to support 14 outbreak responses (including monkeypox, typhoid fever (see story on page 25), cholera, and H1N1) in 11 countries (including the Democratic Republic of Congo, Malawi, Kenya, and Mexico). The Operations Center also serves as CDC's liaison with GOARN, receiving and responding to requests for international assistance to control disease outbreaks.

The GDD Operations Center relies on a global network to identify and confirm disease outbreaks, including:

- CDC subject matter experts in the U.S. and their international networks
- CDC international staff based in more than 50 countries
- WHO staff in more than 140 countries
- Members 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

Building Capacity in the Americas through Regional Networks

The GDD Regional Center for Central America and Panama is located in Guatemala City and covers eight countries—Belize, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The GDD Center is noted for its partnership with all these Central American countries. During 2009, the efforts to strengthen regional surveillance and response capacity were enhanced through the Center's support for the Central American Integration System (SICA) and forging an alliance with SICA's health sector represented by the Council of Ministers of Health of Central America (COMISCA).

The GDD Center's ability to work through a regional network is important in providing technical assistance related to the implementation of the IHR. It is working with the subregional PAHO IHR office in Panama, COMISCA, and the Inter-American Development Bank to strengthen national surveillance and public health laboratory systems and develop a regional surveillance system with shared information on a dozen key diseases. This approach was tested during the first wave of H1N1. The GDD Center's support for a regional network leverages its technical expertise through policies, guidelines, and protocols that can be approved by COMISCA and implemented across the region, thus enhancing regional response to disease outbreaks of international concern.

Training to Control Hospital Infections

Pathogens such as SARS, tuberculosis, and influenza, including H1N1, underscore the importance of respiratory infection control practices in health care settings to prevent the amplification and spread of disease. Unfortunately in many countries, locally adapted training on infection control practices does not exist. GDD Centers in China, Kenya, and Thailand, working with an array of international public health organizations have addressed this need by adapting infection control guidelines from WHO and CDC for the Ministries of Health in their regions. A variety of training has been created to meet the needs of health care providers in both under-resourced and more advanced areas. With GDD's global reach, GDD Centers have been able to bring this important training to 370 participants from 40 countries. In addition, the Guatemala Regional Center is in the process of adapting the curriculum for its regional use.

H1N1 Highlight

Over a four-month period, the GDD Operations Center deployed 67 experts to 12 countries to assist with H1N1 field investigations and sent staff in support of the GOARN team to Mexico, Guatemala, Costa Rica, Argentina and Chile.

Core Capacities of Global Disease Detection (GDD) Regional Centers

GDD Regional Centers are helping to strengthen public health systems and build essential infrastructure in host countries to uphold IHR 2005. The following core capacities were identified by internal and external GDD stakeholders as critical to the development of a country's ability to rapidly identify and control emerging infectious diseases at the source.

Emerging infectious disease detection and response: Identification and response to a wide range of emerging infections (including respiratory syndromes, diarrheal diseases, food-borne illnesses, zoonotic diseases, and others) through integrated disease surveillance, prevention, and control activities.

Training in field epidemiology and laboratory methods: Training for scientists and public health practitioners in field epidemiology and laboratory methods builds and strengthens public health systems and increases their capacity to detect and control emerging infectious diseases.

Pandemic influenza preparedness and response: Influenza viruses, especially highly pathogenic avian influenza, remain the most urgent global infectious disease threat. Develop influenza surveillance capacity—both laboratory and epidemiologic—in host countries, including improving and expanding global surveillance networks, increasing virus isolation and epidemiological data collection through expansion of capacity and increasing timely identification, reporting, and response to outbreaks.

Zoonotic disease investigation and control: Veterinary expertise helps strengthen capacity in detecting and responding to zoonotic diseases and enhance partnerships between the Ministry of Agriculture and the Ministry of Health within host countries. Approximately 60% of recently identified emerging infectious diseases affecting humans are diseases of animal origin. Additionally, 80% of pathogens with a high potential for bioterrorism are zoonoses.

Health communication and information technology: Focused efforts in health communication and technology strengthens communication with affected populations during outbreaks and assures public health responses are culturally, technologically, and scientifically appropriate and disseminated in the most cost-effective, time-sensitive manner possible.

Laboratory systems and biosafety: These ensure appropriate containment facilities, equipment, policies/practices, security precautions, and occupational health programs to encourage working safely with highly pathogenic agents and strengthening laboratory operations by standardizing test procedures, laboratory protocols, and management practices.

CS208439-B

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