

# The Influenza Division International Activities



## Fiscal Year 2009 Annual Report

National Center for Immunization and Respiratory Diseases  
Influenza Division



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## **Acknowledgement**

The U.S. CDC Influenza Division would like to acknowledge the WHO Regional Offices, the National Influenza Centers, and all of our influenza surveillance cooperative agreement partners for their dedication and determination to establish, expand, and maintain seasonal and possible pandemic influenza surveillance locally and globally. Their notable efforts and contributions have significantly increased laboratory and epidemiologic capacity for the world to respond better to pandemic and other emerging infectious disease threats. Their collective effort has contributed to greater global health security.

## **Cover Photo Credit**

Joel M. Montgomery, PhD  
Animals in an open-air market in Peru.

# **The Influenza Division International Activities**

**Fiscal Year 2009 Annual Report**



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# Influenza Division Mission

The Influenza Division provides the scientific and programmatic foundation and leadership for the diagnosis, prevention, and control of influenza domestically and internationally.

In addition, the Influenza Division

- Conducts global and domestic surveillance to guide vaccine formulation and understand the effect of influenza.
- Develops policy for the prevention and control of influenza.
- Conducts state-of-the-art research to better understand the evolution, antigenicity, genetic properties, antiviral susceptibility, transmissibility, pathogenicity, immune response, and other characteristics of influenza viruses in order to develop better tools for preventing and controlling influenza.
- Provides international technical assistance for outbreak investigations, the expansion of laboratory and epidemiologic capacity, and international and domestic training.

## Background

The Influenza Division (formerly the Influenza Branch) has a long history of providing international technical assistance and support to the World Health Organization (WHO) and WHO National Influenza Centers (NICs) to enhance laboratory capacity. Because of limited resources, most support provided internationally was technical in nature and in collaboration with the WHO. For years, most of the technical assistance provided was through hands-on laboratory training of staff in other countries, the annual provision of WHO reagents kits produced and distributed by the U.S. Centers for Disease Control and Prevention (CDC), and technical consultations for vaccine strain selections. In addition, the Influenza Branch conducted epidemiologic research, including vaccine studies and serologic assays, and provided international outbreak investigation assistance.

In 1997, the first human cases of avian influenza A (H5N1) in humans were reported in Hong Kong, and the branch played a key role in assisting with the outbreak investigations. The reemergence of fatal human cases of avian influenza A (H5N1) in China in 2003 following severe acute respiratory syndrome (SARS) led to a growing concern that a pandemic of influenza might soon occur.

In 2004, ongoing outbreaks of avian influenza and human cases of avian influenza in Vietnam and Thailand heightened the concern that a pandemic might emerge. These events fostered the beginning of a larger international program to improve global pandemic preparedness and enhance capacity for laboratory and epidemiologic surveillance of seasonal and avian influenza. The human outbreaks caused by highly pathogenic avian influenza A (H5N1) viruses in 2003 and 2004 highlighted several important gaps that needed to be closed to improve the ability to rapidly identify avian influenza viruses with pandemic potential.

These gaps included

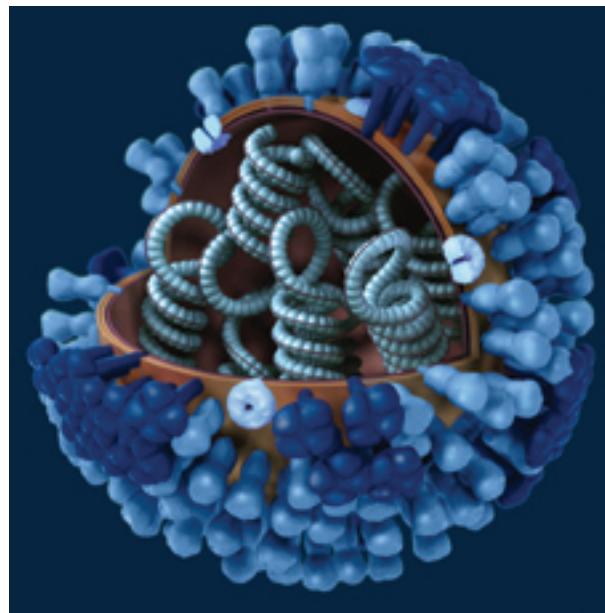
- Conspicuous geographic gaps in human influenza surveillance.
- Critical gaps in information, laboratory and epidemiologic training, and technology transfer for rapid identification and analysis of avian influenza viruses in many affected countries.
- Long-standing obstacles and gaps in sharing information, resources, and specimens between agriculture and human health authorities.

Funding was made available in 2004 to begin to address global deficiencies in pandemic preparedness. The U.S. government (HHS/CDC) committed resources and developed a multifaceted approach to enhance the existing WHO Global Influenza Program (GIP), as well as establish influenza surveillance in countries that did not participate in WHO's GIP by providing training, staffing, direct assistance, supplies and reagents, and technical assistance. The program accomplished key goals by building on existing programs and infrastructure, including the WHO and its regional offices, U.S. CDC's Global Disease Detection (GDD) sites,



International Emerging Infections Program (IEIP) sites, the Department of Defense's international program sites, and by using the assistance of U.S. embassies.

Over the past 5 years, the program has undergone remarkable growth (see maps) and expanded to provide support to more than 40 countries, all WHO regional offices and headquarters, and has developed partnerships with the Department of Defense, the United States Agency for International Development (USAID), Bureau of Engaving and Printing (BEP) Cooperative for Assistance and Relief Everywhere (CARE), and other entities to enhance global surveillance and preparedness. We have placed more than 20 permanent staff (see map) in the field to provide on-the-ground assistance and support to countries and WHO, and to augment the GDD program.



Because different countries have varying needs, the program has been designed as a continuum to include improving surveillance, implementing burden of disease studies to measure the impact of influenza, and enhancing pandemic preparedness. By using data generated by surveillance, each country will be able to determine which populations are most vulnerable to influenza-related morbidity and mortality and, therefore, should receive influenza vaccine. On the basis of surveillance and other analyses, influenza vaccination policy can be formulated, and issues related to vaccine production can be examined in each country and through a regional perspective. By collaborating with WHO, the United States and other countries with influenza vaccination programs can share information on developing vaccination policies and technologies for developing influenza vaccine production. Thus, the resources and efforts to improve influenza surveillance will pay future dividends by aiding in developing vaccine policy, vaccine production, pandemic planning, and preparedness overall.

On April 13, 2009, the first case of 2009 pandemic H1N1 influenza virus infection in the United States was identified. Subsequent cases were quickly identified in Mexico and other countries. The influenza virus identified in these early cases was unique and contained a combination of gene segments that had not been previously reported in animals or humans. As of March 2010, laboratory-confirmed infections with 2009 pandemic H1N1 influenza had been identified in 212 countries and overseas territories and have been associated with more than 15,000 deaths reported worldwide to WHO. The H1N1 pandemic allowed many of the countries that we work with to showcase the progress they have made. First-time investigations of influenza were conducted in response to the pandemic, and laboratories that previously could not identify influenza were able to diagnose pandemic H1N1 by using molecular techniques. Many countries that had not reported influenza routinely before were able then to report consistently and contribute to the global picture of influenza during the pandemic.

Although the response to the H1N1 pandemic was an opportunity to show recent progress, avian influenza H5N1 outbreaks still pose a significant and ongoing global health threat. To sustain the gains made during 2009, a broad-based commitment to build and maintain

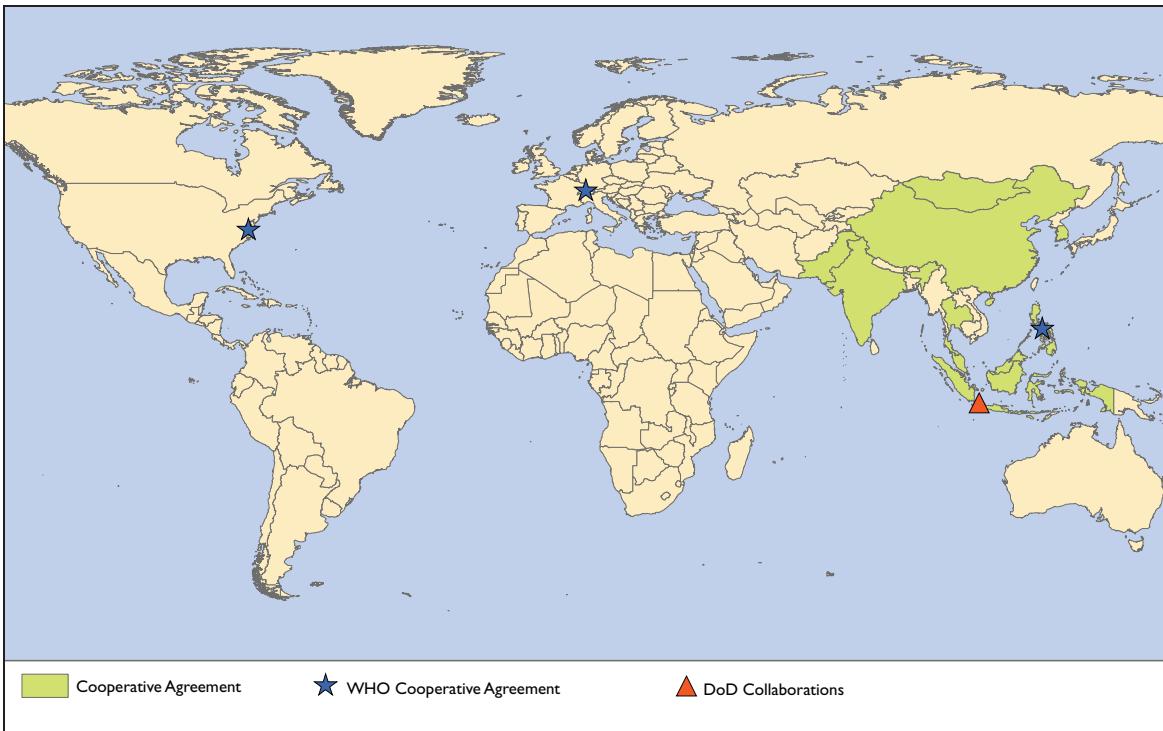
sustainable (and eventually self-sustainable) influenza surveillance globally requires dedicated annualized resources and staffing. It is our hope that these U.S. HHS/CDC resources and technical assistance will act as a catalyst for affected countries, neighboring countries, and donor countries to commit resources to establish long-term influenza surveillance, prevention and control, and pandemic preparedness activities as high priorities. In addition, we envision that each affected country will use the technical assistance and resources available to improve surveillance, develop influenza vaccination policy, plan for the use of influenza vaccine both annually and during a pandemic, and work closely with regional and international partners to further preparedness.

This program has implications beyond influenza. The capacity that is being developed for laboratory and epidemiologic surveillance has served as the basis for the diagnosis and investigation of other infectious diseases. Laboratory equipment and training has enabled the diagnosis and investigation of other diseases. Likewise, by implementing a global rapid response training program, U.S. CDC has trained or provided materials to train thousands of people globally. These courses have enabled the teams trained to participate in outbreaks for the recent pandemic and for many other pathogens, including Rift Valley fever, Ebola, and other respiratory diseases. Evidence shows that the technical assistance provided by the Influenza Division assists countries in increasing their capacity necessary for compliance with the new International Health Regulations (IHR).

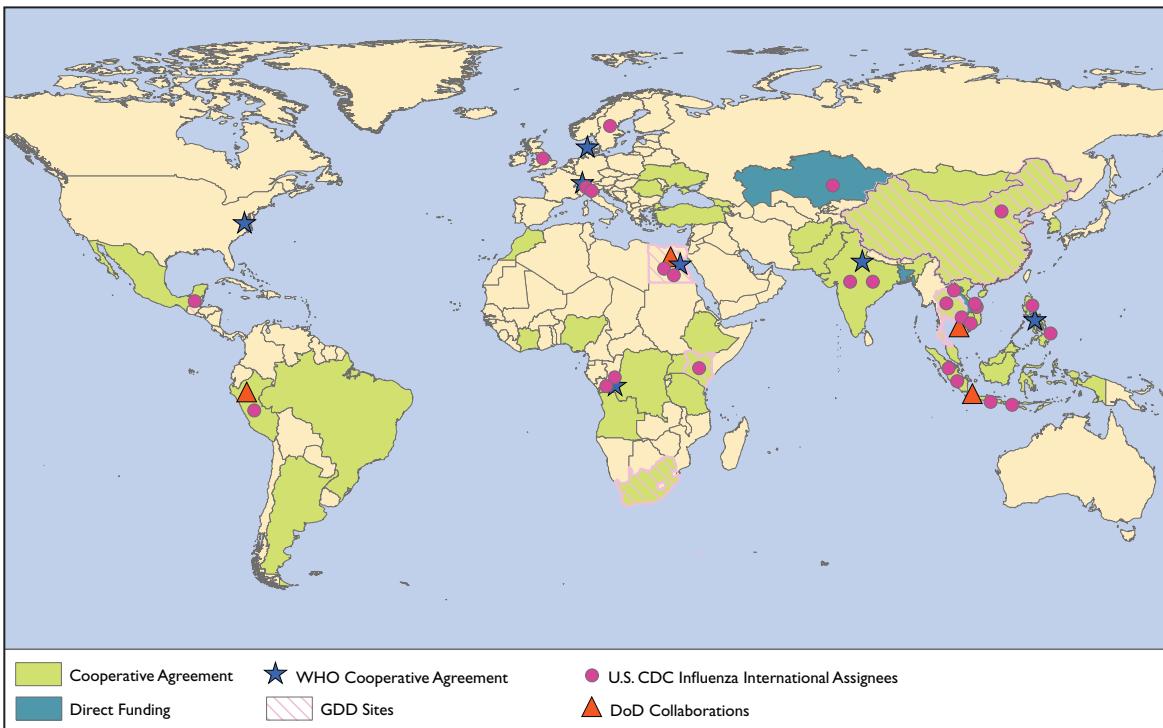
Our generic approach and a focus on seasonal and avian influenza contribute greatly to the global capacity for laboratory, epidemiology, and overall preparedness for emerging and reemerging infectious diseases. The Influenza Division's international program has contributed greatly to global capacity and readiness, but there is still much work to do. This report is the second annual update on the Influenza Division's international activities.



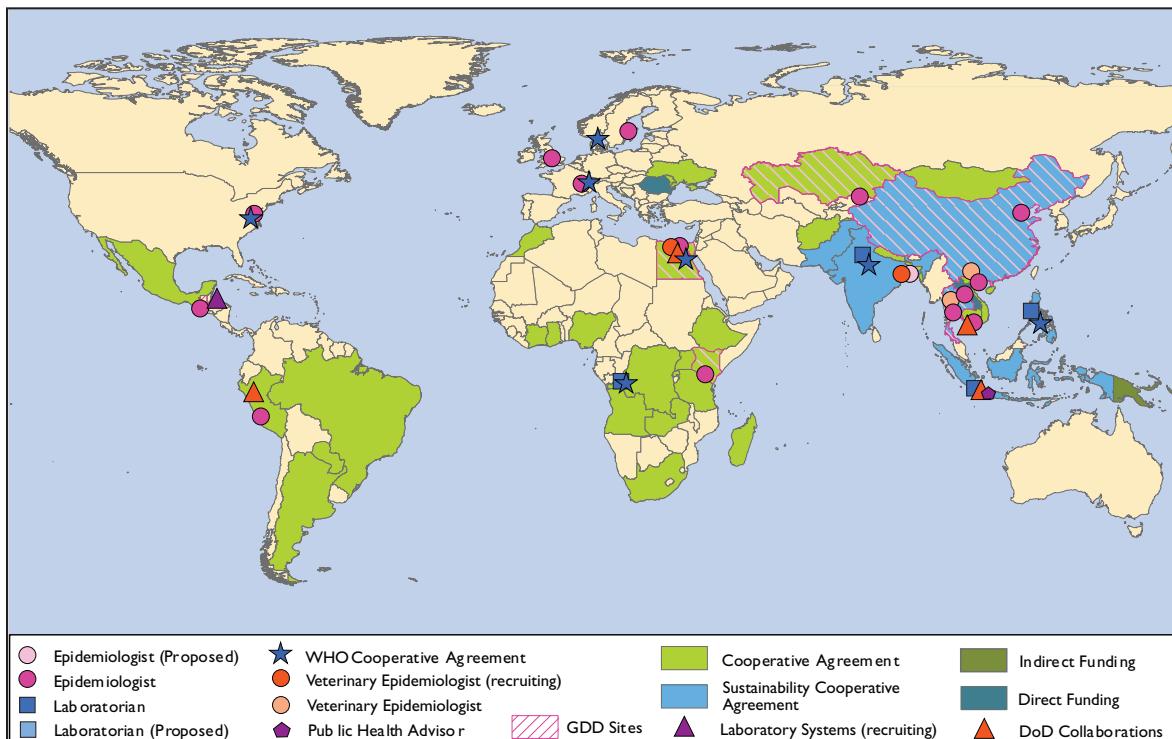
## U.S. CDC International Activities and Support, FY 2004



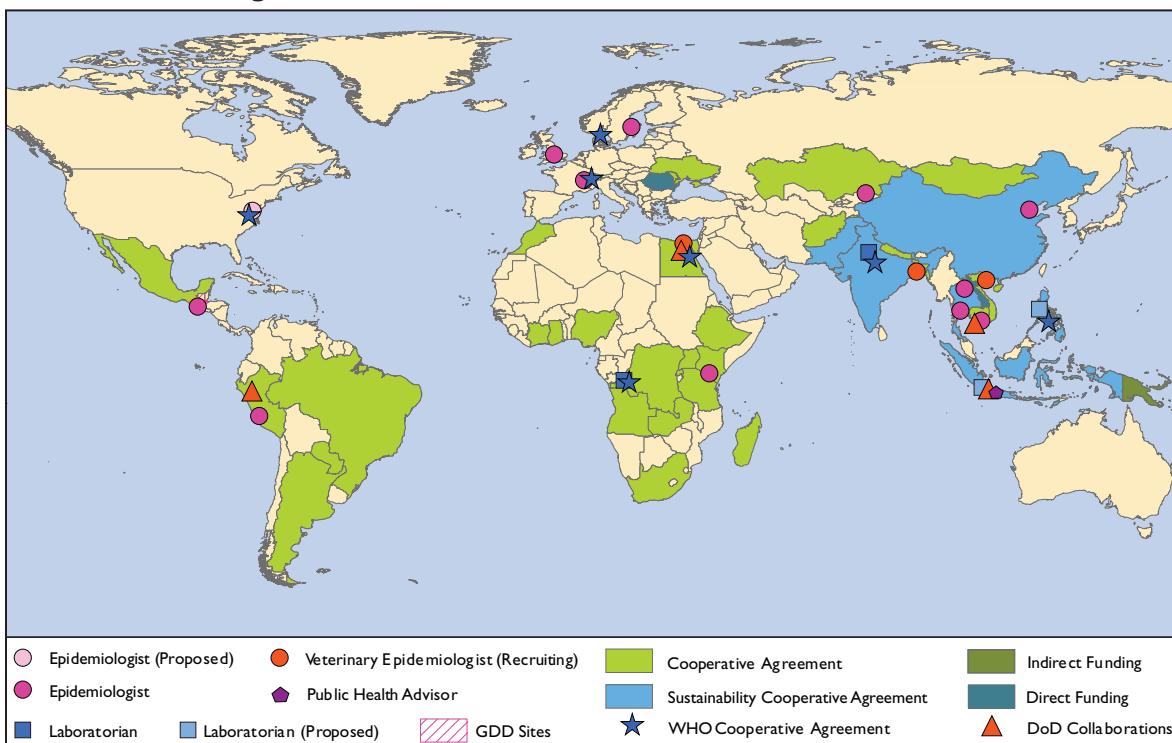
## U.S. CDC International Activities and Support, FY 2007



## U.S. CDC International Activities and Support, FY 2009



## U.S. CDC Field Assignee, FY 2009



# **U.S. CDC and WHO Collaborations—Influenza**

March 2009

The U.S. HHS/CDC Influenza Division has maintained cooperative agreements with WHO headquarters and the PAHO and WPRO regional offices for many years to address seasonal and pandemic influenza. In 2006, new cooperative agreements were put in place with SEARO, AFRO, EMRO, and EURO. The main purpose of the cooperative agreements has been to address global and regional preparedness needs for influenza—seasonal, pandemic, and avian—and to support enhancement of the WHO Global Influenza Surveillance Network. Through these collaborations, standard guidelines for surveillance have been developed and used in many countries and the national disease burden has been estimated. This effort effectively increased the number of countries participating in global influenza surveillance and has enhanced the global and local capacity for early pandemic warning, effective response, and communication. This work helped countries respond to the 2009 H1N1 influenza pandemic.

The U.S. CDC Influenza Division has provided funding and technical support to WHO headquarters in 2009 for multiple projects related to influenza:

- **Influenza Pandemic Preparedness**  
WHO conducted an inventory of 180 nations and distributed a tool kit to support countries in designing and conducting pandemic exercises. WHO pandemic influenza guidance is under revision.
- **Animal-Human Interface Influenza Surveillance**  
A workgroup has been expanded and meets the critically important mandate of improving surveillance and collaboration at the animal-human interface. Environmental surveillance for birds was conducted in Indonesia, Kazakhstan, and Egypt, and pilot tools were developed for risk assessment of human infection. Work has been carried out in multiple countries, and relationships with the Office of International Education (OIE) and the Food and Agriculture Organization (FAO) have been strengthened.
- **Strengthening Influenza Surveillance Nationally and Globally**  
Developing international standards for surveillance is planned. The international standards will integrate seasonal and avian influenza goals, develop educational materials for medical care workers, and integrate epidemiologic and laboratory surveillance. Work to develop pandemic surveillance guidelines has been conducted in collaboration with other international experts.
- **Influenza Surveillance Laboratories**  
A process to look at improving the overall functioning of the Global Influenza Surveillance Network is underway. The process involves an assessment of the evolving needs of the system, which is particularly important given the spread of avian influenza and the emergence of 2009 H1N1 influenza virus. On-site consultations targeted countries in need of support. Critical work to develop a new platform for sharing information is ongoing. Lastly, global case definitions have been developed and published.

- **External Quality Assessment Program (EQAP)**

EQAP is critical to implementing quality assurance/quality control (QA/QC) for RT-PCR, the method of choice for identification of H5 viruses, because of the laboratory biosafety conditions available in most countries (biosafety level 2 [BSL-2]). The objectives are to establish external quality control for the detection of influenza viruses, to monitor quality and standards of performance for NICs, and to promote good laboratory practices. The work with the EQAP has been ongoing and diagnostic QA assessment panels for PCR have been shipped out every 6 months for the past 3 years. An increasing number of countries are participating.

- **Facilitating Early Response and Laboratory Confirmation**

This project addresses issues with the specimen delivery system. Our grant supports a full-time staff member dedicated to facilitating shipments, keeping records, and enhancing the system setup. Preplacement of materials in some regional offices is planned to enhance the timeliness of distributing materials to laboratories worldwide. Virus sharing issues have been ongoing, and much time has been dedicated to platforms for sharing information.

- **Pandemic Influenza Rapid Response and Early Containment**

Work has been ongoing to update and publish new guidelines for containment. These activities strengthen the global pandemic preparedness by outlining standard operating procedures for global partners in the areas of logistics, management and rapid deployment of antiviral drugs, clearances, waivers and licensure of antiviral drugs and nonpharmaceutical interventions in countries, deployment of teams, and other important procedures.

- **Pandemic Risk Communication**

WHO conducted training for representatives from 150 member states in outbreak communication, provided training to journalists to improve quality of outbreak coverage, developed the Outbreak Communication Planning Guidelines, initiated the WHO Global Health Security Network, and supported development of an emergency communication simulation (exercise) tool kit.

- **WHO Biosafety and Laboratory Capacity and Strengthening Programs**

These programs have developed a pilot training tool to use (Train-the-Trainers Manual) as a means for laboratory personnel and their managers to improve biosafety practices around the world. Biosafety training seminars were conducted. The workshops have provided a forum for national health authorities and directors of national, central human and animal laboratories to meet subject matter experts in biosafety and biosecurity, as well as other national authorities from the same region with ongoing experience in these issues.

- **South-East Asia and Western Pacific Pandemic Influenza Stockpile Development**

We have provided continued support for the regional WHO stockpile. The 3 components of this project are

- Establishing an avian and pandemic influenza countermeasure stockpile modeled on commercial pharmaceutical distribution systems.
- Planning the release, shipment, receipt, and distribution of stockpiled materials to countries of SEARO and WPRO.
- Training and exercise drills for member states of SEARO and WPRO for the receipt and distribution of stockpiled materials (distal distribution within national boundaries).

# **Global Disease Detection and the Influenza Division**

The U.S. CDC's Influenza Division and GDD have worked together since 2004 to decrease the threat of future pandemics. Together with partners, they have connected their technical expertise, international presence, and resources to develop an integrated global network to meet GDD's congressional mandate to "...mitigate the consequences of a catastrophic public health event, whether by an intentional act of terrorism, or the natural emergence of a deadly infectious virus...." Congress, 2004.

GDD and the Influenza Division protect the health of Americans and the global community from the spread of infectious disease threats by contributing to a global system of disease protection in support of WHO and the newly revised International Health Regulations (IHR). The goals of this partnership are to

- Establish connected global systems and centers throughout every WHO region in order to detect and respond to new disease threats, including influenza.
- Support a U.S. government response to infectious disease and influenza pandemics.
- Support other countries' responses by decreasing the time it takes to detect, report, and contain or mitigate the spread of infectious disease.

## **U.S. CDC's Global Response to Pandemic 2009 H1N1 Influenza**

Beginning in early April 2009, U.S. CDC analysts received the first reports of unusual outbreaks of pneumonia in parts of Mexico. Within days, the Influenza Division and GDD recruited epidemiology, laboratory, quarantine, communication, logistics, and policy experts from around the agency to join the international team that has become the epicenter of CDC's global response to 2009 H1N1 influenza.

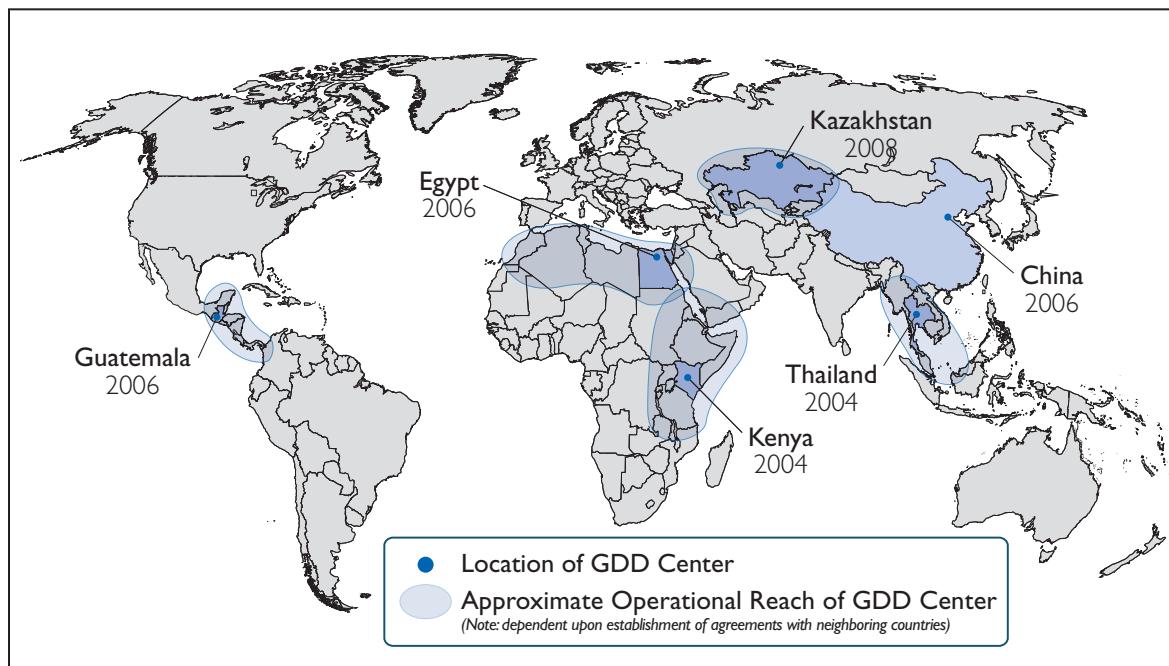
- The U.S. CDC's Influenza Division led the agency's response to the pandemic both domestically and globally with support from experts at U.S. CDC headquarters and in 40 countries in which U.S. CDC supports influenza preparedness.
- The GDD operations center monitored reports of 2009 H1N1 infections and associated deaths, including countries that had not yet officially reported cases to WHO.
- U.S. CDC staff who were assigned to more than 50 countries, including 6 GDD regional centers (one in each WHO region), provided real-time reports on influenza trends in their host countries.

## **GDD Regional Centers**

A central focus of GDD is establishing and expanding GDD regional centers. As a network, GDD regional centers coordinate with local, regional, and global public health entities to rapidly detect, accurately identify, and promptly contain emerging infectious diseases and bioterrorist threats that occur internationally.

During 2004–2009, U.S. CDC launched and developed 6 GDD regional centers, 1 in each of the WHO regions. Regional centers are located in China, Egypt, Kazakhstan, Kenya, Guatemala, and Thailand. In 2009, India was identified as the location for the 7th GDD regional center, and initial activities are underway.

## U.S. CDC-Funded Global Disease Detection Regional Centers



GDD regional centers are selected in consultation with national and international partners. Centers assimilate the on-site expertise of full-time U.S. CDC assignees, Ministry of Health (MOH) staff and partners, and other resources to help the host country and surrounding region increase their own abilities to detect, confirm, and contain public health threats and emergencies of international concern.

The Influenza Division provides support to GDD's outbreak, laboratory, surveillance, training, and risk communication activities, and the division is a vested leader in defining regional center priorities in coordination with MOHs, including policy development. For example, by using data generated from the variety of surveillance systems developed through the National Center for Immunization and Respiratory Diseases (NCIRD) and GDD's collective resources and scientific scope, influenza vaccination was first recommended to Thailand in 2008. Questions about vaccine policy can be approached on a country-by-country and regional basis to determine the populations that are most vulnerable to influenza-related morbidity and mortality and establish evidence-based decisions on who should receive influenza vaccine.



## **GDD Operations Center**

The GDD operations center is located at U.S. CDC's headquarters in Atlanta and is an innovative unit that uses nontraditional surveillance methods to provide early warning about international disease threats. This event-based surveillance system is particularly effective at detecting disease occurrences in countries that have weak surveillance and reporting. Since 2006, the GDD operations center has provided support to more than 30 outbreak responses in 15 countries.

The operations center is often the first to alert CDC U.S.-based programs or CDC international staff about a potential disease abnormality with potential to become a threat to the public's health. Information is collected and analyzed from Internet-based media reports by using sophisticated text-mining and multilingual translation systems and then entered into a custom designed software application that also distributes daily reports to U.S. CDC programs.

The operations center is U.S. CDC's liaison with the Global Outbreak Alert and Response Network (GOARN) to receive and respond to requests for international assistance to control disease outbreaks. In addition, the operations center provides technical support and funds for outbreak response to U.S. CDC programs when host countries and WHO request U.S. assistance.

### **Development of Public Health Capacity**

<b>GDD Centers Core Capacities</b>	<b>U.S. CDC Program Leads</b>
Emerging infectious disease detection response.	IEIP
Training in field epidemiology and laboratory methods.	Field Epidemiology Training Program (FETP)
Pandemic influenza preparedness and response.	Influenza Division
Zoonotic disease research and containment at the human-animal interface.	National Center for Emerging and Zoonotic Infectious Diseases
Health communication and information technology.	Two programs: <ul style="list-style-type: none"><li>• Office of Communication</li><li>• Information Technology Services Office</li></ul>
Laboratory systems and biosafety.	Two programs: <ul style="list-style-type: none"><li>• Division of Laboratory Systems</li><li>• Office of Health and Safety</li></ul>

## **Extending Scientific Expertise**

GDD regional centers integrate and extend the abilities of diverse scientific disciplines and public health programs throughout U.S. CDC that are needed to create systems and solutions to better identify and control public health threats at the source of the problem. GDD is connected to more than 2,500 U.S. CDC experts in more than 50 countries. In addition, GDD provides tactical assistance through its Technical Support Corps, a cadre of technical experts that provide 24-hour, 7-day support to GDD regional centers and can facilitate aid to the field in the case of prolonged or complex emergencies.

Currently, 14 subject matter experts throughout U.S. CDC are funded by GDD. Many are finding new protocols and efficiencies that are beginning to be shared between U.S. CDC programs and GDD centers.

GDD progress represents the collective achievements of the GDD regional centers and other U.S. CDC programs and partners and is reported cumulatively from January 2006 through October 2009.

## **GDD Influenza Activities**

### **Outbreak Response**

- GDD regional centers provided rapid response to more than 436 diseases in 2009.
- Influenza-related infections accounted for 45% of total outbreaks.

### **Surveillance**

- More than 4 million persons are under surveillance for pneumonia and other respiratory diseases, diarrhea, jaundice, febrile illness, and other syndromes.
- In 2009, GDD centers tracked and analyzed all available surveillance data ranging from U.S. CDC's event-based systems, sentinel sites, and population-based cohorts to detect outbreaks for pandemic 2009 H1N1 influenza to evaluate interventions and make policy recommendations.

### **Networking**

Since April 2009, as part of the international response to the pandemic 2009 H1N1 influenza outbreak, U.S. CDC has deployed 67 experts to 12 countries to assist with field investigations, laboratory setup and training, risk communication, mitigation strategies, case definitions, data management, logistics, clinical care, surveillance, and transmission studies.

### **GDD Headquarters Leadership, Atlanta**

Scott Dowell, MD, MPH  
Division Director, Disease Detection and Emergency Response

Ray Arthur, PhD  
Director, GDD Operations Center

Stephanie Griswold, MPH  
GDD Program Manager

### **GDD Regional Center Leadership**

#### ***GDD-Kenya: Established 2004***

Rob Breiman, MD, MPH  
GDD Country Coordinator

Mark Katz, MD  
Influenza Lead

#### ***GDD-Thailand: Established 2004***

Susan Maloney, MD, MPH  
GDD Country Coordinator

Mark Simmerman, MD, MPH  
Influenza Lead

***GDD-China: Established 2006***

Jeff McFarland, MD  
GDD Country Coordinator and Influenza Lead

***GDD-Central America and Panama (CAP): Established 2006***

Isabella Danel, MD, MPH  
GDD Country Coordinator

Nivaldo Linares Pérez, MD, MSc, PhD  
Influenza Lead

***GDD-Egypt: Established 2006***

Erica Dueger, PhD, DVM  
GDD Country Coordinator

Michael Demming, MD, MPH  
Influenza Lead

***GDD-Kazakhstan: Established 2008***

John Moran, MD, MPH  
Influenza Lead

***GDD-India: Selected in 2009***

Renu Lal, PhD  
Acting GDD Country Coordinator and Influenza Lead

For more information, please visit the GDD Web site: [www.cdc.gov/globalhealth/GDD](http://www.cdc.gov/globalhealth/GDD).



# **Africa Regional Office (AFRO)**



# Africa Regional Office (AFRO)



The WHO AFRO coordinates and oversees activities among 46 member states in the AFRO region. In 2006, WHO listed 9 African countries with NICs that could detect influenza viruses and report epidemiologic findings to WHO. Laboratory assessments conducted in 2006 and 2007 by WHO and U.S. CDC determined that only 5 of 9 NICs were active.

The U.S. CDC signed a 5-year cooperative agreement in 2006 to help strengthen avian influenza preparedness and response in the AFRO region. This involves expanding the NIC network to improve both diagnostic and epidemiologic capacities by working toward the following goals:

- Enhancing epidemiologic and virologic surveillance for influenza, including highly pathogenic avian influenza.
- Reinforcing response and containment of avian and pandemic influenza.
- Strengthening preparedness and communication for avian and pandemic influenza.

The U.S. CDC works with AFRO to expand the Global Influenza Surveillance Network (GISN) in the African region. In 2008, AFRO developed guidelines for sentinel site surveillance for influenza and severe acute respiratory infection (SARI) and included surveillance for SARI within the Integrated Disease and Surveillance Response (IDSR) system. AFRO has recommended that all member states report SARI in their weekly reporting activities from the

district level. The states are asked to immediately report unusual SARI cases or clusters and suspected cases of influenza A virus (H5N1) or pandemic 2009 H1N1 influenza.

All countries in the region have been reporting 2009 H1N1 influenza since May 2009. Countries in the western epidemiologic block of AFRO have been reporting human avian influenza cases weekly. As part of the WHO global response to 2009 H1N1 influenza, AFRO disseminated surveillance guidelines for novel influenza to all member states. These countries use U.S. CDC pandemic influenza funds to implement IDSR training, promote reporting of SARI and other notifiable diseases by clinicians, and enhance disease surveillance at international points of entry.

Ten countries in the region (i.e., Angola, Benin, Burkina Faso, Republic of Congo, Gabon, Malawi, Mali, Mozambique, Sierra Leone, and Togo) have begun or are planning to begin influenza testing. CDC pandemic influenza funds have supported the ongoing training of laboratory staff. In addition, workshops have been held on biosafety and laboratory security.

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### **CDC-Kenya Field Staff**

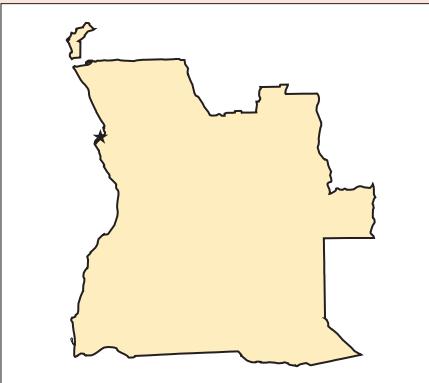
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# African Region

## Angola



- **Capital:** Luanda
- **Area:** 1,246,700 sq km
- **Population:** 13,068,161 (July 2010 est.)
- **Age Structure:** 0–14 years: 43.6% (male 2,760,264/female 2,707,665); 15–64 years: 53.6% (male 3,416,914/female 3,302,552); 65 years or older: 2.7% (male 151,609/female 192,353) (2008 est.)
- **Life Expectancy at Birth:** Total population: 37.92 years; male: 36.99 years; female: 38.9 years (2008 est.)
- **Infant Mortality Rate:** Total: 182.31 deaths/1,000 live births; male: 194.38 deaths/1,000 live births; female: 169.64 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 67.4%; male: 82.9%; female: 54.2% (2001 est.)
- **GDP:** \$114.6 billion (2008 est.)
- **GDP per Capita:** \$9,100 (2008 est.)

### U.S. CDC Direct Country Support

Preparedness and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began FY 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

The National Institute of Public Health (INSP) is the central reference laboratory of the MOH. The INSP led the emergency response role for 2009 H1N1 influenza. The first Angola case was confirmed in September 2009 at the laboratory of the National Institute of Communicable Disease (NICD) in South Africa. U.S. CDC and NICD supported INSP to build the capacity of the laboratory and to provide on-the-job training on molecular biology techniques to diagnose 2009 H1N1 influenza on-site in Angola.

Laboratory consultants from NICD South Africa provided additional support in Angola from October 2005 to October 2009 to test for pandemic and seasonal influenza at the Angola INSP. During this period, the consultants worked with 3 INSP laboratory technicians to test 159 samples; 20 samples were positive for 2009 H1N1 influenza viruses, and 5 samples were positive for seasonal influenza H3N2. To date, 196 samples have been tested, and 36 are confirmed 2009 H1N1 influenza cases. Since 2006, U.S. CDC has supported the INSP laboratory with capacity building, laboratory supplies, and infrastructure upgrades.

## **Surveillance**

Angola has 3 functioning sentinel surveillance sites supported by the avian and pandemic influenza cooperative agreement. The INSP molecular biology laboratory has the capacity to diagnose the influenza viruses by using real-time RT-PCR.

The national influenza surveillance effort in Angola started in October 2008 through intensive on-site training activities with nurses, medical doctors, and laboratory technicians. The health workers were trained at the 3 selected sentinel sites: David Bernardino Pediatric Hospital, Josina Machel Central Hospital, and Uige Provincial Hospital.

In May 2009, active surveillance started in these sentinel sites through SARI case identification and influenza-like illness (ILI) cases in outpatients. A data collection tool was developed by CDC South Africa; it was used by dedicated nurses who worked in the sentinel site facilities. They collected oral and nasal pharyngeal samples and transported them to the INSP, where they were packaged and sent to the South Africa NICD for confirmation during the early phases of surveillance activities. The surveillance system collects both epidemiologic information and laboratory specimens at the sentinel sites in Luanda and Uige provinces.

## **Laboratory**

CDC Angola supports the molecular biology laboratory of INSP with training, laboratory equipment procurement, installation, and maintenance. Reagents and laboratory consumables are furnished to help with influenza surveillance activities. Consistent training of INSP laboratory technicians included hands-on work with molecular techniques, such as real-time RT-PCR for H5N1, 2009 H1N1 influenza, and seasonal influenza. In addition, laboratory standard operating procedures were developed to enhance quality measures.

Laboratory databases, reporting systems, and mechanisms for shipping samples to reference laboratories were established. Ten INSP laboratory technicians received certification training on the shipment of dangerous goods (IATA approved).

## **Preparedness**

Angola has a national preparedness plan that was collaboratively developed and updated with all stakeholders involved in the 2009 H1N1 influenza response.



## **Training**

U.S. CDC funding has sponsored the following trainings:

- Laboratory training of 2 technicians at NICD South Africa on 2009 H1N1 influenza diagnosis in May 2009.
- Specialized training to strengthen the capacity of the pandemic influenza Rapid Response Teams (RRTs). The RRTs were established and trained in Luanda in September 2008; they had 36 participants from the Ministries of Health and Agriculture and the Angola Armed Force. The 36 participants represented 15 of the 18 provinces.
- Twenty participants were trained in influenza sentinel surveillance; 2 hospitals in Luanda were selected as sentinel sites for SARI and ILI cases (Luanda, October 2008). Forty participants participated in on-the-job training at Josina Machel Hospital and David Bernardino Pediatric Hospital (October 2008–May 2009).
- One hundred sixty participants from Uige and Huila provinces, where an additional 2 sentinel sites were identified (October 2009), received training at a workshop.
- Twenty-two provincial ministry of health and agriculture officers were trained in Uige Province in influenza sentinel surveillance (April 2009).
- Seven health workers had on-the-job training at Uige hospital and provincial laboratory to implement SARI and ILI surveillance (August 2009).

## **H1N1 Activities, FY 2009**

- CDC Angola and INSP played active roles in preparedness, communication strategies, and response efforts for outbreaks of public health concerns, such as the 2009 H1N1 influenza epidemic.
- CDC Angola participated in the MOH multidisciplinary technical team that was assisting with the 2009 H1N1 influenza outbreak and offered a workshop for national and international stakeholders, including CDC influenza experts from South Africa.
- INSP laboratory technicians travelled to the South Africa National Institute of Communicable Disease Respiratory Virus Unit to receive training in 2009 H1N1 influenza diagnostic techniques. This collaborative effort supported INSP's expansion of SARI illness and ILI surveillance activities at 3 sentinel sites.

Several trainings were conducted by the INSP and CDC Angola and South Africa:

- Trained 207 health workers in Luanda province on sample collection, preservation, and transportation.
- Supported the interministerial commission's work group of pandemic 2009 H1N1 influenza.
- Provided surveillance materials to selected sites and provinces (e.g., questionnaires, personal protective equipment [PPE] for the surveillance officers, sample collections, swabs, and viral transport media, including standard operating procedures and guidelines).
- Provided 2009 H1N1 influenza workshops.
- Provided information, education, and communication materials.
- Shipped suspect specimens to the regional reference laboratory for confirmation (NICD in Johannesburg).

## **Notable Achievements, 2009**

- Established 3 functional sentinel sites in Luanda and Uige provinces.
- Supplied (U.S. CDC) reagents and needed equipment at the INSP laboratory to help with 2009 H1N1 influenza diagnoses.
- Contributed to a more robust pandemic influenza response through successful capacity-building activities that involved health workers at INSP laboratory and sentinel sites.
- The National Institute of Public Health became the 4th laboratory in the Southern Africa region to diagnose and confirm 2009 H1N1 influenza cases on-site.

## **Special Influenza Projects**

Discussions were initiated to establish partnerships and research projects involving the faculty, medical, and nursing students of the public university.

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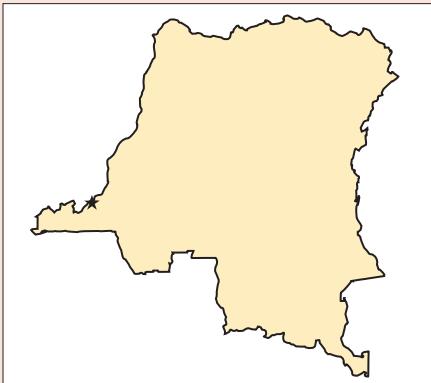
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# African Region

## Democratic Republic of Congo



- **Capital:** Kinshasa
- **Area:** 2,345,410 sq km
- **Population:** 70,916,439
- **Age Structure:** 0–14 years: 47.1% (male 15,711,817/female 15,594,449); 15–64 years: 50.4% (male 16,672,399/female 16,875,468); 65 years or older: 2.5% (male 674,766/female 985,607) (2008 est.)
- **Life Expectancy at Birth:** Total population: 53.98 years; male: 52.22 years; female: 55.8 years (2008 est.)
- **Infant Mortality Rate:** Total: 83.11 deaths/1,000 live births; male: 91.14 deaths/1,000 live births; female: 74.83 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 67.2%; male: 80.9%; female: 54.1% (2001 est.)
- **GDP:** \$21.08 billion (2008 est.)
- **GDP per Capita:** \$300 (2008 est.)

### U.S. CDC Direct Country Support

#### Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 is the 3rd year of the agreement.

Democratic Republic of Congo (DRC) has been collaborating with the U.S. CDC on influenza control since 2006. The collaboration is through a cooperative agreement—Support Surveillance and Response to Avian and Pandemic Influenza. A core of professionals (technical and administrative) and experts from the 4th directorate, Institut National de Recherche Biomédicale (INRB), and the Kinshasa School of Public Health work on the influenza surveillance network project. The team continues its close collaboration with the U.S. CDC avian influenza focal point and WHO and the national committee for avian influenza.

International support has contributed to strengthen influenza surveillance and priority diseases in the country, notably, support from U.S. CDC to improve influenza laboratory diagnostic capacity. The agreement improves influenza laboratory testing capability and enhances preparedness and response capacity to influenza pandemic and other disease emergencies.

Since its establishment in 1984, INRB continued to function despite many social and economic challenges within DRC. As of 1998, thanks to bilateral and multilateral collaborations with international donors, INRB enhanced its research infrastructure and improved the work capacity of its technicians and scientists. Currently, INRB is involved in the surveillance of poliomyelitis, measles, and yellow fever under the auspices of WHO.

## **Surveillance**

The DRC has not detected human or animal cases of H5N1, but remains at high risk because of certain factors, such as its large geographic area, location in the direct pathway of wild bird migratory movements that originate from Asia and Europe, and the importation of poultry and products from other countries with H5N1. Another important factor is public knowledge of H5N1 influenza prevention. In addition, the recent emergence of 2009 H1N1 influenza worldwide causes fear, worry, and confusion among people in DRC.

Ten countrywide sentinel sites were supported in FY 2009 to strengthen efficiency in detecting, reporting, sampling, testing, and shipping laboratory specimens to the national influenza laboratory. Support provided included tools and forms for data collection, laboratory consumables and supplies, phone credits, payment of shipping costs, and local transport.

Over the past 3 years, the Kinshasa School of Public Health (KSPH), the INRB, and the MOH 4th directorate in charge of disease control carried out surveillance activities, such as helping to

- Write national plans for surveillance and response to avian and pandemic influenza.
- Integrate human infection from avian influenza virus on the national list of surveillance diseases.
- Adapt and disseminate documents about influenza case definition and notification, samples collection and shipment, and reporting.
- Train medical biologists in PCR.
- Train national and provincial sentinel site staff.
- Implement sentinel sites throughout the country and supply samples and avian influenza rapid tests.
- Analyze samples and reporting results.

## **Laboratory**

INRB, DRC's national reference laboratory, performs seasonal and pandemic influenza laboratory diagnostics. INRB has set up a database, purchased reagents and office equipment, and hired 2 staff to perform project functions. In FY 2009, INRB received an RT-PCR machine and reagents from CDC-Atlanta. The RT-PCR machine was set up, and staff were trained by a consultant contracted by CDC-Atlanta. A core of professionals (technical and administrative) and experts from the directorate, INRB, and the KSPH worked on the influenza surveillance network project. The team continues to work closely with the U.S. CDC avian influenza focal point, WHO, and the national committee for avian influenza. The main components of the INRB include

- Clinical laboratory.
- Applied research.
- Laboratory-based disease surveillance.
- Reference laboratory.

Despite challenges to setting up and maintaining the influenza laboratory, influenza testing was conducted during FY 2009 with the following results:

- A total of 1,016 samples were collected during FY 2009.
  - A total of 360 samples were collected from patients with SARI.
  - A total of 547 samples were collected from patients with ILI.
  - A total of 109 samples were collected from patients who were not classified.
- Of the 1,016 samples
  - A total of 78 (8%) tested positive for influenza A.
  - A total of 20 (2%) tested positive for influenza B, and 908 (90%) tested negative for influenza A or B.
- Results show that A (H3N2) was the predominant strain circulating in 2008 and 2009.
- Of the 78 patients with influenza A
  - A total of 32 (41%) had SARI, 26 (33%) had ILI, and 20 (26%) were not classified.
  - Seventy-eight samples with influenza A were subtyped:
    - › Forty-four cases of A/H3N2 (56%).
    - › Twelve cases of seasonal A/H1N1 (15%).
    - › Twelve cases of new H1N1 (15%).
    - › Six cases unclassified by real-time RT-PCR (8%).
    - › Four cases not analyzed (6%).

### **Preparedness**

The Avian Influenza National Plan was generated in 1996 and revised in June 2008 and March 2009. The latest version is waiting to be adopted by the government. The plan's goal is to

- Prevent introduction of avian and pandemic influenza into the country.
- Control outbreaks by key interventions, surveillance, stock importation controls, mass communications, trainings, disease containment activities, and compensation for lost poultry stock.

The new revision aimed to adapt the national plan according to the current epidemiologic context and available resources. The plan was revised by the Avian Influenza National Technical Committee with all the commissions integrating the human and animal aspects of the surveillance and response. The DRC government is considering the production of a distinct plan that will integrate influenza H5N1 and 2009 H1N1 influenza. The integrated plan is in process.

Support to the MOH is being provided to conduct field assessments of weekly surveillance systems and to improve the preparedness planning and rapid response teams. A weekly database is managed by the MOH office in charge of surveillance diseases, and this data is shared globally. In addition, the national technical committee organized 10 monthly meetings from October 2008 through September 2009.

## **Training**

Training is provided by the KSPH to

- Update the knowledge and skills of Congolese health professionals, as needed, to address health management priorities.
- Enhance disease surveillance, health research, and operations research to gather and evaluate data and programs in the DRC.
- Provide leadership and training on the use of information technology to the health program managers and policy makers in the DRC.
- Train health care professionals from the influenza sentinel sites to ensure adequate performance in detecting, reporting, sampling, using rapid tests, managing cases, and reducing transmission risk at the sites. This activity was conducted by trained supervisors, including clinicians, medical biologists, and a laboratory technician.

## **H1N1 Activities, FY 2009**

The outbreak of 2009 H1N1 influenza was a good opportunity to strengthen the national disease surveillance system. WHO helped to manage the outbreak by delivering 100,000 doses of antiviral medicine (Tamiflu) for the national H1N1 response.

During the outbreak, messages were created and sent on a small scale according to developed communication strategies. These messages helped people distinguish between influenza A (H1N1) and avian influenza (AI). More of these messages will be designed and sent to the rest of DRC.

## **Special Projects**

There is a great need to improve communication about influenza surveillance from Kinshasa to other areas throughout the DRC. An influenza hotline was set up in 2006 by INRB to provide awareness of influenza to the population, and it continues to provide the accurate information. The number of callers to the hotline declined before the HIN1 pandemic, but 84,200 callers received answers and information about their influenza questions during FY 2009.

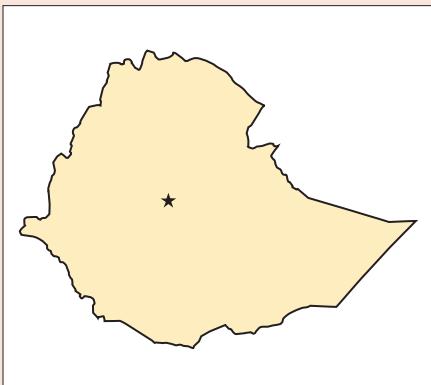
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# African Region

## Ethiopia



- **Capital:** Addis Ababa
- **Area:** 1,127,127 sq km
- **Population:** 88,013,491
- **Age Structure:** 0–14 years: 46% (male 18,922,334/female 19,017,593); 15–64 years: 51.4% (male 20,749,002/female 21,656,509); 65 years or older: 2.7% (male 947,323/female 1,252,077) (2008 est.)
- **Life Expectancy at Birth:** Total population: 54.99 years; male: 52.54 years; female: 57.51 years (2008 est.)
- **Infant Mortality Rate:** Total: 82.64 deaths/1,000 live births; male: 94.08 deaths/1,000 live births; female: 70.87 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 42.7%; male: 50.3%; female: 35.1% (2003 est.)
- **GDP:** \$63.44 billion (2008 est.)
- **GDP per Capita:** \$800 (2008 est.)

### U.S. CDC Direct Country Support

Preparedness and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began August 2007.
- FY 2009 was the 3rd year of the influenza cooperative agreement.

### Surveillance

- Established 3 sentinel sites in Addis Ababa that feed into the national influenza laboratory for ILI in clinic patients and SARI in hospital patients.
- Adapted and finalized sentinel surveillance implementation guidelines and protocol; ILI and SARI case definitions; and case-based, weekly aggregated, reporting formats for influenza sentinel surveillance in Ethiopia.

### Laboratory

- Collected specimens in November 2008 from ILI sites and in January 2009 from SARI sites. To date, the number of specimens collected from ILI sites is 89 and from SARI sites is 132.
- Analyzed, laboratory samples by using real-time PCR from ILI sites (60) and from SARI sites (47).
- CDC-Kenya scientists gave an orientation on real-time PCR and troubleshooting, August 31, 2009 to September 10, 2009.

- Obtained certification of biologic safety cabinets in National Influenza Laboratory, September 2009.
- Participated in WHO External Quality Assurance Program (EQAP) in July 2009 for the first time.
- Presented Ethiopian National Influenza Lab at first NIC meeting in the AFRO region, Dakar, Senegal, November 2008.

### **Preparedness**

- Reactivated the national task force for zoonotic diseases at the highest government level and reviewed the national pandemic preparedness and response plan involving all stakeholders.
- Developed public awareness exercises.
- Distributed standard case definitions.
- Developed an influenza communication strategy.

### **Training**

- Provided 2 rounds of training on specimen collection, storage, transportation, infection prevention and control, and epidemiology of avian influenza for 58 health care workers from selected influenza sentinel sites, September 2008 and January 2009.
- Laboratory staff member participated in training workshop, “Safe Shipment of Infectious Substances,” Johannesburg, South Africa, March 9–11, 2009, organized by WHO.
- Two laboratory staff members participated in training organized by CDC-Kenya, Kenya Medical Research Institute on real-time PCR diagnosis of 2009 H1N1 influenza, Nairobi, Kenya, June 2–4, 2009.



## **H1N1 Activities, FY 2009**

- Gave orientation on new influenza to 138 federal and regional health professionals, May 2009, and to staff of St. Peter's Hospital in Addis Ababa, the site identified for screening suspect cases of 2009 H1N1 influenza.
- Identified 31 federal and regional hospitals for the management of cases.
- Distributed specimen collection materials to health facilities selected for screening cases of 2009 H1N1 influenza.
- Distributed antiviral drugs (i.e., Tamiflu) and N95 masks to selected hospitals.
- Identified isolation and treatment wards, primarily at St. Paul's Hospital and later at St. Peter's Tuberculosis Specialized Hospital, both located in Addis Ababa.
- Initiated laboratory testing of suspect cases immediately after receiving 2009 H1N1 influenza kits and consumable laboratory items from U.S. CDC, June 2009.
- Screened more than 80 suspect cases; 10 cases were positive for 2009 H1N1 influenza.
- Established an emergency operating center under the emergency public health management directorate.
- Prepared and submitted an abstract for the Africa Influenza Scientific Symposium on 2009 H1N1 influenza in Ethiopia.
- Participated in briefings to the public on the threat of 2009 H1N1 influenza and laboratory status regarding testing for suspect cases.

## **Notable Achievements, 2009**

- Initiated testing of laboratory specimens collected through routine influenza surveillance.
- Laboratory participated in WHO EQAP for the first time.
- Built capacity for real-time PCR testing of influenza viruses at the Ethiopian Health and Nutrition Research Institute (EHNRI).

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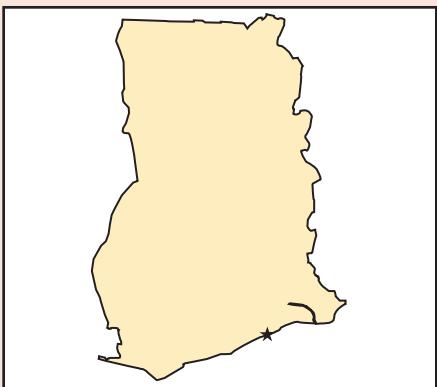
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# African Region

## Ghana



- **Capital:** Accra
- **Area:** 238,533 sq km
- **Population:** 24,339,838
- **Age Structure:** 0–14 years: 36.8% (male 4,529,594/female 4,429,802); 15–64 years: 59.6% (male 7,252,245/female 7,262,757); 65 years or older: 3.6% (male 395,007/female 470,433) (2010 est.)
- **Life Expectancy at Birth:** Total population: 60.55 years; male: 59.36 years; female: 61.78 years (2010 est.)
- **Infant Mortality Rate:** Total: 49.89 deaths/1,000 live births; male: 53.38 deaths/1,000 live births; female: 46.29 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 57.9%; male: 66.4%; female: 49.8% (2000 census)
- **GDP:** \$14.93 billion (2009 est.)
- **GDP per Capita:** \$1,500 (2009 est.)

### U.S. CDC Indirect Country Support

#### *Developing Influenza Surveillance Networks in Collaboration with U.S. NAMRU-3 in Ghana*

Continuous global scrutiny of influenza viruses that cause illness in humans is required to detect changes in the viruses and distinguish outbreaks that could lead to pandemics. Therefore, influenza surveillance has been initiated by routinely monitoring acute respiratory illness in selected health institutions in Ghana. This surveillance is part of national preparedness efforts for the threat of pandemic influenza with the U.S. Naval Medical Research Unit-3 (NAMRU-3) and U.S. CDC.

#### **Surveillance**

Seasonal influenza surveillance was started at sentinel sites in Ghana in September 2007. Since then, more than 1,700 samples have been processed, and 100 isolates have been cultured. Before FY 2009, 289 samples had been processed and 28 isolates cultured. In FY 2009, this number rose to 1,380 samples processed and 65 isolates cultured. More than 100 samples each month have been processed consistently since April 2009.

#### **Laboratory**

The following lists quantities and types of samples processed:

#### **ILI**

- Processed 1,380 samples from 10 sentinel sites.
- Cultured 65 isolates.

- Detected 4 antigenically distinct H3N2 viruses; the samples were sent to the WHO in London for further analysis. Several unusual H3N2 viruses were identified and sequenced.

### **2009 H1N1 influenza**

- Processed 200 samples.
- Fourteen samples were positive for pandemic H1N1.

### **SARI**

- Processed 32 samples by DFA.
- Two samples were 2 positive by DFA (i.e., RSV and influenza A H3).

### **Avian influenza (AI)**

- Collected and processed 1,000 bird samples.

### **Preparedness**

- Sensitization of Muslim pilgrims at Hajj village. Drugs for treating influenza have been left with the medical team to treat those who may contract influenza while in Mecca during the pilgrimage.
- Undertook technical support visits and training for regional and district teams in surveillance and management of diseases by national teams in all 10 regions.
- Continued surveillance and managed cases by regional and district teams.
- Meetings of technical coordinating committees at national, regional, and district levels are ongoing.
- Intensified public education through mass media (i.e., electronic, print).
- Collected and transported samples from suspected cases to Noguchi for diagnosis is ongoing.
- Distributed antiviral drugs for 2009 H1N1 influenza and materials for collecting specimens from suspected patients to all the regions.
- Activated the communication strategy and distributed posters on 2009 H1N1 influenza to all the regions.
- Directed all regional health directorates to work with media houses to secure free airtime in order to educate the public on the disease.
- The School Health Education Program coordinators are taking steps to sensitize school children and to facilitate the detection of any case of fever with cough or sore throat for immediate notification.

### **Training**

#### **SARI (i.e., Global Emerging Infections Surveillance [GEIS], CDC)**

- Trained 144 hospital staff in research ethics.
- Provided direct fluorescent antibody (DFA) test training for 10 hospital laboratory staff, including 2 from the 37th military hospital.

- Provided surveillance protocol and epidemiologic training for more than 80 hospital staff, including 11 from the 37th military hospital.
- Trained 25 health care workers in sample collection techniques for nasopharyngeal and oropharyngeal (NP/OP) swabs.

### **Influenza (CDC-Atlanta)**

- Trained 30 participants from West African countries (i.e., Burkina Faso, Cote d'Ivoire, Ghana, Nigeria, Togo, Liberia, Sierra Leone) in surveillance epidemiology and laboratory techniques at a regional training workshop funded by CDC-Atlanta.

### **ILI**

- Trained 36 workers from 12 sentinel sites in Ghana in ILI case definition and surveillance review training.

### **HINI**

- Provided training for 15 people from 5 countries (i.e., Ghana, Burkina Faso, Nigeria, Senegal, Côte d'Ivoire) in Ghana at the Noguchi Memorial Institute for Medical Research (NMIMR).
- Trained 76 health care workers from public and private facilities designated as pandemic clinics by the MOH in H1N1 case definitions and sample collection.

### **H1N1 Activities, FY 2009**

The pandemic strain of 2009 H1N1 influenza was identified in Ghana in August 2009. To date, 345 samples have been collected from suspected cases, and contacts have been tested at the NMIMR laboratory; 38 positive cases of pandemic 2009 H1N1 influenza have been confirmed by the laboratory. From these 38 confirmed cases, 33 are from the Greater Accra region, 3 are from the Western region, and 2 are from the Ashanti region. No deaths have been recorded.

### **Notable Achievements, 2009**

In August 2009, a SARI protocol was implemented at the largest hospital in Ghana (i.e., Korle Bu Teaching Hospital), the 37th military hospital, and the Tema General Hospital through a collaboration among the U.S. CDC, the U.S. NAMRU-3, the Ghana Health Service (MOH), and the NMIMR in Ghana.

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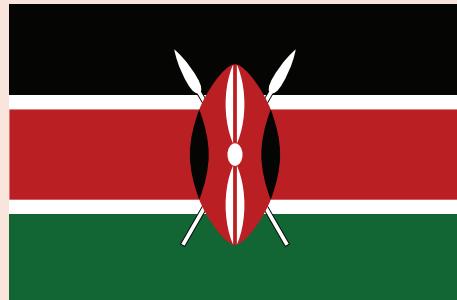
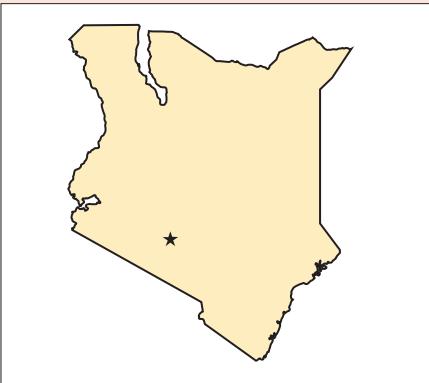
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# African Region

## Kenya



- **Capital:** Nairobi
- **Area:** 582,650 sq km
- **Population:** 40,046,566
- **Age Structure:** 0–14 years: 42.2% (male 8,065,789/female 7,953,077); 15–64 years: 55.2% (male 10,498,468/female 10,434,764); 65 years or older: 2.6% (male 457,886/female 543,854) (2008 est.)
- **Life Expectancy at Birth:** Total population: 56.64 years; male: 56.42 years; female: 56.87 years (2008 est.)
- **Infant Mortality Rate:** Total: 56.01 deaths/1,000 live births; male: 58.95 deaths/1,000 live births; female: 53.02 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 85.1%; male: 90.6%; female: 79.7% (2003 est.)
- **GDP:** \$66.48 billion (2008 est.)
- **GDP per Capita:** \$1,800 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began September 2004.
- FY 2009 was the 5th year of the agreement.

The Kenya Ministry of Public Health and Sanitation (MOPHS) has a longstanding collaboration with U.S. CDC for influenza pandemic preparedness. The bilateral agreement between the Kenya MOPHS and U.S. CDC started in 2004; it has provided resources to create a national sentinel surveillance system for influenza, including 10 sentinel sites and a NIC. The collaboration has also supported work in infection control and risk communication relating to influenza pandemic preparedness.

### Surveillance

The Kenya MOPHS and CDC-Kenya has maintained a national influenza sentinel surveillance system at 10 sites. Specimens are collected from patients with ILI and SARI at 7 provincial hospitals, 2 refugee camp hospitals, and the national referral hospital in Nairobi. Samples are tested at the NIC, part of the Kenya Medical Research Institute, and the CDC-Kenya International Emerging Infections Program laboratory. Every month, approximately 500 samples are collected and tested.

In early May 2009, following the first cases of 2009 H1N1 influenza in North America, the Kenya MOPHS undertook a campaign with CDC-Kenya, WHO-Kenya, and the U.S. Army

Medical Research Unit in Kenya to train clinicians at additional hospitals and clinics around the country in order to identify and collect samples from suspected H1N1 patients. Samples are tested at the NIC and CDC-Kenya laboratories daily. Additional surveillance and detection work undertaken included

- Regional laboratory trainings for laboratory scientists in Africa.
- National, provincial, and district-level trainings to support implementing the national Integrated Disease Surveillance and Response (IDS) system.
- Periodic supervisory visits to sentinel surveillance and IDS sites to monitor influenza surveillance.
- Support for training of national MOPHS laboratorians in influenza laboratory testing, including hands-on rotations through the NIC in Nairobi.

### **Preparedness**

With support from partners in Kenya, the Kenya MOPHS has devoted considerable effort to preparing the country for an influenza pandemic. The results of the work that took place over the past 3 to 4 years were clear when the pandemic emerged in Kenya in June 2009. Kenya was able to identify its 1<sup>st</sup> case of 2009 H1N1 influenza by testing at the NIC, and contact tracing was conducted with the help of staff from influenza sentinel surveillance sites throughout the country. The pandemic influenza task force met, and materials for risk communication to the public were developed. An enhanced training program was undertaken to train clinicians around the country about 2009 H1N1 influenza.

### **Training**

The Kenya MOPHS, the Kenya Ministry of Medical Services, the WHO, and CDC-Kenya have implemented training at provincial and district hospitals throughout Kenya to establish reporting through the IDS system. Additionally, the MOPHS has supported training on influenza laboratory testing, influenza surveillance, and infection control issues related to influenza.

### **HINI Activities, FY 2009**

- Enhanced H1N1 surveillance in hospitals and clinics throughout Kenya.
- Extensive contact tracing of initial cases of H1N1 in Kenya.
- Development of communication materials for the public and guidelines for national clinicians about 2009 H1N1 influenza.



## **Notable Achievements, 2009**

- Surveillance and detection for seasonal and 2009 H1N1 influenza at sites throughout Kenya.
- National infection control training focusing on the development of national infection control guidelines.
- Establishment of surveillance for hospital-acquired infections in 3 Kenyan hospitals.

## **Principal Collaborator**

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# African Region

## GDD-Kenya

GDD-Kenya center was established in 2004; it collaborates with Kenya's MOH and is recognized as a strong resource for disease detection and response throughout East Africa. GDD-Kenya helps the country and the region detect and respond to serious public health threats, including cholera, Ebola, extensively drug-resistant tuberculosis, influenza, Rift Valley fever, and typhoid.

GDD-Kenya has extended its coverage to more than 10 countries in the region by developing regional public health leaders trained through the Field Epidemiology and Laboratory Training (FELTP). Most of these graduates hold leadership positions in countries throughout the region, including Ghana, South Sudan, Tanzania, and Uganda. One of the 1<sup>st</sup> FELTP graduates is leading the program in Nigeria.

### Activities

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

In 2009, GDD-Kenya earned recognition for its outstanding work in research, pathogen discovery, and training. GDD-Kenya discovered 3 pathogens that were new to the region and 1 that was new to the world. In addition, they increased their laboratory testing capacity by 81%. GDD-Kenya trained 13 FELTP graduates and more than 3,700 participants in short-term regional and national trainings. GDD-Kenya responded to 31 outbreaks, of which 94% achieved a measurable public health impact.

### In-Country Field Staff

Rob Breiman, MD, MPH  
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Influenza Lead

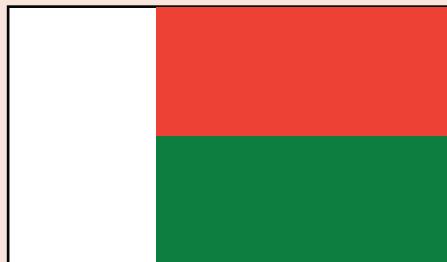
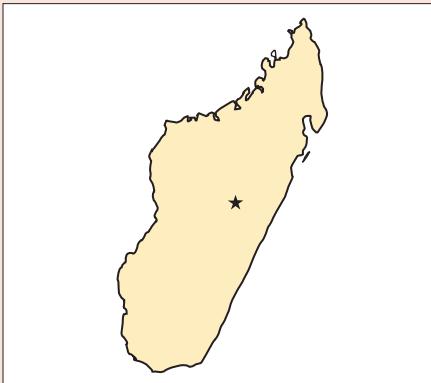
### Principal U.S. CDC Program Collaborations In-Country

- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FELTP.
- Laboratory Systems and Biosafety.
- Immigrant, Refugee, and Migrant Health.



# African Region

## Madagascar



- **Capital:** Antananarivo
- **Area:** Total: 587,041 sq km
- **Population:** 21,281,844 (July 2010 est.)
- **Age Structure:** 0–14 years: 43.3% (male 4,641,212/female 4,575,129); 15–64 years: 53.7% (male 5,672,321/female 5,745,901); 65 years or older: 3% (male 287,402/female 359,879) (2010 est.)
- **Life Expectancy at Birth:** Total population: 63.26 years; male: 61.27 years; female: 65.3 years (2010 est.)
- **Infant Mortality Rate:** Total: 52.84 deaths/1,000 live births; male: 57.69 deaths/1,000 live births; female: 47.84 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 68.9%; male: 75.5%; female: 62.5% (2003 est.)
- **GDP:** \$20.5 billion (2009 est.)
- **GDP per Capita:** \$1,000 (2009 est.)

### U.S. CDC Direct Country Support

Developing Seasonal, Pandemic, and Influenza Surveillance Networks Cooperative Agreement

- In FY 2009, Madagascar was awarded a new cooperative agreement.

A new cooperative agreement is now in place with the NIC in Antananarivo on behalf of the MOH of the Republic of Madagascar. The agreement is designed to support execution of the existing Support Program for Integrated National Action Plans Against Avian and Human Influenza (SPINAP-AHI) and to complement and support ongoing AI activities. The project aims to support national efforts to address a possible pandemic of AI or emerging novel influenza viruses from a disease prevention and control perspective. In addition, the project will address preparedness for possible other emerging infections and SARI to

- Monitor the emergence of pandemic viruses (including HPAI in humans).
- Reduce morbidity and mortality from possible emerging respiratory infectious diseases by rapid detection and containment.
- Reduce economic effects and social upheaval or unrest from a pandemic.

The project's goals are

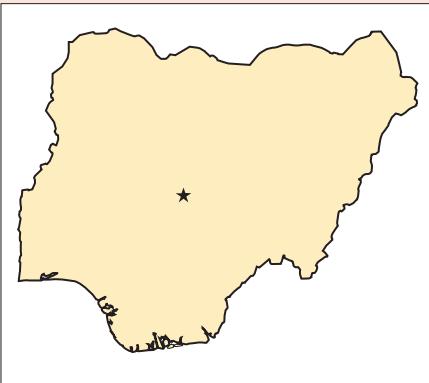
- Preparedness and Communication
  - Support and endorse a strategic plan for communication.
  - Support a Knowledge, Attitudes, and Practices study.
  - Support the formulation of appropriate communication messages and material needed to address a potential pandemic.
  - Endorse the communication message.
  - Produce and disseminate communication materials.
- Surveillance and Detection
  - Continue supporting the NIC in Madagascar.
  - Expand ILI and SARI surveillance systems.
  - Establish a communication network among sentinel sites, the MOH, and IPM.
  - Recruit a local epidemiologist to monitor sentinel sites.
  - Recruit a local staff person for database management.
  - Implement SARI surveillance by dedicating a staff person for the surveillance and collection of specimens.
- Response and Containment
  - Revise component of National Rapid Response Training.
  - Train Regional Rapid Response Teams (RRTs).
  - Develop a national course for the field investigation practice of epidemiology.

### **Project Investigator**

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# African Region

## Nigeria



- **Capital:** Abuja
- **Area:** 923,768 sq km
- **Population:** 152,217,341
- **Age Structure:** 0–14 years: 41.7% (male 31,171,949/female 29,806,204); 15–64 years: 55.3% (male 41,243,003/female 39,611,565); 65 years or older: 3% (male 2,152,318/female 2,270,267) (2008 est.)
- **Life Expectancy at Birth:** Total population: 46.53 years; male: 45.78 years; female: 47.32 years (2008 est.)
- **Infant Mortality Rate:** Total: 95.74 deaths/1,000 live births; male: 101.83 deaths/1,000 live births; female: 89.28 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 68%; male: 75.7%; female: 60.6% (2003 est.)
- **GDP:** \$328.1 billion (2008 est.)
- **GDP per Capita:** \$2,200 (2008 est.)

### U.S. CDC Direct Country Support

#### Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 is the 3rd year of the agreement.

The Nigerian Federal Ministry of Health (FMOH) has been collaborating with the U.S. CDC on influenza control since 2006. The collaboration is through a cooperative agreement—Support to Surveillance and Response to Avian and Pandemic Influenza.

The support has contributed to strengthening influenza surveillance and surveillance for other priority diseases in the country. Notably, influenza laboratory diagnostic capacity has improved remarkably since the beginning of the collaboration. The agreement has also enhanced the general level of preparedness and response capacity of the country to influenza pandemic and other disease emergencies.

### Surveillance

Before beginning the cooperative agreement, Nigeria had a population-based surveillance system—the IDSR system. The surveillance system monitors the occurrence of 21 priority diseases in the country. With the threat of influenza pandemic, influenza A (H5N1) has been added to the list of the country's priority diseases, bringing the total to 22 priority diseases.

The cooperative agreement has provided support to strengthen the IDSR system by training and providing supplies. In 2008, influenza sentinel surveillance was introduced in the country with the support of funds from the cooperative agreement.

During FY 2009 (March–April), 3 sentinel surveillance sites were added to the initial pilot site established in 2008. Each of the sentinel sites monitors occurrences of ILI in their outpatient clinics and SARI among their hospitalized clients. The sites also support surveillance for influenza A (H5N1) and 2009 H1N1 influenza in the country. Samples collected from the sentinel sites are transported by a courier system to a centrally located National Influenza Reference Laboratory (NIRL) for analysis.

In FY 2009, financial and technical support was provided to the Nigerian MOH for evaluating the possible implementation of the IDSR system across the country. Findings from the evaluation were shared with stakeholders, and recommendations were made to improve the surveillance system in the country.

### **Laboratory**

Through the cooperative agreement, an NIRL was established in 2007, which became fully functional in 2008. In FY 2009, an additional PCR machine was donated by U.S. CDC to the NIRL. U.S. CDC also provides technical support, supplies, and reagents to the laboratory. The performance of the 2nd NIC in Nigeria was further boosted in FY 2009 by the donation of a PCR machine, training of laboratory personnel, and the provision of reagents.

### **Preparedness**

Preparedness and response to influenza pandemic in Nigeria is guided by a policy document, *The National Integrated Avian and Pandemic Influenza Plan*, which was developed in 2007. In FY 2009, U.S. CDC provided technical and financial support for the revision of the document through the cooperative agreement. U.S. CDC also facilitated the request and subsequent donation of 7,000 sets of PPE by USAID to the FMOH.



## **Training**

Several trainings were conducted during FY 2009:

- Trained 120 health workers (doctors, nurses, and pharmacists) per zone on clinical management of avian influenza.
- Trained 20 laboratories scientists on PCR technique (didactic session and hands-on practice).
- Trained 50 trainers (doctors, nurses, and pharmacists) for clinicians on identifying and managing cases of 2009 H1N1 influenza.
- Trained 80 state epidemiologists and avian influenza desk officers on case definition and surveillance for 2009 H1N1 influenza.
- Trained 3 laboratory scientists from Nigeria on PCR diagnosis of 2009 H1N1 influenza in Accra, Ghana.

## **H1N1 Activities, FY 2009**

After the emergence of 2009 H1N1 influenza and the subsequent declaration of an influenza pandemic by WHO's Director General, several response activities were instituted by the cooperative agreement.

- Adapted case definition, surveillance guidelines, and case tools.
- Adapted 2009 H1N1 influenza case definition and surveillance guideline.
- Developed 2009 H1N1 influenza case management protocol.
- Adapted recommendations for antiviral use.
- Trained clinicians on identifying and managing clinical cases of 2009 H1N1 influenza.
- Trained state epidemiologists and avian influenza desk officers from all the states on case definition and surveillance for 2009 H1N1 influenza.
- Trained 3 laboratory scientists from Nigeria on PCR diagnosis of 2009 H1N1 influenza in Accra, Ghana.
- Acquired kits for RT-PCR testing of 2009 H1N1 influenza from U.S. CDC.
- Received and tested samples from suspected cases of 2009 H1N1 influenza across the country.
- Revised the National Influenza Pandemic Response Plan to incorporate 2009 H1N1 influenza concerns.

## **Notable Achievements, 2009**

- Commissioned and handed over a fully functional NIRL to the government of Nigeria by the U.S. Ambassador to Nigeria.
- Activated 3 functional influenza sentinel surveillance sites.

## **Special Influenza Projects**

- Participated in grant management training.
- Participated in *Multinational Influenza Seasonal Mortality Study* (MISMS) research workshop organized by NIH at Dakar, Senegal.
- Facilitated regional training of influenza sentinel surveillance, Accra, Ghana.
- Facilitated the Nigerian Field Epidemiology and Laboratory training program.
- Facilitated the National MDR-TB Survey.

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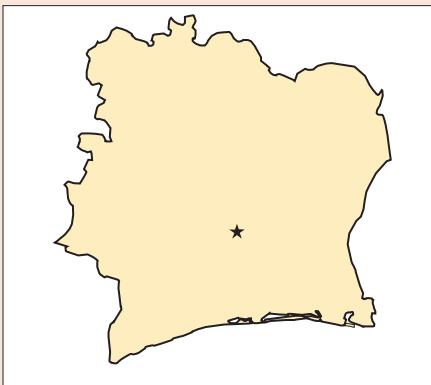
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# African Region

## Republic of Côte d'Ivoire



- **Capital:** Yamoussoukro
- **Area:** 322,460 sq km
- **Population:** 21,058,798
- **Age Structure:** 0–14 years: 40.9% (male 4,161,238/female 4,092,593); 15–64 years: 56.3% (male 5,790,503/female 5,568,621); 65 years or older: 2.8% (male 285,116/female 281,531) (2008 est.)
- **Life Expectancy at Birth:** Total population: 54.64 years; male: 53.95 years; female: 55.35 years (2008 est.)
- **Infant Mortality Rate:** Total: 69.76 deaths/1,000 live births; male: 77.06 deaths/1,000 live births; female: 62.25 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 48.7%; male: 60.8%; female: 38.6% (2000 est.)
- **GDP:** \$33.78 billion (2008 est.)
- **GDP per Capita:** \$1,700 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 is the 3rd year of the cooperative agreement.

The Ministry of Health and Public Hygiene (MSHP) of Côte d'Ivoire has obtained financial and technical support from U.S. CDC for pandemic preparedness and reinforcement of influenza surveillance. The National Institute for Public Hygiene (INHP) is the technical beneficiary of this cooperative agreement at the MSHP.

During the 2008–2009 budget period, all planned operational activities were implemented. Implementation of these activities produced a number of results, namely reinforcing laboratory diagnostic capacities. Quick access to information and results has been improved by providing sentinel sites with surveillance and communication software.

### Surveillance

Distribution of reporting tools and influenza surveillance policies to sentinel sites has become routine, and sample collection and transport to laboratories are operational.

To ensure timely information and availability of laboratory results, the 4 sentinel sites were provided with a connection to the Internet. In addition to Web access, the laboratory received computer equipment (i.e., work station, printer, UPS). Two doctors participated in the

conference of the French Society for Public Health (Société Française de Santé Publique) in Nantes from September 29, 2008 to October 3, 2008 to share their experience with surveillance of potentially epidemic diseases.

During November 28–December 24, 2008, a number of avian influenza risk cases were investigated. In the health districts of Port-Bouet, Treichville, Cocody-Bingerville, San-Pédro, Séguéla, Bouaké, and Agnibilékrou, 476 cases were investigated.

### **Laboratory**

The NIC located at the Pasteur Institute of Côte d'Ivoire (IPCI) has been given reagents and laboratory materials through the cooperative agreement in order to fulfill its role as influenza reference laboratory, thereby reinforcing its operational capacity. The laboratory was able to analyze 889 influenza samples in 2008 and approximately 1,000 samples in 2009. As of September 27, 2009, the following results were achieved:

- Twenty specimens positive for A (H1N1).
- One hundred thirty-two specimens positive for A (H3N2).
- Eighty-two specimens positive for influenza B.

### **Preparedness**

- In June 2009, a series of sensitization sessions, which included 20 towns in North and South Côte d'Ivoire, imparted information to poultry business owners, community leaders, and the local authorities. During these sessions, leaflets and brochures explaining the influenza mechanism and preventive measures were developed and distributed to the population.
- A journalist training workshop took place, and discussions with neighboring countries and partner organizations are occurring to determine the ideal dates for the planned cross-border meeting.

### **Training**

- Health care workers who are involved in epidemiologic and biologic surveillance of influenza were trained at national and international workshops. Their capacities and skills for detection, care and treatment, data collection, and management were reinforced.
- August 26, 2009–September 2, 2009, 40 health care workers were trained in epidemiologic surveillance. This training session was a response to the need to upgrade the skills of district health care workers for operations in the new sentinel surveillance sites of Bouaké, Korhogo, Soubré, and Daloa.
- September 22–25, 2009, 28 health care workers from the sentinel sites of Agnibilékrou, Abengourou, Adzopé, and Akoupé were trained in H1N1 detection and care and treatment.
- During October 12–23, 2009, 24 sentinel site laboratory technicians were trained in IPCI on sampling techniques, sample analysis (i.e., PCR), and cell culture.
- To improve the quality of data recording and facilitate data analysis during epidemiologic surveillance at INHP, 12 health care workers were trained on the use of Epi-Info software during May 4–7, 2009 and July 6–9, 2009 (i.e., 2 sessions with 6 participants each).

During a supervisory visit to sentinel sites in July 2009, the daily constraints and needs of health care workers were analyzed. The visit allowed INHP MOH to answer health care worker questions and suggested solutions to enable them to operate more efficiently to improve their working skills. During the same month, an epidemiologist in charge of the surveillance of diseases with epidemic potential attended a 2-week epidemiologic training course at Paris XI University, France. Topics covered included

- Supervising health care workers.
- Building the capacity at the sentinel sites.
- Training health district management on 2009 H1N1 influenza surveillance, care, and treatment.
- Recruiting laboratory technicians.
- Recruiting a medical epidemiologist.
- Providing information to the public on prevention and transmission of 2009 H1N1 influenza.

### **H1N1 Response Activities, FY 2009**

- Reinforcement of surveillance has allowed detection, isolation, and care and treatment of confirmed 2009 H1N1 influenza cases.
- During the past year, 3 H1N1 cases were detected and successfully treated.
- A hotline has been set up by the INHP MOH to provide answers to questions and guidance to the public about the threat of pandemic 2009 H1N1 influenza.

### **Notable Achievements, 2009**

- Implementing SARI surveillance with a site at each of the medical teaching hospitals of Abidjan (i.e., Treichville, Cocody, Yopougon).
- Real-time PCR technique made available at the NIC (IPCI).
- Training laboratory staff on the new H1N1 primers and probes developed by U.S. CDC.

### **Principal Collaborators**

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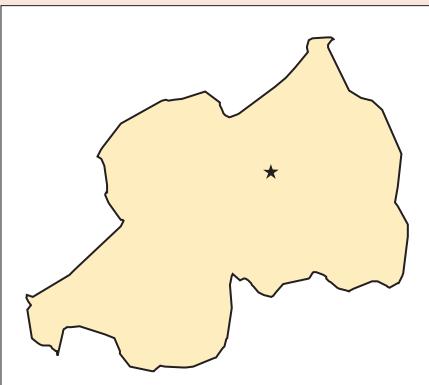
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# African Region

## Rwanda



- **Capital:** Kigali
- **Area:** 26,338 sq km
- **Population:** 11,055,976
- **Age Structure:** 0–14 years: 41.9% (male 2,143,479/female 2,124,588); 15–64 years: 55.7% (male 2,826,557/female 2,842,020); 65 years or older: 2.4% (male 99,721/female 149,698) (2008 est.)
- **Life Expectancy at Birth:** Total population: 49.76 years; male: 48.56 years; female: 51 years (2008 est.)
- **Infant Mortality Rate:** Total: 83.42 deaths/1,000 live births; male: 88.53 deaths/1,000 live births; female: 78.16 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 70.4%; male: 76.3%; female: 64.7% (2003 est.)
- **GDP:** \$8.909 billion (2008 est.)
- **GDP per Capita:** \$900 (2008 est.)

### U.S. CDC Direct Country Support

Preparedness and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began FY 2006.
- FY 2009 is the 3rd year of the cooperative agreement.

### Surveillance

Sentinel surveillance of seasonal influenza has been initiated in Rwanda. According to the national strategy, 6 active sentinel sites have been established in order to have 1 sentinel site for each province: 2 are the university hospitals in Kigali City and Butare city, and 4 are district hospitals (i.e., Kibagabaga, Gihundwe, Kibungo, and Ruhengeri). The site in Kigali City was established in July 2008, Kibungo in August 2008, Gihundwe in September 2008, Kibagabaga in December 2008, and Butare and Ruhengeri in May 2009.

Surveillance is based on 5 case definitions: ILI, SARI, person under investigation of avian influenza, suspected avian influenza, and suspected novel influenza A (H1N1) 2009. In total, 537 specimens for seasonal influenza surveillance were collected and tested. Fifteen percent of the specimens were positive for influenza. The predominant circulating strain was 2009 H1N1 influenza, followed by influenza B and seasonal influenza A (H3N2).

### Laboratory

The molecular biology unit of the National Reference Laboratory (NRL) is equipped with a real time RT-PCR 7500 ABI (Applied Biosystem Incorporation) to test influenza samples by typing

and subtyping seasonal influenza, avian influenza, and 2009 H1N1 influenza virus strains. Equipment that included a BSL-3 hood, CO<sub>2</sub> incubator, refrigerated ultra centrifuge, and deep freezers (i.e., -80°C) was received in April 2009.

Under the Material Transfer Agreement (MTA) signed with U.S. CDC, the NRL regularly receives primers, probes, and controls for influenza virus for detection and characterization. The panel includes influenza A, influenza B, human H1, human H3, Asian avian H5 (a), Asian avian H5 (b), RNase protein (RNP), human seasonal influenza virus positive control, influenza A (H5N1) virus real-time PCR positive control, and complete kits to test 2009 H1N1 influenza virus. The NRL is now fully equipped, and influenza samples have been tested since September 2008. The NRL participated in the 5th WHO EQAP. In addition, aliquots are regularly sent to CDC-Kenya's laboratory for quality control. The hood cabinet filters were maintained and certified in July 2009 by the South African company, Air Filter Maintenance Services (AFMS).

### **Preparedness**

In August 2009, CDC-Rwanda; the Center for Treatment and Research on AIDS, Malaria, Tuberculosis, and Other Epidemics (TRAC Plus); the Rwanda Animal Resources Development Authority (RARDA); and NRL organized a pandemic influenza tabletop exercise at Kigali. The exercise brought together 52 representatives from various agencies in Rwanda. The key institutions present at the exercise included the MOH, CDC, TRAC Plus, the Rwanda Development Board, RARDA, the Rwanda Bureau of Standards, NRL, WHO, the Rwanda Information Agency, and the Central Procurement Office of Essential Medicines in Rwanda.

The discussion-based exercise tested the National Pandemic Influenza A (H1N1) Operational Plan of Rwanda. It encompassed 6 sessions on the following selected topics pertaining to the pandemic influenza: disease surveillance, laboratory capacity to diagnose pandemic influenza strains, communication, health care planning and infection control, community disease control and prevention, and antiviral and vaccine dispensing and distribution. Overall, participants said the most valuable components of the exercise were discussing pandemic plan; identifying gaps, limitations, and concerns; and networking with other stakeholders in Rwanda on pandemic influenza.

Participants indicated that the following areas needed improvement:

- Community disease control and private clinic involvement in the national surveillance system.
- Laboratory capacity to diagnose pandemic influenza strains.
- Training and communication at the community level.
- Elaborating SOPs and legal framework for patient isolation.

### **Training**

- The influenza surveillance officer working for MOH TRAC Plus attended the first international Francophone train-the-trainer workshop on sentinel surveillance of influenza organized by U.S. CDC, Institute Pasteur Madagascar, and WHO AFRO Region in Antananarivo (Madagascar), August 2008.

- Two laboratory scientists at the National Veterinary Laboratory and the NRL had in-house refresher courses on testing seasonal influenza and use of 2009 H1N1 influenza kits by CDC-Kenya Medical Research Institute (KEMRI) laboratory technicians, September 2008.
- The U.S. CDC avian influenza focal point person had a 2-week training course to prepare for a certificate in the epidemiology of emerging infectious diseases with the University of Iowa's College of Public Health. The online course is ongoing.
- Several health care workers have been trained in influenza surveillance at sentinel sites. Overall, 15 medical doctors, 72 nurses, and 11 laboratory technicians were trained. CDC-Rwanda and RARDA trained 62 veterinary and laboratory technicians on surveillance of avian influenza in poultry.

### **H1N1 Activities, FY 2009**

- Updated the national operational plan for 2009 H1N1 influenza.
- Held refresher training for rapid response teams.
- Stockpiled supplies (i.e., 14,000 Tamiflu units, masks).

### **Notable Achievements, 2009**

- NRL tested and found seasonal influenza circulating strains.
- Increased sentinel sites from 4 to 6.
- Completed isolation facility at Kigali University Teaching Hospital.
- Completed the tabletop exercise to test the operational plan.
- Trained 62 veterinary and laboratory technicians on surveillance of avian influenza in poultry.
- Developed an abstract on influenza sentinel surveillance in Rwanda, July 2008–June 2009.

### **Special Influenza Projects**

The NRL would like to become a NIC. Staff need training and an appropriate facility to perform seasonal influenza virus culture and isolation in order to be able share isolates with WHO collaborative centers. Further, the NRL wants to purchase a real-time RT-PCR machine to improve the timely reporting of influenza testing results. At present, no early warning system exists, but NRL plans to use the WHO Global Outbreak Alert and Response Network.

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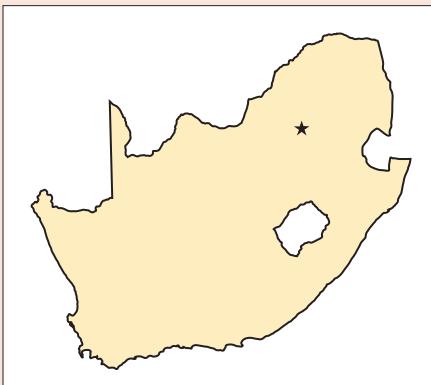
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# African Region

## South Africa



- **Capital:** Pretoria (administrative capital)
- **Area:** 1,219,912 sq km
- **Population:** 49,109,107
- **Age Structure:** 0–14 years: 29.2% (male 7,147,151/female 7,120,183); 15–64 years: 65.5% (male 16,057,340/female 15,889,750); 65 years or older: 5.3% (male 1,050,287/female 1,518,044) (2008 est.)
- **Life Expectancy at Birth:** Total population: 48.89 years; male: 49.63 years; female: 48.15 years (2008 est.)
- **Infant Mortality Rate:** Total: 45.11 deaths/1,000 live births; male: 49.47 deaths/1,000 live births; female: 40.65 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 86.4%; male: 87%; female: 85.7% (2003 est.)
- **GDP:** \$506.1 billion (2008 est.)
- **GDP per Capita:** \$10,400 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began August 2007.
- FY 2008 was the 2nd year of the agreement.

### Surveillance

#### **Viral Watch Surveillance Program**

South Africa has a longstanding ILI surveillance program with 256 outpatient sentinel sites in all 9 provinces that includes both general medical practitioners and hospitals. In 2009, in response to 2009 H1N1 influenza, the program expanded to include additional hospital sites in all 9 provinces where patients with SARI are enrolled.

## SARI Surveillance Program

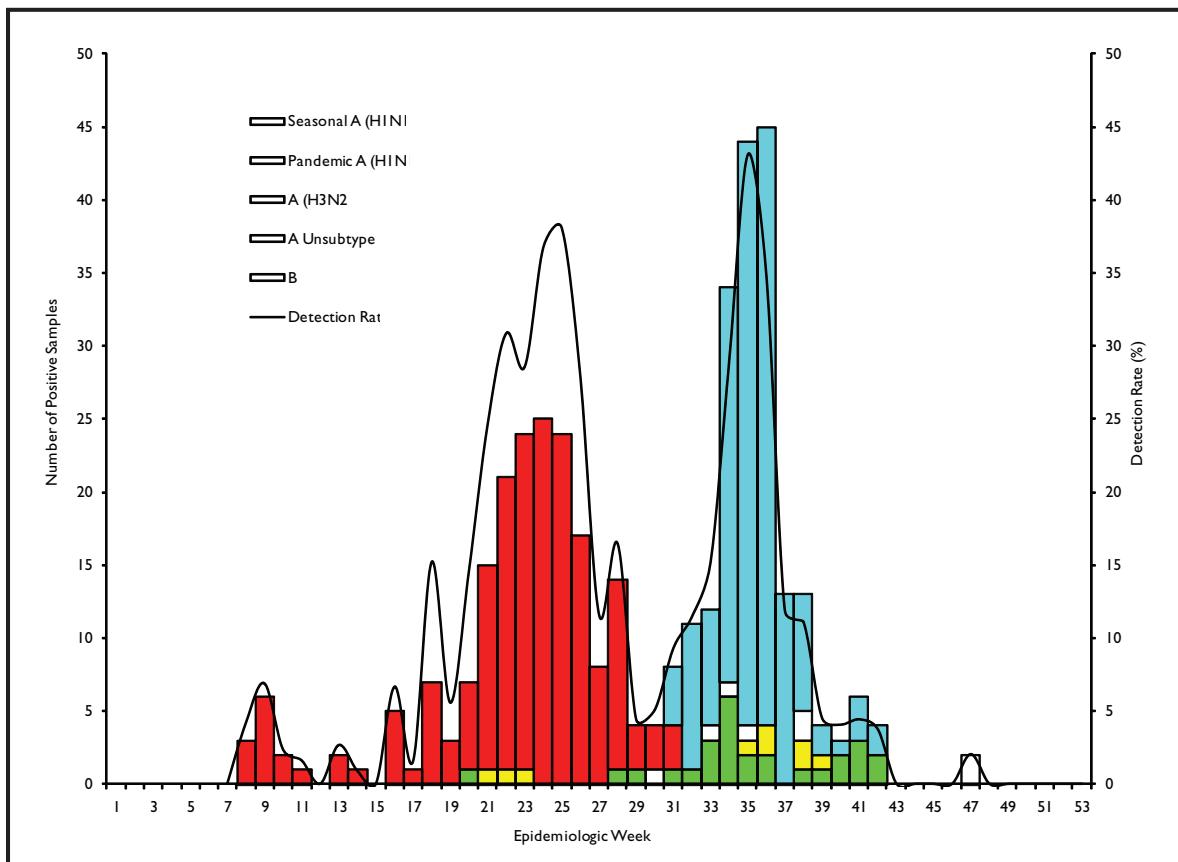


SARI surveillance was introduced in 2009 with 4 public sector hospital-based sites as follows:

- Chris Hani Baragwanath Hospital—This urban hospital is located in Gauteng Province with a well-defined population (Soweto).
- Edendale Hospital—This semi-urban hospital is located in KwaZulu-Natal Province.
- Mapulaneng and Matikwana Hospitals—These rural hospitals are adjacent to the Agincourt demographic surveillance site in Mpumalanga Province, where annual population surveys on demographic factors (e.g., births, deaths, migrations) are captured. These surveys will allow for more accurate estimation of rates of SARI hospitalizations.
- Detailed clinical and epidemiologic data, site laboratory results, patient outcomes, and specimens for detection of respiratory viruses (i.e., influenza, respiratory syncytial virus, adenovirus, human metapneumovirus, enterovirus, rhinovirus, and parainfluenza 1, 2, and 3), *Streptococcus pneumoniae*, and HIV infection are collected. This program enabled monitoring the effect of 2009 H1N1 influenza in hospitalized patients.

## SARI Surveillance in South Africa, 2009

### Number of Influenza Types and Subtypes and Detection Rate by Week



### Respiratory Consultations Surveillance System

This program obtains data from national private sector health care providers on patients seen with ILI and pneumonia and aims to track the progression of the influenza season.

### Enhanced Surveillance Activities in Response to 2009 H1N1 Influenza

Enhanced surveillance was initiated at 9 public sector hospitals around the country to collect specimens for virologic surveillance from patients with SARI. The severity of the epidemic was monitored and assessed by establishing a registry for all 2009 H1N1 influenza laboratory-confirmed cases, severe cases, and deaths. The first 100 confirmed cases were also investigated. These interventions allowed risk factors for severe illness and death to be detected and the secondary attack rate, serial interval, and basic reproductive number ( $R_0$ ) to be estimated.

### Reporting Surveillance Data

All surveillance programs manage data in real time, and weekly surveillance reports are disseminated to all stakeholders and published on the National Institute for Communicable Diseases (NICD) Web page ([www.nicd.ac.za](http://www.nicd.ac.za)) during the influenza season or influenza outbreak periods. Influenza data are also made available to the international community through the WHO GISN.

## **Laboratory**

The Respiratory Virus Unit (RVU) at the NICD is earmarked as a WHO regional reference laboratory for influenza and plays a key role in supporting the establishment of influenza laboratory and surveillance capacity in the Southern African Development Community (SADC). The RVU and Virus Isolation Unit (VIU) have regularly been testing and typing influenza samples collected under the Viral-Watch, SARI, and the Pandemic H1N1 Enhanced Surveillance systems. The RVU performs laboratory surveillance, molecular diagnosis, and typing of influenza viruses and is tasked with investigating the annual influenza molecular epidemiology, genetic drift, and resistance testing as part of the annual WHO vaccine recommendations. The VIU performs isolation and antigenic typing of various viral pathogens, including influenza. Specific activities implemented by the RVU include

- Developing standard methods for detecting H5 by real-time and conventional PCR.
- Developing PCR capacity for detection of H7 and H9 subtypes.
- Optimizing PCR-based detection method for detection of H275Y resistance that causes mutation in the H1N1 viruses.
- Developing a new multiplex PCR (used for the screening all SARI samples) that can detect 9 different viruses, including influenza.
- Developing guidance for establishing diagnostic capabilities for the 2009 H1N1 influenza virus for confirmed severe cases and deaths.
- Implementing molecular diagnostic trainings for avian, seasonal, and 2009 H1N1 influenza offered upon request from several countries from the SADC region.
- Technical support and confirmatory testing to other influenza laboratories in the region.
- Testing for oseltamivir resistance in 2009 H1N1 influenza and few seasonal H1N1 specimens for the 2009 season.

## **H1N1 Activities, FY 2009**

In addition to the establishing enhanced surveillance programs for 2009 H1N1 influenza, the following activities were implemented:

- Formulating national guidelines for health workers in collaboration with the National Department of Health and other partners.
- Implementing provincial workshops in 7 of the 9 provinces to reinforce adherence to the pandemic response plans and health worker guidelines.
- Providing advice on clinical case management and control measures, infection control guidance, and guidelines on appropriate specimen collection, including support with field work during outbreak investigations.
- Supporting the development of a network of laboratories in public and private sectors.
- Developing monthly and special communiqués to raise awareness and update clinicians about management of communicable diseases, including 2009 H1N1 influenza, which are distributed to approximately 18,000 health professionals and posted on the NICD Web page.
- Compiling weekly 2009 H1N1 influenza situation reports and posting the reports on the NICD Web page and distributing them to health professionals.

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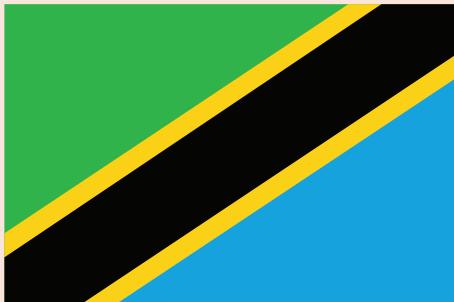
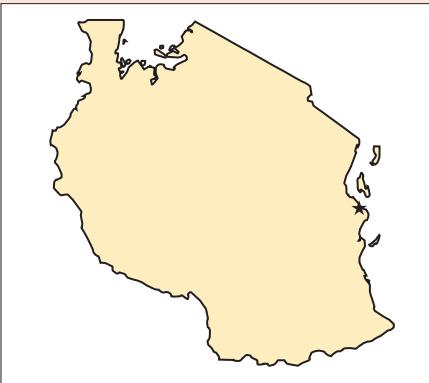
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# African Region

## Tanzania



- **Capital:** Dar es Salaam
- **Area:** 945,087 sq km
- **Population:** 41,892,895
- **Age Structure:** 0–14 years: 43.5% (male 8,763,471/female 8,719,198); 15–64 years: 53.7% (male 10,638,666/female 10,947,190); 65 years or older: 2.8% (male 502,368/female 642,269) (2008 est.)
- **Life Expectancy at Birth:** Total population: 51.45 years; male: 50.06 years; female: 52.88 years (2008 est.)
- **Infant Mortality Rate:** Total: 70.46 deaths/1,000 live births; male: 77.51 deaths/1,000 live births; female: 63.19 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 69.4%; male: 77.5%; female: 62.2% (2002 census)
- **GDP:** \$56.22 billion (2008 est.)
- **GDP per Capita:** \$1,400 (2008 est.)

### U.S. CDC Direct Country Support

Preparedness and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began FY 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

Tanzania began avian and pandemic influenza preparedness and response activities in 2006 by constituting the National Multisectoral Taskforce and developing the national avian and pandemic influenza preparedness and response plan. In 2008, the Ministry of Health and Social Welfare (MOHSW) and U.S. CDC established the National Influenza Laboratory in Dar es Salaam and initiated the virologic and epidemiologic influenza sentinel surveillance in 5 hospitals around the country to enhance the national ability for early detection of highly pathogenic influenza viruses. This surveillance enhancement contributed to the country's timely response to Rift Valley fever in 2007 and 2009 H1N1 influenza.

### Surveillance

The influenza surveillance system in Tanzania uses both the IDSR system, which is based on reporting suspected cases of SARI, and sentinel surveillance, which is based on the laboratory confirmation of sampled patients meeting ILI standard case definitions and all SARI cases.

- Established 5 influenza sentinel hospitals in 5 of the 21 regions in Tanzania.

- Held orientation for 78 multisectoral stakeholders, including policy makers and 100 sentinel site managers on influenza surveillance.
- All 133 districts are implementing IDSR weekly reporting.
- No confirmed influenza A (H5N1) outbreaks in birds or cases in humans have been reported in Tanzania.

With the emergence of 2009 H1N1 influenza globally, Tanzania contingency plans included

- Screening travelers at international airports.
- Identifying and equipping designated referral hospitals.
- Providing standard case definitions and collecting samples.
- Storing and transporting materials.



### **Laboratory**

The influenza laboratory network includes the 5 influenza sentinel laboratories, which are mainly specimen collection, storage, and transportation points, and the NIC, which is the only laboratory in Tanzania handling influenza activities.

- Tested 350 samples from sentinel sites at the NIC; sent 80 PCR-positive specimens to the WHO collaborating center as part of WHO's global influenza surveillance.
- Hired an additional laboratory expert for the NIC to strengthen the capacity of the laboratory to support the national influenza surveillance activities.
- The NIC participated in the WHO influenza External Quality Assessment Program (EQA) and provided supportive supervision to all influenza sentinel surveillance sites.

### **Preparedness**

- Tanzania continued to work with U.S. CDC, the United Nations, and other stakeholders to implement a preparedness and response plan for avian and pandemic influenza.
- Conducted 5 sessions of public awareness seminars in high-risk areas.
- Developed and distributed 4,000 avian and pandemic influenza leaflets to the public.
- Developed and distributed IEC influenza materials to poultry traders and disaster management committees.
- Trained 80 of 132 district rapid response teams.
- Participated in the first tabletop simulation exercise that tested the effectiveness of national preparedness and response plan.

## **Training**

- The NIC conducted training on specimen collection, storage, and transportation to all laboratories in the influenza surveillance network.
- Eighty-five health care workers received on-site training on influenza surveillance.
- One laboratory expert at the NIC received training on the International Air Transport Association (IATA)-accredited course on packaging and shipping dangerous goods.
- The NIC received training in 2009 H1N1 influenza testing using real-time PCR and influenza culture techniques at the CDC-KEMRI laboratory in Nairobi, Kenya.

## **H1N1 Activities, FY 2009**

- Tanzania developed and distributed national guidelines and procedures for surveillance and management of suspected and confirmed cases of 2009 H1N1 influenza.
- Set up screening of travelers at international airports and provided health care staff with training, supplies, and communication equipment.
- Provided training to NIC laboratory staff on 2009 H1N1 influenza testing by using real-time RT-PCR.
- Provided training to regional rapid response teams and hospital teams on 2009 H1N1 influenza surveillance and sample collection, storage, and transportation.
- Enhanced the surveillance of ILI and SARI in all public and private health facilities.

## **Notable Achievements, 2009**

- The established influenza screening program identified the first 2009 H1N1 influenza suspect case at the port of entry and confirmed the case within 24 hours.
- Tanzania had adequate drugs (i.e., Tamiflu) to treat all laboratory-confirmed 2009 H1N1 influenza.
- Established capacity to test influenza samples by using real-time RT-PCR at the NIC.
- Contributed positive samples to WHO's GISN.
- Provided national influenza surveillance data showing influenza trends and circulating virus types.

## **Special Influenza Projects**

- Involved Tanzania Field Epidemiology and Laboratory Training Program (T-FELTP) in the surveillance and response to avian and pandemic influenza.
- Participated in the East African countries (i.e., Tanzania, Kenya, Uganda) cross-border avian influenza simulation exercise.
- Enhanced communication and sharing of data with laboratories in the network and other regional laboratories.

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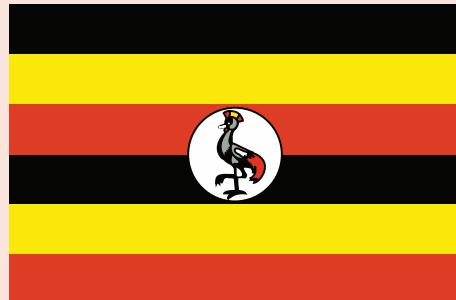
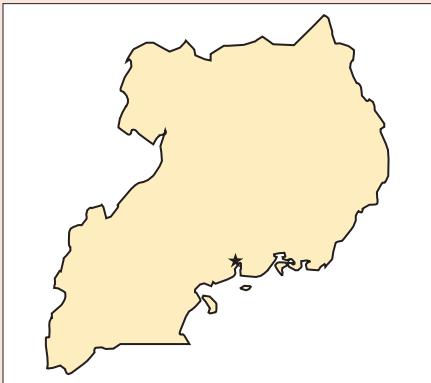
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# African Region

## Uganda



- **Capital:** Kampala
- **Area:** 236,040 sq km
- **Population:** 33,398,682
- **Age Structure:** 0–14 years: 50% (male 7,903,935/female 7,789,792); 15–64 years: 47.8% (male 7,528,073/female 7,469,938); 65 years or older: 2.2% (male 284,122/female 392,112) (2008 est.)
- **Life Expectancy at Birth:** Total population: 52.34 years; male: 51.31 years; female: 53.4 years (2008 est.)
- **Infant Mortality Rate:** Total: 65.99 deaths/1,000 live births; male: 69.65 deaths/1,000 live births; female: 62.21 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 66.8%; male: 76.8%; female: 57.7% (2002 census)
- **GDP:** \$34.23 billion (2008 est.)
- **GDP per Capita:** \$1,100 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began August 2007.
- FY 2009 was the 3rd year of the agreement.

Uganda Virus Research Institute (UVRI) was designated a NIC in the 1980s. However, NIC activities had slowed considerably until recently, when proposals to carry out surveillance for seasonal influenza were reinitiated. The advent of Highly Pathogenic Avian Influenza (HPAI) contributed to the reestablishment of the UVRI NIC.

In response to the risk of HPAI worldwide, in October 2005, the government of Uganda established a multisectoral National Task Force (NTF) for influenza to undertake a risk assessment and to prepare and implement an Avian and Human Pandemic Influenza Preparedness Plan. Under the preparedness plan, the MOH is responsible for establishing and implementing systems for the prevention and containment of human influenza. UVRI was redesignated as the NIC.

In August 2006, supplemental funding was obtained through the U.S. CDC Global AIDS Program to support the NIC; this funding provides in-country reference laboratory facilities and surveillance for seasonal influenza and a rapid response to pandemic or avian influenza outbreaks, filling in some gaps in the national plan.

In 2007, a proposal was written that requested funds to support the NIC. The purpose was to help support the national avian influenza preparedness plan and to establish a sustainable influenza surveillance network in Uganda. This was to be achieved by

- Supporting the NTF in awareness and training activities.
- Supporting the NIC at UVRI by carrying out both PCR detection and virus isolation for influenza and other respiratory viruses.
- Supporting the NIC in carrying out influenza surveillance in areas of Uganda that are not covered.
- Supporting epidemiologic surveillance and establishing early warning systems.
- Establishing rapid response and training teams.
- Coordinating in-country influenza efforts.

A 4-year U.S. CDC cooperative agreement funds award was given to the institute for these activities. FY 2009 was the 3rd year of the agreement.

### **Surveillance**

In 2007, surveillance activities were initiated at sentinel sites in the central region of Kampala and Entebbe, and this was later extended to northwestern Uganda, in the West Nile region of Arua and Koboko districts. There were 3 sentinel sites in Kampala and a site in Entebbe, plus a sentinel site each in the Arua and Koboko districts.

In 2008, surveillance was extended to another site in Kampala, and 1 was closed. With the advent of 2009 H1N1 influenza, more sentinel sites opened in Kampala. The new sites were targeted to collect samples from the local communities (e.g., Kitebi Health Center IV) and from expatriate staff and affluent societies (e.g., UN Clinic and the Surgery Clinic), who were more likely to travel out of the country and bring back different types of influenza. A satellite sentinel site (Labole) opened in Koboko; it works closely with the main site in Koboko Town.

Surveillance was started in May 2009 in southwestern Uganda's Mbarara district at the Mbarara Regional Referral Hospital. Ten sites are active. Plans are underway to start surveillance in Western (Kabalore district) and Eastern Uganda (Tororo district). The MOH and WHO country offices have requested that the NIC open more sites to cover the country. The NIC works with the Makerere University Walter Reed Program (MUWRP), which also has sentinel sites in Jinja, Bugiri, and Kayunga districts in Central and Eastern Uganda and a sentinel site at Mulago Hospital, the National Referral Hospital in Kampala. MUWRP is also going to expand its sentinel sites to Western and Northern Uganda.

### **Laboratory**

The NIC at UVRI is the only laboratory capable of influenza diagnostic testing in the country. The laboratory can use hemagglutination (HA) and hemagglutination inhibition (HI) and RT-PCR testing to confirm diagnoses. The laboratory has also been evaluating sensitivity and specificity to viruses circulating in Uganda by using commercially available rapid diagnosis kits for seasonal influenza. The laboratories have been newly renovated, and more space is due for refurbishment. More equipment has been acquired to assist the laboratory activities.

The NIC has worked closely with U.S. CDC to establish a state-of-the-art laboratory, and technologists have trained extensively with CDC-Atlanta scientists, KEMRI, and scientists at the National Institutes of Communicable Diseases, South Africa, on typing, subtyping, and real-time PCR.

The NIC laboratory participates in the WHO EQA for influenza A viruses. All viruses were successfully identified in the last 6 panels in which the laboratory participated. Isolates and aliquots of some of influenza virus strains that could not be typed were periodically sent to the WHO collaborating center in Atlanta.

### **Preparedness**

The NIC participated in the preparation and implementation of the Uganda preparedness plan and was part of the national task force for influenza. Staff from the NIC participated in national and regional tabletop exercises to test implementation of the preparedness plan. The NIC also provided funding for some of the activities of the tabletop exercises.

### **Training**

The NIC was involved in training health, veterinary, and agriculture personnel in each district, and staff at WHO, USAID, the Ministry of Agriculture Animal Industries and Fisheries, and the MOH.

- The NIC trained health personnel in Kampala district, a densely populated area where 2009 H1N1 influenza has circulated in the population.
- Training of health personnel was carried out in Bushenyi district, where clustered episodes of 2009 H1N1 influenza occurred in schools.
- A refresher training was given by the NIC for staff of all sentinel surveillance sites.
- The laboratory conducted training for technologists from the MUWRP before they started working in the NIC.
- The MUWRP held an African regional influenza diagnostics training in which participants had hands-on experience at the NIC, and NIC staff members were part of the training team.
- NIC laboratory scientists and the technologist staff attended training at Kenya Medical Research Institute, Nairobi, Kenya.

### **H1N1 Activities, FY 2009**

- The NIC has been involved in outbreak investigation, collection of samples, and confirmatory testing.
- Aliquots and isolates from the outbreak have been sent to the Atlanta WHO for further characterization and testing for resistance to influenza antiviral drugs.
- NIC staff have been performing control activities to limit the spread of pandemic influenza.
- NIC staff have participated in television and radio talk shows on pandemic influenza.

- The NIC has provided specimen collection supplies to several districts to assist in the collection of samples for testing.
- The Uganda NIC provided diagnostic capacity for Burundi when samples were sent for testing. We confirmed pandemic influenza from some of the samples sent.

### **Notable Achievements, 2009**

- A wing for influenza laboratories and NIC offices was refurbished and opened.
- The World Bank approved a loan to Uganda to implement the preparedness plan, with active involvement from the NIC in the preparation and negotiations.

### **Special Influenza Projects**

A student pursuing a Master of Science degree performed research in the NIC by using samples collected from 2 of the sentinel sites. The study, “Identification of Respiratory Viruses and Epidemiological Factors Associated with Acute Respiratory Illness (ARI) in Kampala and Entebbe, Uganda, 2008,” aimed to identify and describe the epidemiology of respiratory viruses associated with ARI at Kiswa, Kampala, and Entebbe hospitals, specifically the respiratory viruses circulating among ARI patients at Kiswa and Entebbe hospitals to determine the epidemiologic factors associated with respiratory virus infections. It was a cross-sectional study. Samples were collected from a subset of clinically diagnosed ARI patients of all ages. A 2-test multiplex PCR for 12 viruses was performed on the samples. The viruses that were studied included the following: influenza A; influenza B; coronavirus 229E; coronavirus OC43; parainfluenzas 1, 2, and 3; rhinovirus A; respiratory syncytial virus A; respiratory syncytial virus B; adenoviruses; and metapneumovirus.

Study results showed that the main viral causes of ARI in the study area were influenza A (19.2%), adenoviruses (8.7%), and rhinoviruses A (7.9%). Risk factors associated with ARI infection included an age of less than 10 years, overcrowding, use of some cooking fuels (e.g., charcoal), and contact with certain birds (e.g., ducks). In response to these findings, further studies need to be carried out, such as prospective studies to determine the public health importance of each viral pathogen and to identify the causative agents for the remaining undetermined pathogens (53.4%).

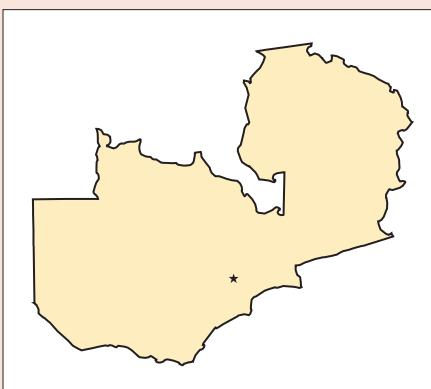
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# African Region

## Zambia



- **Capital:** Lusaka
- **Area:** Total: 752,618 sq km
- **Population:** 12,056,923
- **Age Structure:** 0–14 years: 44.8% (male 2,710,947/female 2,685,181); 15–64 years: 52.9% (male 3,199,685/female 3,180,292); 65 years or older: 2.3% (male 113,299/female 167,519) (2010 est.)
- **Life Expectancy at Birth:** Total population: 38.86 years; male: 38.77 years; female: 38.95 years (2010 est.)
- **Infant Mortality Rate:** Total: 99.92 deaths/1,000 live births; male: 104.67 deaths/1,000 live births; female: 95.04 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 80.6%; male: 86.8%; female: 74.8% (2003 est.)
- **GDP:** \$18.5 billion (2009 est.)
- **GDP per Capita:** \$1,500 (2009 est.)

The MOH of the Republic of Zambia is working to support the execution of the existing National Response Plan (NRP) for Avian Influenza and to complement ongoing and planned AI activities funded by other donors and technical agencies.

The influenza surveillance cooperative agreement with the Influenza Division will complement ongoing initiatives by strengthening public health laboratory and surveillance capacity for ILI and SARI in the country. Moreover, the project will contribute to strengthen rapid response and infection control capacity of the country through potential outbreaks of AI and other emerging and reemerging infectious diseases. The project will be implemented by the University Teaching Hospital (UTH) and the Lusaka District Health Office (LDHO) on behalf of the MOH and in close collaboration with CDC-Zambia, CDC-South Africa, the National Institute for Communicable Diseases (NICD-South Africa), and the WHO.

The project under the cooperative agreement aims to support national efforts to address a possible pandemic of AI from a disease prevention and control standpoint. In addition, the project intends to address preparedness for possible other emerging SARI to

- Monitor the emergence of pandemic viruses, including AI in humans.
- Reduce morbidity and mortality from possible emerging respiratory infectious diseases by rapid detection and containment.
- Reduce economic effects and social upheaval or unrest from a pandemic.

## **Current Activities**

- Surveillance and Detection Goal
  - To substantially increase the capacity of the MOH for surveillance and diagnosis of ILI and SARI cases, including seasonal influenza and HPAI in humans.
- Objectives
  - UTH Virology Laboratory will meet requirements to perform molecular biology diagnosis and viral isolation of influenza samples and obtain WHO accreditation as a NIC.
  - Pediatric and adult medicine admission wards at the central referral hospital (UTH) and one outpatient public clinic in Lusaka will effectively implement SARI and ILI surveillance, respectively.
- Response and Containment Goal
  - To substantially increase the capacity of the MOH to adequately respond to potential AI and emerging or epidemic prone diseases.
- Objectives
  - Review all recent influenza outbreaks for lessons learned and outbreak response plans.
  - Update pandemic influenza preparedness plans consistent with NRP and national disaster plans.
  - Train 3 districts in 4 provinces in AI RRT as part of refresher training on emerging and reemerging infectious diseases.
  - Provide infection control training, and provide written standard operating procedures to UTH.
  - Staff pediatric and adult internal medicine admission ward support and designate staff for the selected isolation unit.

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**Eastern  
Mediterranean  
Regional Office  
(EMRO)**



# Eastern Mediterranean Regional Office (EMRO)



## U.S. CDC Direct Regional Support

Strengthening Surveillance and Response to Avian and Pandemic Influenza in the Eastern Mediterranean Region Cooperative Agreement

- Began October 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

The cooperative agreement between EMRO and the U.S. CDC began in October 2006 and is a 5-year project designed to improve influenza surveillance and response in EMRO. The overarching goal is to strengthen the public health capacity of member states in the region to rapidly detect, assess, respond to, and contain public health risks that result from the threats of HPAI and human pandemic influenza. The project is built on the existing partnerships and collaborative arrangements in EMRO between WHO, FAO, the United Nations Children's Fund (UNICEF), and the World Food Program (WFP) on regional preparedness and response for human pandemic influenza.

This crosscutting project involves multiple focal points in EMRO. A regional task force representing 12 different technical units in the regional office is supporting the Communicable Diseases Surveillance, Forecasting, and Response Unit to implement this 5-year project. The overall objectives of the project are to strengthen the emergency preparedness and risk

communication capacity of EMRO member states to respond to HPAI and pandemic human influenza.

- Enhance the surveillance capacity of member states to detect HPAI, as well as seasonal human influenza and ILI.
- Accelerate member states' ability to respond rapidly and contain HPAI outbreaks in EMRO areas.

Since October 2006, the operational plans for year 1 (2007), year 2 (2008), and year 3 (2009) have been implemented in collaboration with U.S. CDC, other United Nations (UN) agencies, and the NAMRU-3, a WHO collaborating center for emerging diseases. As part of this ongoing project, EMRO developed a regional strategic plan for implementing a global strategy for avian influenza and human pandemic influenza to complement national efforts and enhance the capacity of the member states to respond rapidly and effectively to pandemic influenza. The regional plan encourages member states to

- Ensure adequate stockpiling of antiviral drugs.
- Promote the use of appropriate nonpharmaceutical interventions (e.g., avoidance of crowding, promotion of personal hygiene).
- Promote and support activities in operational and epidemiologic research to improve knowledge of risk factors for spread of influenza.
- Examine the ethical dimensions of enforced quarantine or compliance with other recommended measures.

The specific objectives of this project and grant are as follows:

- Support development of intersectoral collaboration and cooperation among organizations (e.g., FAO and the World Organization for Animal Health [OIE], UNICEF, WFP, and other UN agencies) and other partners, such as NAMRU-3, and maintain a standing committee to deal with zoonotic diseases, in general, and avian influenza, in particular, and strengthen the regional office capacity in veterinary health.
- Increase the level of awareness and commitment of policy and decision makers and identify clear national lines of leadership with clear terms of reference (TOR) for implementation of national pandemic preparedness plans.
- Ensure that public health authorities work closely with animal health and other related sectors, both private and public.
- Promote intersectoral and intrasectoral planning activities between different ministries and related stakeholders to develop and implement national preparedness plans for avian influenza and human pandemic influenza.
- Ensure full transparency and timely exchange of information related to confirmed cases of avian influenza and human pandemic influenza.
- Support countries in revising, updating, and activating their national pandemic influenza preparedness plans so they are ready when needed.

- Support countries to build their public health capacities to conduct epidemic or pandemic risk assessments for any novel influenza virus on the basis of epidemiologic, virologic, and clinical evidence.
- Help countries build their epidemiologic and laboratory surveillance capacities for early detection, rapid response, and containment of any cases or cluster of cases resulting from HPAI virus or any novel strain of influenza virus having pandemic potential.

## **Notable Achievements, 2009**

### **Surveillance**

- Technical assistance was provided to 8 member states to set up sentinel surveillance system for ILI and SARI.
- An IATA licensing workshop on the shipment of infectious substances, including influenza specimens and virus isolates, was organized to support all member states to improve biosafety and biosecurity practices for the shipment of infectious substances and dangerous pathogens by using standardized IATA guidelines and other international procedures.
- A weekly epidemiologic report for influenza surveillance was published regularly to inform all member states of the current and ongoing infectious disease outbreaks in the region, particularly those caused by HPAI and novel influenza virus.
- Logistic support was provided to all member states for proper collection, transport, and shipment of biologic specimens, including influenza virus isolates and patient specimens of suspected H5N1 virus.
- Technical missions were conducted in 8 member states to assess and review the ongoing seasonal influenza surveillance programs in these countries.
- Technical assistance was provided to 4 member states to set NICs.

### **Preparedness**

- A guidance document for developing tabletop simulation exercise on pandemic influenza was developed for the member states by EMRO through a consultative process. Technical support also was provided to 8 member states to conduct tabletop simulation exercise on pandemic influenza.
- Technical missions were conducted in 6 member states to assess national pandemic preparedness plans.
- An intercountry workshop on risk communication for pandemic influenza was organized to help all member states develop their own pandemic risk communication strategies for influenza.
- Multilingual (i.e., Arabic, French, English) illustrative posters, video clips, and radio messages were developed for infection control in public places, community mitigation measures in academic settings, and patient care in health care settings.
- A consultative meeting was organized on health systems preparedness for pandemic influenza to help all member states improve the surge capacity of their health systems.

## **Training**

- A national training course on avian influenza outbreak and containment of human pandemic influenza was organized in 4 member states.
- Two subregional training workshops were organized on infection control practices in health care settings for epidemic and acute respiratory infections with pandemic potential.
- An intercountry training workshop on the use of PCR techniques for the diagnosis of H5N1 influenza virus was organized. The workshop supported all member states to build and strengthen their capacity to use PCR techniques to detect subtype influenza A viruses, including influenza A (H5N1), and to promote good laboratory practices and laboratory safety.

## **H1N1 Activities, FY 2009**

- An intercountry training workshop on management of public health risk following disasters and public health emergencies, including pandemic influenza, was organized for all 22 member states.
- An interim guidance on clinical management of pandemic 2009 H1N1 influenza infection was developed for EMRO through a consultative process.
- An intercountry training workshop on the use of PCR techniques to diagnose and detect 2009 H1N1 influenza was organized to support all member states to build their capacity to diagnose 2009 H1N1 influenza.
- Orientation sessions were organized for the media on the dynamics and transmission of pandemic 2009 H1N1 influenza virus infection.
- An interim guidance on community mitigation measures for schools and other academic settings for pandemic 2009 H1N1 influenza virus infection was developed for EMRO through a consultative process.
- A consultative meeting was organized on health systems preparedness for pandemic influenza to support all member states to improve the surge capacity of health systems for pandemic 2009 H1N1 influenza virus infection.

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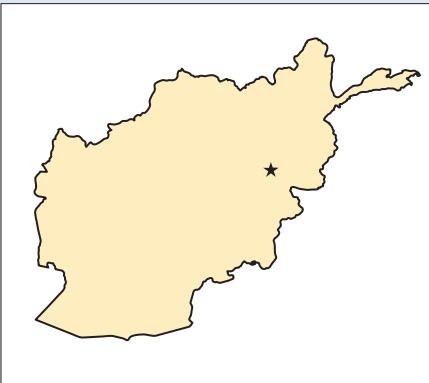
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# Eastern Mediterranean Region

## Afghanistan



- **Capital:** Kabul
- **Area:** 647,500 sq km
- **Population:** 29,121,286
- **Age Structure:** 0–14 years: 44.6% (male 7,474,394/female 7,121,145); 15–64 years: 53% (male 8,901,880/female 8,447,983); 65 years or older: 2.4% (male 383,830/female 409,144) (2008 est.)
- **Life Expectancy at Birth:** Total population: 44.21 years; male: 44.04 years; female: 44.39 years (2008 est.)
- **Infant Mortality Rate:** Total: 154.67 deaths/1,000 live births; male: 158.88 deaths/1,000 live births; female: 150.24 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 28.1%; male: 43.1%; female: 12.6% (2000 est.)
- **GDP:** \$26.29 billion (2008 est.)
- **GDP per Capita:** \$800 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began 2006.
- FY 2009 was the 4th year of the cooperative agreement.

The Islamic Republic of Afghanistan is a nation recovering from decades of conflict and an economic collapse that has left the country extremely poor and lacking essential systems and infrastructure. The Afghan Public Health Institute (APHI) of the Afghanistan MOH was dormant during the years of conflict. Funding from this cooperative agreement supports APHI to plan and conduct pandemic preparedness and response, ILI surveillance, and health education and training activities, as well as to build laboratory capacity.

### Surveillance

- The Disease Early Warning System (DEWS) collects information on 15 reportable diseases, including ILI.
- DEWS includes 154 sentinel surveillance sites covering all 34 provinces in the country.
- There is a daily reporting system for all provincial and regional hospitals.
- Sentinel surveillance sites were established at military and police hospitals.

- During the first 6 months of 2009, DEWS detected 6 suspected outbreaks of avian influenza; all outbreaks were investigated, and none were found to be H5N1.
- There were 12 suspected human cases of H5N1; however, upon further testing, none were found to be positive.
- The influenza and polio surveillance systems in each country were functionally integrated to detect and respond to clusters.

## **Laboratory**

The virology laboratory at the Central Public Health Laboratory was recognized by WHO as the NIC in April 2009.

- A total of 559 specimens of influenza (ILI, avian influenza [AI], and pandemic 2009 H1N1 influenza) were collected from different parts of the country for testing, with isolation of virus from 2 specimens.

## **Preparedness**

- New guidelines for H1N1 surveillance and case management were developed, and these guidelines were translated, printed, and distributed to health care workers.
- Five thousand capsules of oseltamivir were distributed to each region, enough for treatment of 500 severe cases of influenza.
- Five hundred PPE kits were distributed in each region. These kits include a surgical mask and gown, gloves, boot covers, and a head cover.
- Preparedness workshops were conducted for religious leaders, teachers, the media, and 800 health care workers.
- A command and control center was established, and 3 hotline numbers are available to the public.

## **Training**

- Refresher training was conducted for rapid response teams from 13 provinces.
- In the first 6 months of 2009, 13 workshops and training programs were conducted on AI, pandemic 2009 H1N1 influenza, epidemiology, surveillance, pandemic planning, advocacy for pandemic response, and data management.

## **H1N1 Activities, FY 2009**

- Laboratory capacity for the diagnosis of pandemic 2009 H1N1 influenza was strengthened through monitoring and additional training.
- The first case of pandemic 2009 H1N1 influenza was detected in the NIC by using the H1N1 miniature RNA kit provided by U.S. CDC.

## **Notable Achievements, 2009**

- A pandemic action plan for the health sector was developed and prepared with the cooperation of all health sector stakeholders; the plan was finalized in February 2009 and endorsed by the MOH.
- The Afghan Central Public Health Laboratory received WHO recognition as a NIC in April 2009.
- New guidelines for H1N1 surveillance and case management have been developed and the guidelines were translated, printed, and distributed to health care workers.

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# Eastern Mediterranean Region

## Arab Republic of Egypt



- **Capital:** Cairo
- **Area:** Total: 1,001,450 sq km
- **Population:** 80,471,869 (July 2010 est.)
- **Age Structure:** 0–14 years: 32.8% (male 13,495,577/female 12,890,378); 15–64 years: 62.8% (male 25,689,588/female 24,871,255); 65 years or older: 4.4% (male 1,602,219/female 1,922,852) (2010 est.)
- **Life Expectancy at Birth:** Total population: 72.4 years; male: 69.82 years; female: 75.1 years (2010 est.)
- **Infant Mortality Rate:** Total: 26.2 deaths/1,000 live births; male: 27.84 deaths/1,000 live births; female: 24.48 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 71.4%; male: 83%; female: 59.4% (2005 est.)
- **GDP:** \$471.2 billion (2009 est.)
- **GDP per Capita:** \$6,000 (2009 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza Cooperative Agreement

- Began August 2009.

In Egypt's MOH, officials in the Preventive Sector have outlined the following 3 goals to guide efforts to build capacity to detect, prepare, and respond to a potential influenza pandemic:

- Prevent the emergence and spread of a pandemic influenza virus.
- Reduce morbidity and mortality caused by a pandemic influenza virus.
- Improve the state of preparedness and the quality of response to an influenza pandemic.

The MOH proposes the following activities under each of the major components:

#### Surveillance

- Improve laboratory capacity and infrastructure for influenza surveillance.
- Enhance epidemiology capacity and infrastructure for disease surveillance.
- Develop or enhance the integrated epidemiologic surveillance network for influenza.
- Develop or expand comprehensive, territory-wide surveillance for cases and clusters of respiratory and febrile illnesses that could represent new pandemics.

## **Laboratory**

- Develop or expand sentinel, laboratory-based surveillance for SARI.
- Develop or enhance the integrated laboratory surveillance network for influenza.

## **Preparedness**

- Update national public health preparedness plans.
- Develop communication plans, risk messages, and products.

## **Training**

- Develop and implement pandemic preparedness training courses as a pilot in 2 governates.
- Train rapid response teams at the governate and district levels.
- Train hospital workers on infection control practices.

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# **Eastern Mediterranean Region**

## **GDD-Egypt**

Established in 2006, the Global Disease Detection Regional Center in Egypt (GDD-Egypt) began as an extension of an established agreement between the U.S. CDC, WHO-EMRO, and NAMRU-3 to develop national and regional resources to control and combat infectious diseases that are the leading causes of death, disability, and illness in the region. The center is located on the NAMRU-3 campus.

### **Coverage**

GDD-Egypt has provided support to more than 20 countries in AFRO, EMRO and EURO from its base at NAMRU-3. It is also the platform for much of U.S. CDC's public health support to Iraq and Afghanistan. GDD-Egypt benefits from access to state-of-the-art laboratory facilities, including BSL-3 space from NAMRU-3. Egypt and the United States also work together to conduct joint surveillance activities, such as performing timely laboratory confirmation and pathogen discovery and training public health leaders in field epidemiology.

### **Activities**

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

### **Effect**

In 2009, GDD-Egypt responded to and provided laboratory support for 17 outbreaks. GDD-Egypt officials also discovered a pathogen new to the region and increased their laboratory testing capacity fourfold. In addition, the center expanded the skills of more than 800 participants through short-term regional and national training courses.

### **In-Country Field Staff**

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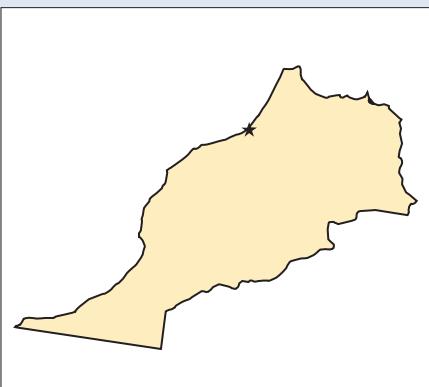
### **Principal U.S. CDC Program Collaborations In-Country**

- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FETP.
- Laboratory Systems and Biosafety.



# Eastern Mediterranean Region

## Morocco



- **Capital:** Rabat
- **Area:** 446,550 sq km
- **Population:** 31,627,428
- **Age Structure:** 0–14 years: 30.5% (male 5,337,322/female 5,136,156); 15–64 years: 64.3% (male 11,015,409/female 11,069,038); 65 years or older: 5.2% (male 765,882/female 1,019,412) (2008 est.)
- **Life Expectancy at Birth:** Total population: 71.52 years; male: 69.16 years; female: 74 years (2008 est.)
- **Infant Mortality Rate:** Total: 38.22 deaths/1,000 live births; male: 41.74 deaths/1,000 live births; female: 34.53 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 52.3%; male: 65.7%; female: 39.6% (2004 census)
- **GDP:** \$137.4 billion (2008 est.)
- **GDP per Capita:** \$4,000 (2008 est.)

### U.S. CDC Direct Country Support

Strengthening Influenza Surveillance Networks in Morocco Cooperative Agreement

- Began 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

The Kingdom of Morocco's National Institute of Hygiene (NIH) is the NIC and the recipient of the U.S. CDC's cooperative agreement for influenza surveillance. U.S. CDC provides the only foreign funds for influenza surveillance in Morocco.

### Surveillance

- SARI surveillance is functional in 15 regions around the country.
- ILI surveillance is functional in 15 regional health units and includes 110 private physicians.
- SARI surveillance is conducted in 15 regional hospitals.
- The NIC received samples from 1,299 SARI and ILI cases in 2009. Thirty-two specimens were sent to the reference laboratory in London.
- An evaluation of the surveillance system has been conducted and corrective actions are ongoing.
- Fax machines were purchased for private physicians to facilitate the data transmission.

- A Web-based database is operational for data entry, analysis, retrieval, and communication between partners.
- Supervisory visits were made by representatives from the NIC and Epidemiology Surveillance Unit to identify regions that needed assistance to improve surveillance activities.

### **Laboratory**

- Six real-time PCR machines for regional laboratories, an extraction machine, and a sequencing machine were purchased.
- The project regularly orders laboratory consumables for the NIC and regional laboratories.
- The project coordinator attended a U.S. CDC-sponsored serology course and a WHO-sponsored NIC meeting.

### **Preparedness**

The National Public Health Preparedness Plan was updated.

### **Training**

- Laboratory and health professionals have attended data analysis training.
- A 2-day evaluation workshop was held for laboratory directors, regional hospital directors, and representatives from regional health observatories.
- Laboratory professionals received training in microneutralization.

### **Notable Achievements, 2009**

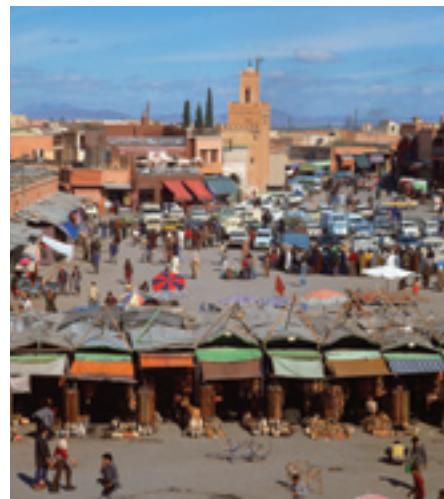
- A major evaluation of the country's influenza surveillance system was undertaken, and recommendations for corrective actions were made.
- The national preparedness plan was updated and distributed.

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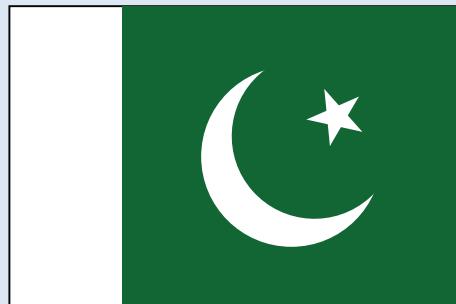
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# Eastern Mediterranean Region

## Pakistan



- **Capital:** Islamabad
- **Area:** 803,940 sq km
- **Population:** 177,276,594 (July 2010 est.)
- **Age Structure:** 0–14 years: 37.8% (male 33,617,953/female 31,741,258); 15–64 years: 58% (male 51,292,535/female 48,921,023); 65 years or older: 4.2% (male 3,408,749/female 3,818,533) (2008 est.)
- **Life Expectancy at Birth:** Total population: 64.13 years; male: 63.07 years; female: 65.25 years (2008 est.)
- **Infant Mortality Rate:** Total: 66.94 deaths/1,000 live births; male: 67.04 deaths/1,000 live births; female: 66.84 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 49.9%; male: 63%; female: 36% (2005 est.)
- **GDP:** \$454.2 billion (2008 est.)
- **GDP per Capita:** \$2,600 (2008 est.)

### U.S. CDC Direct Country Support

Development of Influenza Surveillance Networks Cooperative Agreement

- Began 2004.
- FY 2009 is the 5th year of the cooperative agreement.

This cooperative agreement supports the development and maintenance of laboratory capacities at various sentinel sites in Pakistan to provide means for rapid confirmation of cases of human and pandemic influenza. The funding also supports pandemic influenza preparedness through the improvement of the national influenza surveillance program, planning for prevention and control programs, and developmental of a national vaccine policy.

Pakistan's MOH and NIH have implemented a 5-year, laboratory-based influenza surveillance program with technical assistance from the U.S. CDC. The capacity of the NIH central laboratory has been enhanced, and 1 regional laboratory in each province is being provided the requisite equipment and supplies to process specimens from suspected 2009 H1N1 influenza cases. Despite a delayed start and the country's current sociopolitical situation, significant progress has been made.

## **Surveillance**

Designated the following 5 sentinel sites at the outpatient departments of major tertiary care hospitals in Pakistan's 4 provinces and the federal capital:

- King Edward Medical University (KEMU), Lahore in Punjab Province.
- Civil Hospital, Karachi in Sindh Province.
- Hayatabad Medical Complex (HMC), Peshawar in the North-West Frontier Province (NWFP).
- Bolan Medical Complex (BMC), Quetta in Balochistan.
- Federal Government Services Hospital (FGSH), Islamabad Capital Territory.

These sites were chosen in order to ensure data from all geographic areas of the country. They also represent areas of high population density and facilities with high patient turnover. These sites collected more than 1,018 ILI and 31 SARI samples during FY 2009.



Other surveillance activities included the following:

- Joint MOH-WHO rapid response teams were dispatched to affected areas and districts.
- The country's existing surveillance system was activated to perform case finding, collect samples, and send information to the virology laboratory at the NIH.
- Provincial and regional health departments were asked to strengthen surveillance systems and designate district surveillance officers.

## **Laboratory**

Five BSL-2 laboratories will be set up to conduct influenza surveillance, diagnostic activities, viral isolation, and information-sharing with stakeholders. The NIH laboratory conducts PCR testing, tissue cultures, and HA/HI. The 4 labs in Peshawar, Lahore, Karachi, and Quetta perform real-time PCR.

Viral transport media and swabs were supplied to provincial health departments and all international airports for the collection and transportation of samples from any suspected patients. The laboratory facilities in Lahore and Peshawar are undergoing biosafety enhancements to ensure that they follow the required standards for molecular testing for influenza. The laboratories also have received the equipment and supplies needed to conduct real-time PCR.

Since its establishment, the biosafety-enhanced (BSL-2 plus) influenza laboratory at NIH has developed, standardized, and implemented standard operating procedures (according to U.S. CDC protocols) for several laboratory techniques. As the country's national influenza center, the NIH laboratory participates in internal and external quality assurance surveys conducted by WHO. The laboratory's Public Health Laboratory Division offers a fully functional, standardized facility that can perform tissue cultures, real-time PCR testing, and immunofluorescent assays.

### **Preparedness**

Officials in Pakistan's MOH have taken several steps to prevent and control pandemic influenza in the country, including creation of the National Preparedness Plan for Prevention and Control of Avian and Pandemic Influenza. This plan was developed by the multisectoral National Expert Committee in 2005 and led to implementation of a National Program for Prevention and Control of Avian and Pandemic Influenza. Components of this plan include emergency response, clinical health services, antiviral medicines, vaccine, containment and quarantine, communication, and staffing issues.

Through its laboratory surveillance activities, officials in Pakistan's NIH monitor the global influenza pandemic situation daily. The NIH also is receiving technical support from WHO, NAMRU-3, and the U.S. CDC.

Specific steps taken for surveillance of human cases were

- Immediate dispatching of joint MOH-WHO rapid response teams to affected areas and districts.
- Strengthening of NIH laboratory capacity to conduct viral culture, subtyping, and molecular (PCR) testing.
- Activating the country's existing surveillance system for case finding, sample collection, and transportation to the virology laboratory at the NIH.
- Activating district-level monitoring and response committees overseen by district coordination officers for avian influenza.
- Distributing viral transport media to provincial health departments and all international airports for the collection and transportation of samples from any suspected patients.



General steps taken for surveillance of human cases were as follows:

- Joint steering committees were established at the federal level, with the federal ministers for health and food, agriculture, and livestock serving as cochairmen.
- Joint committees were established at district levels under the epidemiology district officer, the medical superintendent at District Headquarters Hospital, the agriculture and livestock district officers, an officer from the wildlife department, the deputy director of the information department, and a representative from the district finance department.
- The national reference BSL-3 laboratory at NIH is in its final phases of construction.
- The MOH has registered the antiviral medicines that are known to be effective against influenza, and 13 local pharmaceutical companies have shown interest in manufacturing generic versions of oseltamivir (Tamiflu).
- Public health specialists from provincial health departments have been added to the rapid response teams of the ministries of food, agriculture, and livestock.
- National and international collaborative links have been established among the MOH and international stakeholders such as WHO and the U.S. CDC.
- Standard operating procedures for surveillance and rapid response for cases of pandemic influenza have been circulated to the provincial health departments of Punjab, Sindh, NWFP, and Balochistan and to the regional health departments of the Azad State of Jammu and Kashmir (AJK).
- Standard operating procedures for collection, storage, and transportation of specimen from suspected cases of influenza have been developed.
- The national influenza project sent information about PPE standards to the provincial health departments, Islamabad Capital Territory, AJK, Federally Administered Northern Areas, and Federally Administered Tribal Areas.
- Antiviral medicines such as oseltamivir (Tamiflu) were sent from the national level to high-risk districts throughout Pakistan. Oseltamivir (Tamiflu), other antiviral medicines, and seasonal influenza vaccine were procured for staff engaged in seasonal, swine, and avian influenza surveillance.



## **Training**

Several physicians, public health professionals, and laboratory personnel were trained through a program designed specifically for this project. Activities focused on providing rapid response training for officials involved in outbreak response activities. In 2009,

- Five exercises were conducted, with 46 people trained.
- Five trainings for sentinel site physicians were conducted, with 42 participants.
- Ten laboratory staff from all sites and provinces attended PCR training.
- A national seminar on influenza and a workshop on quality control are planned for the next quarter.
- Public health and health care professionals were trained how to conduct surveillance of human cases and how to use PPE through the FELTP in Pakistan.

## **Notable Achievements, 2009**

- Health education materials and forms were produced.
- The biosafety enhanced laboratory at NIH is fully functional to pick up pandemic 2009 H1N1 influenza cases. The federal monitoring cell at NIH is monitoring the situation constantly.
- Consistent information-sharing with GISN and 100% evaluation results or scores in (EQAP) from WHO for seasonal, avian, and swine influenza.
- Press and media communication on regular basis.
- All sentinel sites at FGSH, KEMU, HMC, BMC and CHK are operational after basic orientation training of physicians and medical personnel for collection of epidemiologic data and samples from ILI and SARI cases.
- Sentinel site virologic specimens and epidemiologic data are shipped to NIH by courier.
- Rapid response teams have been reorganized and activated for timely response.

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# **European Regional Office (EURO)**



# European Regional Office (EURO)



## U.S. CDC Direct Regional Support

Surveillance and Response to Avian and Pandemic Influenza by Regional Offices of WHO Cooperative Agreement

- Armenia.
- Georgia.
- Kazakhstan.
- Moldova.
- Romania (through WHO-EURO).
- Ukraine (through Program Appropriate Technology in Health [PATH]).

WHO-EURO works in coordination with the European Centers for Disease Control (ECDC) to support the implementation of public health programs in the region's 53 member states. These member states are located in Eastern and Western Europe, the Caucasus region, and Central Asia.

The U.S. CDC currently has an influenza advisor assigned to the ECDC, which is located in Stockholm, Sweden. During 2009, U.S. CDC placed an epidemiologist in WHO-EURO in Copenhagen, Denmark. Placement of the epidemiologist in the region will provide critical

support to the WHO-CDC mission to support influenza surveillance and response activities in the region.

WHO-EURO and U.S. CDC are collaborating on the implementation of a coordinated plan to improve laboratory capacity in member state NICs. This capacity is needed to detect and respond to outbreaks of novel influenza and other pathogens with pandemic potential in humans and to support pandemic planning and containment efforts in the region. WHO-EURO and U.S. CDC coordinate closely to implement influenza surveillance and pandemic activities in Armenia, Georgia, Kazakhstan, Moldova, Romania, and Ukraine.

### **Surveillance**

- Peer-reviewed seasonal influenza surveillance guidelines were developed and published jointly by WHO-EURO and U.S. CDC. (See [www.euro.who.int/document/e92738.pdf](http://www.euro.who.int/document/e92738.pdf).)
- Thirteen countries received technical assistance and support to submit epidemiologic and virologic data into the WHO-EURO regional surveillance platform.
- A regional platform for influenza surveillance that includes databases with information on the capacities of EU countries was established and expanded from 29 to 53 countries.
- A LabNet meeting for NICs in Commonwealth of Independent States (CIS) and South Eastern Europe (SEE) countries was conducted jointly with epidemiologists responsible for influenza at the national level.
- The restructuring of the WHO-EURO Communicable Disease Section's influenza Web site was completed and expanded to include a section on pandemic 2009 H1N1 influenza.

### **Laboratory**

An intercountry workshop on strategies for improving laboratory quality as part of the implementation of IHR core capacities was conducted.

### **Preparedness**

- Two pandemic preparedness workshops were conducted; 12 CIS countries attended 1 workshop, and 9 SEE countries attended the other.
- Pandemic working groups were established for CIS and SEE countries.
- Three field missions were deployed for outbreak containment.

### **Training**

- Hands-on training in biosafety was conducted for senior laboratory staff from national influenza laboratories in 12 CIS countries.
- IHR-related laboratory management training was conducted for 3 countries.
- Two subregional alert and response training sessions were conducted for the Baltic States and SEE countries.

## **H1N1 Activities, FY 2009**

- A regional meeting was held in August 2009 to discuss current knowledge of 2009 H1N1 influenza and review and reinforce strategies for surveillance.
- WHO-EURO coordinated pandemic communications with WHO country offices, the European Commission, the ECDC, and other EU agencies and partners.
- Nonpharmaceutical social distancing control measures were reviewed.
- 2009 H1N1 influenza kits and other reagents and supplies developed by U.S. CDC were distributed to countries in support of pandemic response efforts.

## **Notable Achievements, 2009**

- Launch of the influenza surveillance platform for all 53 WHO member states.
- Publication of WHO-EURO guidance for influenza surveillance in humans.
- Distribution of laboratory kits to member states after emergence of the pandemic 2009 H1N1 influenza.
- Regional meeting for 25 member states on the response to the pandemic 2009 H1N1 influenza in Copenhagen.

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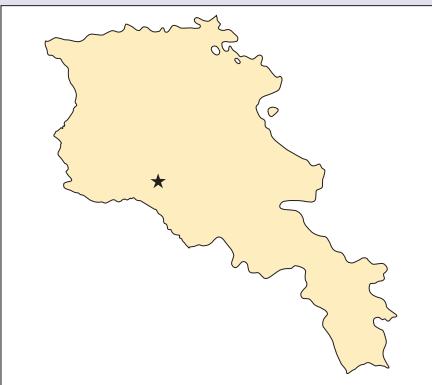
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# European Region

## Armenia



- **Capital:** Yerevan
- **Area:** 29,743 sq km
- **Population:** 2,966,802 (July 2010 est.)
- **Age Structure:** 0–14 years: 18.7% (male 296,401/female 259,594); 15–64 years: 70.3% (male 975,438/female 1,111,989); 65 years or older: 11% (male 128,398/female 196,766) (2008 est.)
- **Life Expectancy at Birth:** Total population: 72.4 years; male: 68.79 years; female: 76.55 years (2008 est.)
- **Infant Mortality Rate:** Total: 20.94 deaths/1,000 live births; male: 25.82 deaths/1,000 live births; female: 15.33 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 99.4%; male: 99.7%; female: 99.2% (2001 census)
- **GDP:** \$19.6 billion (2008 est.)
- **GDP per Capita:** \$6,600 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza by National Health Authorities Outside the U.S. Cooperative Agreement

- Began 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Since 2006, Armenia has been funded to enhance influenza surveillance and laboratory capacity to improve capabilities to respond to avian and pandemic influenza outbreaks. The State Hygiene and Anti-Epidemic Inspectorate (SHAEI) of the MOH in Armenia has project goals that focus on developing appropriate laboratory and diagnostic capacity to rapidly detect suspect cases of avian, seasonal, and pandemic influenza. In addition, project goals include strengthening epidemiologic surveillance capacity at all levels of government, including local and border sanitary quarantine posts.

### Surveillance

During 2008–2009, the following activities were implemented under the epidemiology capacity and infrastructure component of the surveillance and response to avian and pandemic influenza grant project:

- With the support of local experts (i.e., epidemiologists, infectious disease specialists, and virologists), guidance on influenza laboratory diagnostic testing was developed.

- Roles and responsibilities were defined for notification, recording, and reporting of influenza laboratory test results, as well as for the regimen and scheme required for packaging, shipping, and transporting influenza specimens from sentinel sites from the PCR laboratory in Lori Marz (i.e., the Northern region of Armenia) to the AI reference laboratory at the CDC MOH (Yerevan).
- Roles and responsibilities of medical doctors, epidemiologists, and nurses working at sentinel sites were defined according to the influenza epidemiologic surveillance scheme and surveillance standard, including those related to notification, recording, reporting, and sampling. These standards are based on the surveillance standard and protocol for investigating cases and clusters.
- Medical doctors, epidemiologists, and nurses were identified and enrolled at sentinel sites in Lori Marz and Yerevan.
- All sentinel medical doctors, epidemiologists, and nurses from Lori Marz and Yerevan were trained on influenza epidemiologic surveillance scheme and surveillance standards, including case definitions, roles and responsibilities, notification, recording, reporting, and sampling. Sentinel surveillance is being piloted at 2 sites.
- Guidance on how to conduct a sentinel surveillance system was adopted by the Republic of Armenia's MOH.
- Regulations on the exchange of information about cases of animal and human diseases among the MOH, the Ministry of Agriculture, and the Ministry of Ecology (including reporting forms) was adopted by the Armenian government.
- A small library of scientific periodicals was established, with approximately 100 volumes on public health, epidemiology, and virology in English and Russian.

## **Laboratory**

The sentinel surveillance network consists of the following 3 laboratories:

- CDC-MOH (Yerevan).
- Expert center of the State Hygiene and Anti-Epidemic Inspectorate (SHAEI) of Lori Marz (Vanadzor, Armenia), which was renovated and equipped under this project.
- Expert center of the SHAEI of Syunik Marz (Kapan, Armenia), which is not fully equipped yet. It is being equipped through donations from Austria and should be operational in 2010.

The PCR Laboratory of Nork Infection Hospital of the MOH (Yerevan, Armenia) has no real-time PCR equipment, only an open system, and it is not yet part of the influenza sentinel network.

During FY 2008–2009, the following activity was implemented under the laboratory capacity and infrastructure component of the Surveillance and Response to Avian and Pandemic Influenza Grant Project:

- The PCR open system of the Lori Marz SHAEI laboratory was reequipped with a new real-time PCR and necessary accessories to improve and enhance the sentinel surveillance system.

## **Preparedness**

The preparedness plan for pandemic influenza was adopted by the Armenian government.

## **Training**

- Training on how to conduct influenza PCR diagnosis with the LightCycler 480 Instrument II (Roche Diagnostics) was provided for 2 virologists from Lori Marz in August 2009. This training was performed at the PCR Laboratory of the expert center of the SHAEI of Lori Marz and consisted of theoretical and practical applications.
- Training on PCR diagnosis of avian and seasonal influenza and other viral diseases was conducted for 8 PCR laboratory specialists from CDC MOH (Yerevan), Lori Marz, Syunik Marz, and Nork Infectious Clinical Hospital PCR laboratories (each facility sent 2 people). This training consisted of theoretical and practical applications and was performed at the CDC-MOH (Yerevan).
- Four days of training on the introduction of an influenza sentinel pilot system in Yerevan, Vanadzor, and Lori Marz was conducted for 47 doctors from 6 hospitals (4 hospitals from Yerevan, 1 hospital from Vanadzor, and 1 hospital from Lori Marz).

## **H1N1 Activities, FY 2009**

- Since August 2009, project team members have participated in regular weekly meetings of the multilateral task force on 2009 H1N1 influenza at the MOH.
- Sanitary quarantine control was strengthened on the frontier, particularly in the following locations: Zvartnots International Airport (Yerevan), Shirak Airport (Gyumri, Shirak Marz), Bavra (Shirak Marz, border with Georgia), Gogavan-Privolnoe (Lori Marz, border with Georgia), Ajrum-Jiliza (Tavush Marz, border with Georgia), Bagratashen (Tavush Marz, border with Georgia), and Meghri (Syunik Marz, border with Islamic Republic of Iran).
- Staff of the Sanitary Quarantine Post (SQP) in Zvartnots International Airport (Yerevan) implemented the thermoscreening of all passengers arriving from other countries. All passengers filled out the Public Health Passenger Locator Card and provided it to the SQP staff.
- Public awareness activities were undertaken, including distribution of practical guidance and advice for the public. These materials were posted on the MOH Web site.



## **Notable Achievements, 2009**

- The PCR laboratories at CDC-MOH (Yerevan) and Lori Marz are operational.
- The sentinel surveillance scheme was adopted, staff were trained, and pilot programs were launched at 2 sentinel sites.
- Regulations on the exchange of information about cases of animal and human diseases among the MOH, the Ministry of Agriculture, and the Ministry of Ecology (including reporting forms) was adopted by the Armenian government.



## **Special Influenza Project**

World Bank Avian Influenza Preparedness

- Procured 16,000 doses of vaccine against seasonal influenza for the 2008–09 influenza season.
- Implemented vaccination protocol among populations at high risk, such as members of rapid response teams, physicians, pediatricians, family doctors, nurses, workers implementing border control, workers on battery farms, zoo workers, ornithologists, and children aged 6–7 years living in a territory where wild birds settle.
- Constructed, renovated, and equipped the following sanitary quarantine border posts on northern and southern parts of the frontier of Armenia (AIP Project by World Bank):
  - Zvartnots International Airport (Yerevan).
  - Shirak Airport (Gyumri, Shirak Marz).
  - Bavra (Shirak Marz).
  - Gogavan-Privolnoe (Lori Marz).
  - Ajrum-Jiliza (Tavush Marz).
  - Bagratashen (Tavush Marz).
  - Meghri (Syunik Marz).

- Provided Internet connections to the following SHAEI centers to allow these sites to interact with the influenza surveillance network:
  - Central office of the SHAEI of the MOH.
  - Regional center of the SHAEI of Aragtsotn Marz (Ashtarak).
  - Regional center of the SHAEI of Armavir Marz (Armavir).
  - Regional center of the SHAEI of Ararat Marz (Artashat).
  - Regional and intraregional centers of the SHAEI of Syunik Marz (Megri, Goris, Kapan).
  - Regional and intraregional centers of the SHAEI of Kotayk Marz (Abovyan, Hrazdan).
  - Intraregional centers of the SHAEI of Gegharkunik Marz (Chambarak, Vardenis).
  - Regional center of the SHAEI of Shirak Marz (Gjumri).
  - Regional center of the SHAEI of Vajots Dzor (Vayq).
  - Regional center of the SHAEI of Lori Marz (Vanadzor, Tashir, Alaverdi). Nork Infection Hospital.

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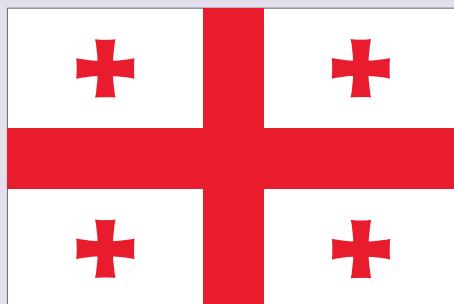
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# European Region

## Republic of Georgia



- **Capital:** Tbilisi
- **Area:** 69,700 sq km
- **Population:** 4,600,825 (July 2010 est.)
- **Age Structure:** 0–14 years: 16.3% (male 402,961/female 352,735); 15–64 years: 67.1% (male 1,496,802/female 1,610,725); 65 years or older: 16.6% (male 307,795/female 459,823) (2008 est.)
- **Life Expectancy at Birth:** Total population: 76.51 years; male: 73.21 years; female: 80.26 years (2008 est.)
- **Infant Mortality Rate:** Total: 16.78 deaths/1,000 live births; male: 18.81 deaths/1,000 live births; female: 14.48 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 100%; male: 100%; female: 100% (2004 est.)
- **GDP:** \$22.93 billion (2008 est.)
- **GDP per Capita:** \$5,000 (2008 est.)

### U.S. CDC Direct Country Support

Surveillance and Response to Avian and Pandemic Influenza by National Health Authorities Outside the United States Cooperative Agreement

- Began 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

### Surveillance

- A total of 1,382 samples were received at the National Influenza Laboratory (NIL) from 1,371 cases of ILI. Of these samples, 688 were tested by rapid-test, 78 were positive for influenza A, and 74 were positive for influenza B.
- A total of 1,190 samples were tested by real-time RT-PCR. Of these samples, 28 were positive for pandemic 2009 H1N1 influenza, 5 were positive for seasonal A/H1 influenza, 34 were positive for A/H3 influenza, and 31 were positive for influenza B.
- Twenty-five influenza isolates cultivated on Madin-Darby canine kidney (MDCK) cells were tested by HI/HA. One was seasonal A/H1 influenza, 8 were A/H3 influenza, and 16 were influenza B.

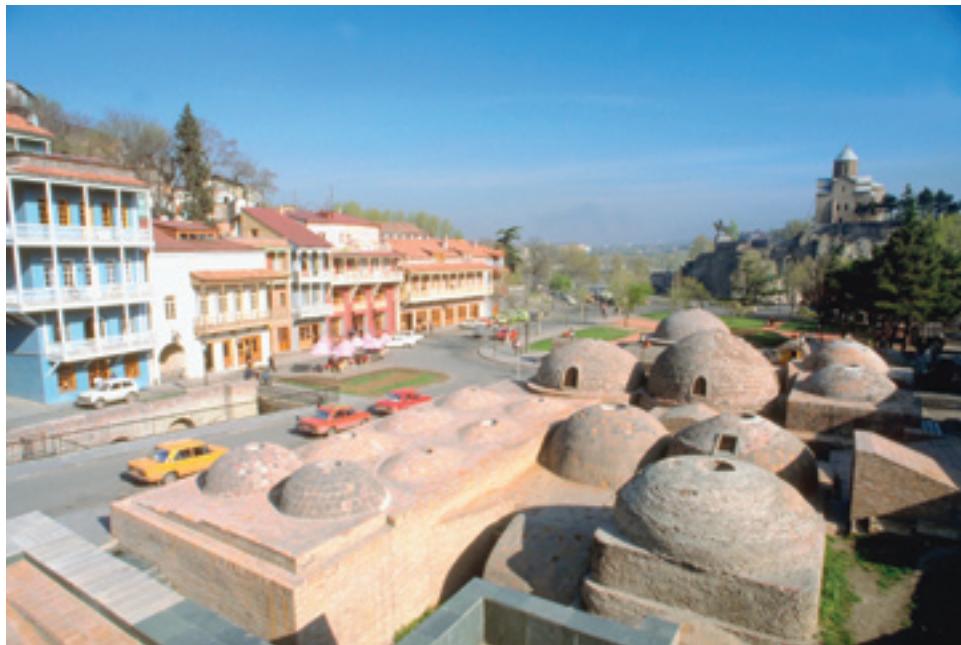
In May 2009, officials in the Republic of Georgia conducted the first round of monitoring of the influenza surveillance system. One objective of this monitoring was to evaluate awareness about influenza and pandemic 2009 H1N1 influenza among health care providers. The data obtained will allow project staff to prepare training materials that include all information

relevant to these issues. A second round of monitoring was conducted in September 2009 and showed that health care providers had satisfactory knowledge about 2009 H1N1 influenza. During the 2 rounds of monitoring, 50 health care facilities were visited. The quality of registration and notification has increased significantly since 2007, when monitoring was first established to maintain the national surveillance network.

Data received from an evaluation survey of issues related to the diagnostic, registration, and reporting system for influenza and acute infections of the upper respiratory tract in Georgia were analyzed in FY 2009. As a result of this analysis, negotiations about what changes should be made to the country's influenza surveillance system are ongoing. The data also were used to develop recommendations and guidelines to address existing gaps in the system. New recommendations and guidelines will be published in FY 2010.

Other surveillance activities during FY 2009 included the following:

- The rapid response team in Georgia conducted several case investigations involving SARI.
- Necessary equipment and supplies were purchased and distributed to 8 sentinel sites.
- Since May 2009, an additional sentinel site was established at a large outpatient clinic in Tbilisi. NIL receives about 60 samples weekly from this site.



## Laboratory

- By April 2009, the NRL at Georgia's National Center for Disease Control and Public Health (NCDC) was provided with all necessary reagents and supplies for laboratory functions during routine surveillance and pandemic circumstances.
- Reagents were procured to conduct differential diagnostics for influenza viruses.

- Additional primers for other respiratory infections were acquired, and the NCDC's NIL can now conduct differential diagnostics for other respiratory infections.
- During 2009, the NRL sent 2 additional laboratory technicians for international training on influenza testing techniques. The technicians are working under contract for the project, and their contracts were extended to the 3rd budget year.
- Because of military operations in Georgia in August 2008, the Project Management Unit (PMU) could not take part in a meeting in Cairo. Instead, staff members from the PMU visited the U.S. CDC to familiarize themselves with materials from the Cairo meeting and to consider project plans.
- In addition, PMU staff members were able to learn about U.S. CDC's organization and structure, discuss existing problems with Georgia's surveillance system, learn more about the U.S. surveillance system, visit U.S. CDC's influenza laboratory, and receive recommendations about laboratory equipment.
- Diagnostics were conducted in BSL-2 laboratories equipped by the Threat Agent Detection and Response Project, with virology and PCR diagnostics performed only for special cases. The number of samples tested by PCR was increased because the efficacy of virology testing is significantly low and time-consuming.
- Because the PCR machine at the NRL is in use almost continuously, officials found space to accommodate a second machine. Other necessary equipment also was purchased as part of the U.S. CDC project.
- Because of the occurrence of pandemic 2009 H1N1 influenza, funds were redirected to pay for developing and printing training materials about the emergency of the new pandemic. Materials were developed to increase awareness of health care providers throughout the country.
- Trainings on how to control pandemic influenza and use PPE were conducted for 1,000 health care providers in all 63 districts of Georgia.

## **H1N1 Activities, FY 2009**

Officials conducted a case investigation of the first cluster outbreak of pandemic 2009 H1N1 influenza, with the following results:

- On July 30, 2009, a member of a Georgian dance group returning from Western Europe was confirmed to have 2009 H1N1 influenza.
- Project staff investigated transmission of influenza within the dance group and with their close contacts upon return to Georgia. A standardized questionnaire was used to collect information on age, symptoms, and health practices.
- Five cases were confirmed, and 8 probable case-patients were suspected to have 2009 H1N1 influenza virus (13 of 35 group members, attack rate (AR) = 37%; 1 of 37 in-country contacts, AR = 3%). The first probable case-patient developed symptoms on July 20, 2009, during the tour. The age distribution of the case-patients was 10–18 years; none of 30 adults (4 group members and 26 in-country contacts) was affected.

- Common symptoms of case-patients were fever more than 38°C (70%), cough (35%), sore throat (35%), runny nose (35%), and headache (29%).
- Surveillance also revealed that 93% of all case-patients had practiced limited handwashing during the tour, and all had been in close contact with each other for 5 days while traveling by ferry and bus. No group members or contacts were ever vaccinated against seasonal influenza.
- No one received antiviral treatment. No complications or deaths have occurred.
- Before this cluster was identified, only 7 sporadic imported cases of pandemic 2009 H1N1 influenza had been confirmed.

### **Notable Achievements, 2009**

- One additional sentinel surveillance site was established at a large outpatient clinic in Tbilisi in May 2009 bringing the total of sentinel sites in Georgia to 9. The NIL receives approximately 60 samples weekly from this new site.
- Space within the NRL was upgraded to accommodate an additional PCR machine and other equipment to meet the growing needs of the project.

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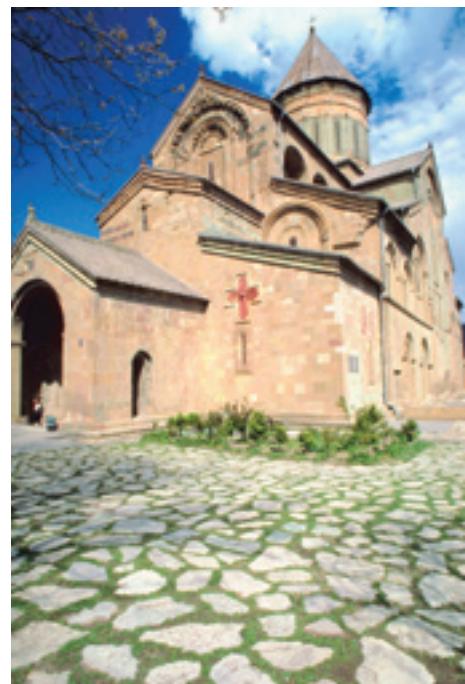
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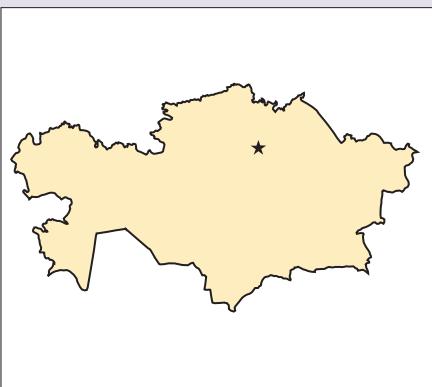
0177, 9 M. Asatiani Street

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# European Region

## Kazakhstan



- **Capital:** Astana
- **Area:** 2,717,300 sq km
- **Population:** 15,460,484 (July 2010 est.)
- **Age Structure:** 0–14 years: 22.1% (male 1,734,622/female 1,659,723); 15–64 years: 69.6% (male 5,219,983/female 5,463,468); 65 years or older: 8.2% (male 443,483/female 819,254) (2008 est.)
- **Life Expectancy at Birth:** Total population: 67.55 years; male: 62.24 years; female: 73.16 years (2008 est.)
- **Infant Mortality Rate:** Total: 26.56 deaths/1,000 live births; male: 31.03 deaths/1,000 live births; female: 21.83 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 99.5%; male: 99.8%; female: 99.3% (1999 est.)
- **GDP:** \$184.3 billion (2008 est.)
- **GDP per Capita:** \$12,000 (2008 est.)

### U.S. CDC Direct Country Support

Development of Influenza Surveillance Networks Cooperative Agreement

- Began 2005.
- FY 2009 was the 5th year of the cooperative agreement.

Funding through the cooperative agreement has been combined with other support from the U.S. CDC and contributions from USAID and NAMRU-3 to establish an influenza sentinel surveillance network of 7 sites that provide influenza-positive specimens to the GISN through the Kazakhstan NIC.

### Surveillance

Surveillance activities in Kazakhstan include the following:

- Fourteen oblast Sanitary Epidemiological Service (SES) laboratories and 2 city SES offices report all cases of acute viral respiratory disease and influenza to the Republican Sanitary Epidemiological Service (RSES).
- The U.S. CDC helped the Kazakhstan MOH establish 3 geographically dispersed sentinel sites to collect information on acute respiratory disease.

- At each site, trained epidemiologists and clinicians collected epidemiologic and clinical information, as well as upper respiratory tract specimens, from a sample of persons who met the WHO ILI or SARI case definitions.

## Laboratory

- Fourteen oblast SES laboratories, 2 city SES laboratories, and the NIC can detect influenza virus by culture and immunofluorescence microscopy.
- The 14 oblast SES laboratories can diagnose influenza by testing acute and convalescent serum specimens.
- Each site obtains 2 nasal and 1 pharyngeal swabs from a sample of persons who meet the WHO ILI or SARI case definitions and who have symptoms for more than 72 hours. The swabs are placed in viral transport medium, which is divided into 2 aliquots and frozen at less than 70°C.

During the 2008–09 influenza season, sentinel sites submitted 669 specimens from patients. Of these, 270 (40%) were positive by PCR for influenza virus. Of these 270 specimens, 97 (36%) were influenza B and 173 (64%) were influenza A. Among the influenza A viruses, 79% were 2009 H1N1 influenza and 21% were seasonal H3N2 influenza.

The following are laboratory milestones:

- In 2009, Kazakhstan gained the capability to reliably diagnose influenza virus infections.
- In 2009, the RSES virology laboratory became a fully functioning NIC and was officially recognized by WHO.
- During the 2008–09 influenza season, more than 100 influenza viruses were typed and subtyped in Kazakhstan for the first time in a decade.
- During summer 2009, as a direct result of U.S. CDC-led effort to establish real-time PCR capability in the RSES laboratory, the Kazakhstan MOH diagnosed 17 imported cases of 2009 H1N1 influenza and ruled out other viruses. These findings lessened a public health challenge presented by the initial introduction of 2009 H1N1 influenza in Kazakhstan and allowed the MOH to make prudent responses.
- The sentinel surveillance network in Kazakhstan will expand to 7 sites, covering the entire country during the 2009–10 influenza season.
- Influenza virus identification and typing by real-time PCR that uses Amplisense primers will be performed at the oblast level for all positives and a sample of negatives and forwarded to the NIC for confirmation with U.S. CDC primers.

## Preparedness

Preparedness activities for FY 2009 included the following:

- U.S. CDC staff drafted a National Pandemic Preparedness Plan and submitted it to the MOH.
- U.S. CDC supported and led the MOH work group created to refine the plan.



- U.S. CDC sponsored two 1-day interministerial meetings to discuss and publicize the plan and two 2-day tabletop simulation exercises with representatives of all relevant ministries and NGOs to further refine the plan.
- The plan was approved by the prime minister of Kazakhstan in August 2009.
- Implementation guidelines were approved by the chief state sanitary doctor in October 2009.

## Training

Training activities in Kazakhstan included the following:

- A week-long course on laboratory biosafety and biosecurity for laboratory directors and workers from Central Asia and the Caucasus.
- Five- and 2-day sentinel surveillance trainings (i.e., clinical, epidemiologic, laboratory) were conducted twice in Uralsk, Petropavlovsk, and Taldykorgan and once in Aktau, Astana, Taraz, and Ust-Kamenogorsk.
- Two-day tabletop exercises on pandemic influenza were held near Astana. One was for national-level officials representing all relevant ministries and NGOs, and the other was for oblast-level representatives of the same organizations.
- A week-long workshop on the cleaning and analysis of influenza sentinel surveillance data was held for sentinel site and RSES epidemiologists in Almaty.
- A 2-day regional training on how to use real-time PCR to detect 2009 H1N1 influenza was held in Almaty.
- A half-day training on the proper use of biosafety cabinets was provided to 400 users of biosafety cabinets in the RSES laboratories.

## **H1N1 Activities, FY 2009**

- Acquired 2009 H1N1 influenza test kits from U.S. CDC.
- Provided regional training on the use of the 2009 H1N1 influenza test kits with help from NAMRU-3.
- Provided consultative services to the MOH during summer 2009 when 17 H1N1 cases were confirmed and again in October when additional cases were suspected.
- Supported an urgent 1-day convocation of senior health officials from throughout the nation to ensure discussion of 2009 H1N1 influenza and the national pandemic plan.

## **Special Influenza Projects**

An assessment of the sensitivity and specificity of influenza A and B typing test kits from Amplisense (Moscow) will be performed by using U.S. CDC primers as a reference standard.

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# **European Region**

## **GDD-Kazakhstan**

Established in 2008, the Global Disease Detection Regional Center, Kazakhstan (GDD-Kazakhstan) began as an extension of the U.S. CDC's presence and success from its FETP, which began in 2003. In addition, integrated efforts with field staff from U.S. CDC's Influenza Division in 2007 helped form the foundation of the center's activities.

### **Coverage**

GDD-Kazakhstan covers 5 countries in Central Asia and has relied heavily on the expertise of the U.S. CDC's Influenza Division to link surveillance and laboratory confirmation of new and emerging pathogens. Two outbreaks of highly pathogenic avian influenza A (H5N1) have been reported in Central Asia: an outbreak among poultry in northern Kazakhstan in 2005 and an outbreak among wild swans in western Kazakhstan in 2006.

### **Activities**

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

### **Effect**

In 2009, GDD-Kazakhstan responded to 14 outbreaks, 93% of which resulted in a confirmed cause through laboratory analysis. In addition, they detected 1 pathogen new to the region and developed new laboratory testing capacity for influenza A and B. GDD-Kazakhstan trained 6 FETP graduates and more than 200 participants through short-term regional and national trainings.

### **Staff**

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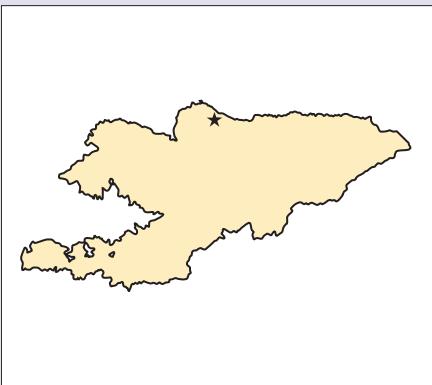
### **Principal U.S. CDC Program Collaborations In-Country**

- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FETP.
- All-Hazards Preparedness and Response.



# European Region

## Kyrgyz Republic



- **Capital:** Bishkek
- **Area:** Total: 199,951 sq km
- **Population:** 5,508,626 (July 2010 est.)
- **Age Structure:** 0–14 years: 29.4% (male 827,346/female 794,746); 15–64 years: 65% (male 1,754,681/female 1,827,553); 65 years or older: 5.5% (male 118,215/female 186,085) (2010 est.)
- **Life Expectancy at Birth:** Total population: 69.74 years; male: 65.74 years; female: 73.94 years (2010 est.)
- **Infant Mortality Rate:** Total: 30.25 deaths/1,000 live births; male: 35.09 deaths/1,000 live births; female: 25.15 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 98.7%; male: 99.3%; female: 98.1% (1999 census)
- **GDP:** \$11.66 billion (2009 est.)
- **GDP per Capita:** \$2,100 (2009 est.)

### U.S. CDC Direct Country Support

Although there is no cooperative agreement in the Kyrgyz Republic (i.e., Kyrgyzstan), the U.S. CDC has received World Bank funding through the U.S. CDC Foundation. These funds were used to supplement support from the USAID, U.S. CDC's Influenza Division, and the GDD.

### Surveillance

- There is universal reporting of acute viral respiratory disease and influenza to the RSES.
- During the 2007–08 influenza season, U.S. CDC helped the MOH in Kyrgyzstan establish 2 geographically dispersed sentinel sites to collect information on acute respiratory disease. At each site, trained epidemiologists and clinicians collect epidemiologic and clinical information, as well as upper respiratory tract specimens, from a sample of persons who meet the WHO SARI case definition.
- During the 2009–10 influenza season, the sentinel sites will attempt to obtain specimens from ILI and SARI patients.

### Laboratory

- Government laboratories in Kyrgyzstan generally lack trained staff and supplies. U.S. CDC works mainly with the RSES virology laboratory in Bishkek and the laboratory in Osh.
- During March 2006–February 2008, the RSES virology laboratory submitted 12 influenza virus isolates to the GISN through NAMRU-3. Ten of the 12 tested positive for influenza B.

- Improving the sensitivity of viral culture in the NIC in Kyrgyzstan continues to be a project goal, and U.S. CDC has supported viral isolation in the RSES virology laboratory with equipment, supplies, and training. At the same time, U.S. CDC and its partners also have established real-time PCR capability in the RSES laboratory and 2 geographically dispersed surveillance sites for acute respiratory disease. At each site, 2 nasal and 1 pharyngeal swabs are obtained from a sample of persons who meet the WHO SARI case definitions and who have had symptoms for less than 72 hours. The swabs are placed in viral transport medium, which is divided into 2 aliquots and frozen at less than 70°C.
- During the 2008–09 influenza season, the sites submitted 390 specimens from patients who met the SARI case definition. Of these, 33% were positive by PCR for influenza virus. Of this subgroup, 5% were influenza B and 95% were influenza A. Among the influenza A viruses, 21% were 2009 H1N1 influenza and 79% were seasonal H3N2 influenza.

### **Preparedness**

- U.S. CDC staff helped write a National Pandemic Preparedness Plan, which was submitted to the MOH. U.S. CDC supported the MOH work group created to refine the plan. As part of this work, U.S. CDC sponsored two 1-day interministerial meetings to discuss and publicize the plan and two 2-day tabletop simulation exercises with representatives of all relevant ministries and NGOs to further refine the plan.

### **Training**

- Two-day sentinel surveillance training (i.e., clinical, epidemiologic, laboratory) was conducted in Bishkek and Osh.
- Two-day tabletop exercises on pandemic influenza were held at Issky-Kul. One was for national-level officials representing all relevant ministries and NGOs, and the other was for oblast-level representatives of the same organizations.
- A week-long workshop on the cleaning and analysis of influenza sentinel surveillance data was held for sentinel site and RSES epidemiologists in Bishkek.
- A 2-day regional training on how to use real-time PCR to detect 2009 H1N1 influenza was held in Almaty. U.S. CDC sponsored 2 laboratory workers from Bishkek to attend.
- A half-day training in the proper use of biosafety cabinets was provided to 125 users of biosafety cabinets in the RSES laboratories.

### **H1N1 Activities, FY 2009**

- Acquired 2009 H1N1 influenza test kits from U.S. CDC.
- Provided regional training on the use of the 2009 H1N1 influenza test kits with help from NAMRU-3.
- Provided consultative services to the MOH during summer 2009 when 4 H1N1 cases were confirmed and again in October when additional cases were suspected.

### **Notable Achievements, 2009**

- In 2009, Kyrgyzstan gained the capability to reliably diagnose influenza virus infection.
- In 2009, the RSES virology laboratory became a fully functioning NIC and was officially recognized by the WHO.

- During the 2008–09 influenza season, more than 100 influenza viruses were typed and subtyped in Kyrgyzstan for the first time in a decade.
- In summer 2009, solely as a result of the U.S. CDC-led effort to establish real-time PCR capability in the RSES laboratory, the Kyrgyzstan MOH was able to diagnose 4 cases of 2009 H1N1 influenza and rule out others. These findings lessened the public health challenge presented by the initial introduction of 2009 H1N1 influenza to Kyrgyzstan and allowed the MOH to make prudent responses.

## **Principal Collaborators**

### **Project Investigators**

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# European Region

## Republic of Moldova



- **Capital:** Chisinau (Kishinev)
- **Area:** Total: 33,851 sq km
- **Population:** 4,317,483 (July 2010 est.)
- **Age Structure:** 0–14 years: 15.7% (male 347,808/female 329,331); 15–64 years: 73.7% (male 1,544,640/female 1,637,707); 65 years or older: 10.6% (male 167,917/female 290,080) (2010 est.)
- **Life Expectancy at Birth:** Total population: 71.09 years; male: 67.39 years; female: 75 years (2010 est.)
- **Infant Mortality Rate:** Total: 12.77 deaths/1,000 live births; male: 14.2 deaths/1,000 live births; female: 11.25 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 99.1%; male: 99.7%; female: 98.6% (2005 est.)
- **GDP:** \$9.986 billion (2009 est.)
- **GDP per Capita:** \$2,300 (2009 est.)

### U.S. CDC Direct Country Support

Enhancing Pandemic Preparedness and Response Capacity in the Republic of Moldova Cooperative Agreement

- Began August 2009.

The Republic of Moldova's MOH is newly funded to support the development of epidemiologic, laboratory, and related capacity to detect, respond, and monitor shifts in influenza viruses. The main objectives of the project are to

- Strengthen pandemic influenza preparedness capacity to reduce the economic and social impact of a pandemic.
- Improve detection and response capacities by enhancing the surveillance system and laboratory network.
- Strengthen response and containment capacity through rapid response and infection control.

Activities will be implemented in close collaboration with WHO regional and country offices and other international partners.

## **Surveillance**

The MOH proposes to enhance detection and response capacity to

- Improve information and data management capacity through integration of the technology system for the surveillance of infectious diseases.
- Improve the process of specimen collection at facilities in the sentinel system.
- Improve the process of information collection for SARI at each site in the sentinel system by using standard case definitions.
- Strengthen early warning systems for reporting human cases of influenza.
- Strengthen infection control capacity.

## **Laboratory**

The MOH proposes to strengthen the current sentinel laboratory network, which consists of the National Viral Respiratory Laboratory (NVRL) and 9 additional laboratories around the country, to support surveillance and detection of influenza through the following activities:

- Strengthening and improving the laboratory capacity of the NVRL for performing the isolation and typing of influenza viruses by using molecular technology.
- Maintaining the diagnostic capacities needed to carry out the functions of the NVRL and the sentinel-based laboratory network through the procurement of essential equipment, supplies, and consumables.
- Maintaining and ensuring the biosafety and biosecurity of targeted laboratories according to national and international standards through the use of guidelines, standard operating procedures, and training.



## **Preparedness**

The government of the Republic of Moldova approved the National Preparedness Pandemic Plan for Human Pandemic Influenza in 2005. During the course of the current cooperative agreement, project staff proposed to

- Upgrade the National Pandemic Plan.
- Establish an interdepartmental working task force with multisectoral involvement from governmental ministries.
- Strengthen and adjust the legal framework for a national response to potential outbreaks.
- Improve the coordination capacity between human and animal sectors, government ministries, businesses, and NGOs.

- Establish a communication component to the pandemic preparedness plan.
- Develop and adopt rapid response and containment protocols to strengthen local rapid response capacity.

## **Training**

The MOH proposes to train

- Epidemiologists to increase their knowledge and skills to support surveillance, outbreak investigation and response, and disease control activities.
- Rapid response and containment teams.
- Laboratory scientists and technicians in the sentinel network in sample collection, and the proper laboratory techniques for detection, typing, and subtyping of the influenza virus.

## **Special Influenza Projects**

The World Bank initiated the Avian Influenza Control and Human Pandemic Preparedness and Response (AIHP) project in Moldova in 2006. The project is a part of the Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response (GPAI). Moldova met the eligibility criteria set in the GPAI document for a country at risk. The overall objective of the project is to minimize the threat posed to humans by HPAI and enhance national pandemic preparedness. The human health component of the project is designed to

- Enhance the national response capacity through review of the regulatory system.
- Improve the informational technology system for surveillance of infectious diseases and train personnel.
- Strengthen the national laboratory capacity to detect avian influenza virus by building a new module for influenza A (H5N1) diagnosis and renovation of the NVRL.
- Strengthen the health system response capacity through renovation of the intensive care unit of the country's referral hospital for suspected cases of avian influenza.

## **Principle Collaborators**

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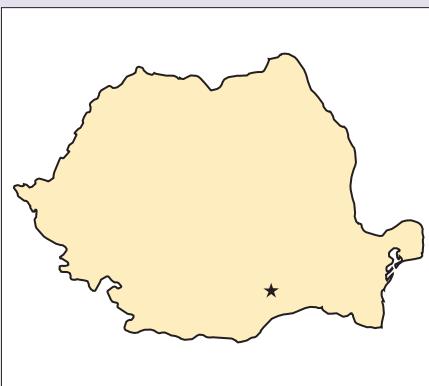
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# European Region

## Romania



- **Capital:** Bucharest
- **Area:** Total: 238,391 sq km
- **Population:** 22,181,287 (July 2010 est.)
- **Age Structure:** 0–14 years: 15.5% (male 1,768,207/female 1,677,503); 15–64 years: 69.8% (male 7,701,149/female 7,774,159); 65 years or older: 14.7% (male 1,326,163/female 1,934,106) (2010 est.)
- **Life Expectancy at Birth:** Total population: 72.71 years; male: 69.22 years; female: 76.43 years (2010 est.)
- **Infant Mortality Rate:** Total: 22.09 deaths/1,000 live births; male: 25.1 deaths/1,000 live births; female: 18.9 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 97.3%; male: 98.4%; female: 96.3% (2002 census)
- **GDP:** \$255.4 billion (2009 est.)
- **GDP per Capita:** \$11,500 (2009 est.)

### U.S. CDC Direct Country Support

Romania is supported in its efforts to enhance laboratory and surveillance capacity to detect and respond to avian, seasonal, and pandemic influenza through a U.S. CDC cooperative agreement with WHO-EURO. A Romanian-based National Professional Officer has been recruited to facilitate the implementation of activities in the areas of pandemic preparedness, surveillance, and response to avian influenza outbreaks, laboratory capacity, and desktop simulation activities. The NIC is located in the Cantacuzino Institute in Bucharest.

### Surveillance

Surveillance activities for Romania include the following:

- An assessment of the Romanian surveillance network was completed.
- Sentinel surveillance sites for ILI and SARI have been established in 20 counties and Bucharest.
- SARI surveillance is being implemented in Iasi, Cluj, Constanta, Timisoara, and Bucharest on the basis of recommendations from the surveillance assessment.
- Guidelines and training materials for SARI surveillance and procedures for quality assurance were developed.

- During the 2008–09 influenza season, 1,064 samples were tested by RT-PCR, resulting in 384 positive results for influenza A H3, 77 positive results for influenza B, and 4 positive results for influenza H1.

## **Laboratory**

Laboratory activities in FY 2009 include the following:

- Development of the Cantacuzino Institute as a regional influenza center for laboratory diagnostics and as a model for implementation and support of influenza surveillance.
- The Cantacuzino Institute has performed influenza specimen testing and quality control for other countries in the region.
- RT-PCR laboratories were upgraded and installed at 4 sentinel sites.
- A laboratory expert from Romania (Alina Baetel) traveled to Macedonia and Albania to support local laboratories in testing pandemic samples.

## **Training**

Romania conducted the following training activities in FY 2009:

- Laboratory staff members were trained on the SARI surveillance guidelines and use of RT-PCR machines.
- Physicians were trained on the SARI surveillance guidelines and standards.

## **Notable Achievements, 2009**

- Recruitment and placement of the National Professional Officer for Romania was successfully completed.
- SARI surveillance is being implemented as part of the sentinel surveillance scheme.
- The Cantacuzino Institute was established as a regional influenza center.

## **Principal Collaborator**

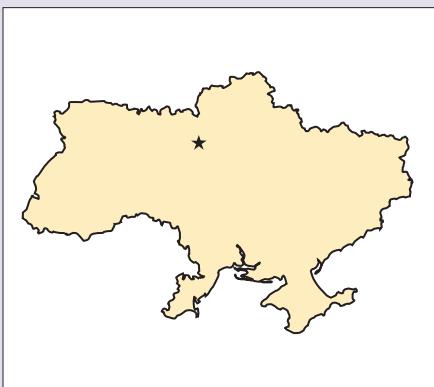
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# European Region

## Ukraine



- **Capital:** Kyiv (Kiev)
- **Area:** 603,700 sq km
- **Population:** 45,415,596 (July 2010 est.)
- **Age Structure:** 0–14 years: 13.9% (male 3,277,905/female 3,106,012); 15–64 years: 70% (male 15,443,818/female 16,767,931); 65 years or older: 16.1% (male 2,489,235/female 4,909,386) (2008 est.)
- **Life Expectancy at Birth:** Total population: 68.06 years; male: 62.24 years; female: 74.24 years (2008 est.)
- **Infant Mortality Rate:** Total: 9.23 deaths/1,000 live births; male: 11.48 deaths/1,000 live births; female: 6.85 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 99.4%; male: 99.7%; female: 99.2% (2001 census)
- **GDP:** \$359.9 billion (2008 est.)
- **GDP per Capita:** \$7,800 (2008 est.)

### U.S. CDC Direct Country Support

Influenza Surveillance and Pandemic Preparedness in Ukraine Cooperative Agreement

- Began 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Since October 2006, the U.S. CDC has provided funds to the Program for Appropriate Technology in Health (PATH) to help the Ukraine MOH in its efforts to strengthen influenza surveillance and pandemic preparedness. Activities have been focused in the following areas:

- Strengthening the NIC in Kiev.
- Establishing sentinel site virologic and epidemiologic surveillance for ILI and SARI from influenza.
- Developing national guidelines for health services in Ukraine to plan and organize measures to combat pandemic influenza.
- Enhancing the nationwide early warning system and epidemiologic capacity to detect and respond to human illness caused by novel influenza A infections or infections from other respiratory pathogen with pandemic potential.

PATH facilitated the Ukraine NIC's efforts to develop national guidelines for health services in Ukraine to plan and organize measures to combat pandemic influenza. In 2009, these guidelines

were approved by the academic council of the National Institute of Epidemiology and Infectious Diseases and used for pandemic preparedness trainings and to guide the MOH's 2009 H1N1 influenza response activities during the October–November surge.

## **Surveillance**

PATH has helped establish a fully functioning sentinel influenza surveillance system in Kiev, Donetsk, and Odessa and developed a Web site ([www.gripnaglyad.com](http://www.gripnaglyad.com)) to support electronic reporting, data analysis, presentation, and other aspects of the system. The sentinel surveillance network includes 19 hospitals and polyclinics. Data findings suggest that 11% of SARI and 21% of ILI cases reported to the sentinel sites were caused by influenza. Two cases of pandemic 2009 H1N1 influenza were captured by the system during summer 2009, demonstrating the strength of the system even during the summer period. Information on seasonal influenza is routinely submitted to FluNet and the European influenza surveillance scheme.

## **Laboratory**

Funding from the partnership between U.S. CDC and PATH and the Ukraine MOH was used to purchase RT-PCR equipment, biologic safety instruments, autoclaves, reagents, consumables, and other supporting items to strengthen the capabilities of the NIC in Kiev, the Mechnikov Anti-Plague Research Institute in Odessa, and 2 regional virologic laboratories in the sentinel regions. These laboratories are now able to perform PCR and virus isolation on cell cultures. During the 2008–09 influenza season, the NIC received and tested 119 seasonal influenza samples from the country laboratories; 95 were type A (primarily H3N2), and 24 were type B.

U.S. CDC's Association of Public Health Laboratories (APHL) review tool was used to conduct an NIL capacity assessment in 2009. The review demonstrated that the Ukraine NIC has an advanced syndromic and laboratory-based surveillance system and well-trained staff who are capable of serving as a potential model for other countries in the region. In addition, the assessment revealed that there is capacity to advance into molecular diagnostics for influenza. Samples from Ukraine are routinely submitted to the WHO collaborating center for the surveillance, epidemiology, and control of influenza at U.S. CDC, and the WHO collaborating center for reference and research on influenza at the National Institute for Medical Research in London, England.

## **Preparedness**

In 2006, the Ukraine Cabinet of Ministers approved the general framework of a national plan of action to combat influenza and to prepare for a potential pandemic. The Ukraine MOH was tasked with developing specific operational details and implementing key provisions of the plan. As a result, the partnership on pandemic preparedness between the MOH, PATH, U.S. CDC, and WHO has resulted in the development of the National Guidelines for Health Services of Ukraine Regarding Planning and Organization of Measures to Combat Pandemic Influenza (i.e., the Guidelines). In 2009, the Guidelines were approved by the academic council of the Ukrainian Institute of Epidemiology and Infectious Diseases and endorsed by WHO-EURO. The Guidelines were used to develop pandemic preparedness simulation exercises in Ukraine, Kazakhstan, and the Kyrgyz Republic to plan national and local preparedness activities and to guide MOH pandemic 2009 H1N1 influenza response activities during the October–November 2009 surge.

In June 2009, PATH organized and facilitated a pandemic preparedness simulation exercise for members of the interagency coordination council on influenza pandemic preparedness, with the

participation of a WHO Ukraine expert. The meeting highlighted several gaps in preparedness and helped identify the most pressing needs and potential solutions. Recommendations for international assistance also were discussed. After the meeting, several measures were taken to increase preparedness in the city of Kiev, including the following:

- Updating the city plan.
- Refining communication channels.
- Creating a small stockpile of antivirals.
- Increasing the reserve of antibiotics.
- Purchasing additional influenza prevention supplies.
- Updating information for the city influenza hotline.
- Training the city's physicians.
- Developing a list of specialists responsible for communication with the media.
- Making arrangements with the National Medical University and nursing schools in the city for rapid mobilization of students in case of emergency.
- Ensuring additional financing, as necessary, through the city's fund for epidemiologic emergencies.
- Lobbying the MOH officials to update the legal documentation needed to support pandemic response activities.
- Conducting similar exercises in Kazakhstan and the Kyrgyz Republic at the request of the U.S. CDC office in Kazakhstan.
- Participating in a joint avian pandemic influenza preparedness exercise for representatives of several ministries (including the MOH) that was organized by the Ministry of Education and Science and the California National Guard. The aim of the exercise was to help the ministries define agency roles in a response to a potential pandemic and to improve interagency coordination at various levels.



## Training

PATH continues to provide technical assistance and training to ensure the functioning of the sentinel surveillance system, quality of the surveillance data, prompt data analysis, and integration of the pandemic work plan with preparedness activities.

- Eight virologists from the NIC regional SESs were trained on influenza virus isolation and identification at the NIC.
- Representatives from the NIC and plague laboratories participated in biosafety, biosecurity, and advanced RT-PCR diagnostics international training workshops conducted by U.S. CDC experts in Almaty, Kazakhstan, and St. Petersburg, Russia.
- The NIC staff also were trained in real-time PCR diagnostics during U.S. CDC's APHL laboratory capacity review.

Personnel of all sentinel influenza stations and regional SESs in Kiev, Odessa, and Donetsk were trained by the cooperative agreement project staff in all aspects of sentinel surveillance. Training included the following:

- SARI and ILI case definitions.
- Flow of laboratory specimens.
- Epidemiologic data collection and reporting procedure.
- Scope for data analysis.
- Data interpretation guidelines.
- A range of recommended control efforts and monitoring and evaluation indicators to assess the quality of the functioning of the system.

Approximately 2,000 epidemiologists and health care workers (i.e., directors of health settings, infectious disease specialists, therapists, family physicians, and ambulance physicians) representing several regions of the country were trained by experts from PATH, the Ukraine MOH, the NIC, and regional SESs. Key topics included the following:

- Novel influenza and respiratory surveillance (i.e., newly developed technical guidelines) focusing on case detection and triggers for reporting, investigation, and immediate response from the diagnosing physician in the broader context of international health regulations.
- Instructions on investigation of cases and outbreaks, organization of response at the rayon level, recommended control response measures (including guidelines for use of PPE and antivirals), seasonal influenza vaccination recommendations, and infection control recommendations for health care facilities.

Representatives of the MOH, the NIC, and PATH also participated in U.S. CDC and WHO influenza pandemic preparedness workshops and meetings in Geneva, Copenhagen, St. Petersburg, Ashgabat, and Bangkok.

### **H1N1 Activities, FY 2009**

- MOH, NIC, SES, and PATH staff were trained through the partnership to provide technical guidance to health care workers nationwide.
- Influenza pandemic preparedness and influenza outbreak response guidelines developed in partnership with PATH and U.S. CDC were used to guide response activities in the country.



- Laboratory equipment and consumables purchased through the partnership were used to detect pandemic 2009 H1N1 influenza cases.
- The sentinel surveillance system currently operating at 2 sites complements routine ARI surveillance designed to monitor the 2009 pandemic.

### **Notable Achievements, 2009**

- The sentinel SARI and ILI surveillance system was fully operational at the Kiev and Odessa sites.
- Sentinel laboratories and the NIC identified 14 cases of pandemic 2009 H1N1 influenza.
- The Guidelines were developed and used for pandemic preparedness to guide H1N1 response activities.
- Tabletop pandemic preparedness simulation exercises were conducted in Kiev and helped the city improve its response capacity.

### **Principal Collaborators**

- PATH.
- MOH.
- WHO.
- NIC.
- Regional SES in sentinel sites, sentinel hospitals, and polyclinics.

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# **Pan American Health Organization (PAHO)**



# Pan American Health Organization (PAHO)



## U.S. CDC Direct Country Support

### Developing Influenza Surveillance Networks Cooperative Agreement

- Began 2006.
- FY 2009 was the 4th year of the cooperative agreement.

The Pan American Health Organization (PAHO) promotes the development of National Influenza Pandemic Preparedness Plans (NIPPPs) and supports all associated member states in this effort. As of 2007, member states were actively engaged in influenza preparedness activities and had developed national plans. PAHO supported its member states to enhance internal communication, risk communication, and media training and to work with journalists.

The Generic Protocol for Influenza Surveillance (GPIS) developed by the U.S. CDC and PAHO is designed to standardize influenza surveillance throughout the region and has been a model for other WHO regions. Every country in Latin America and the Caribbean has been trained to use the GPIS, and implementation is underway. To date, 163 national officials have been trained to use the GPIS. In addition, more than 500 professionals have been trained on hospital-based acute respiratory event surveillance.

PAHO has a network of influenza laboratories where more advanced laboratories routinely train other laboratories that need to enhance their technical skills. PAHO has facilitated the training of laboratories in the region in classical and molecular diagnostic methods. In collaboration with U.S. CDC, PAHO convened a PCR work group that worked to standardize laboratory protocols for molecular diagnosis of influenza. In addition, PAHO purchased laboratory materials, supplies, and equipment to support virologic surveillance in the region.

### **Surveillance**

- PAHO developed operational guidelines and training packages to help MOHs train local personnel in order to support implementation of influenza surveillance.
- PAHO provided IATA training and certification on how to use infectious substances sent to every NIC and 16 countries in the English-speaking Caribbean.
- PAHO purchased real-time RT-PCR machines for Chile, Paraguay, Uruguay, and the Caribbean to serve all Caribbean English-speaking countries.
- PAHO supported personnel to provide technical collaboration for pandemic 2009 H1N1 influenza in the Dominican Republic, Paraguay, Uruguay, Argentina, Mexico, and Brazil.

### **Laboratory**

- Nicaragua has been approved as a NIC, and Guatemala has requested NIC designation.
- PAHO purchased reagents, materials, and equipment for real-time RT-PCR diagnosis of influenza.
- PAHO's laboratory support resulted in every country in Latin America having capability to perform real-time RT-PCR for seasonal and pandemic influenza.

### **Preparedness**

- PAHO supported risk communication workshops in Peru, Bolivia, Uruguay, Paraguay, Colombia, Ecuador, and Chile that included simulation exercises to test national-level communication preparedness plans and plans under development for local-level implementation.
- PAHO helped to implement risk and social communication modules at the local level, which were updated and adapted to focus on pandemic influenza and all public health emergencies.

## **Training**

- PAHO conducted training on acute respiratory event surveillance (Nationwide Enhanced Surveillance) in Dominica, Trinidad and Tobago, and Jamaica, and sentinel surveillance training in Barbados, Dominica, Guyana, Jamaica, Saint Lucia, Saint Vincent, Suriname, and Trinidad and Tobago.
- PAHO's laboratory training network has trained influenza laboratories in Uruguay, Paraguay, and in Central America. After the start of the 2009 pandemic, a laboratory team was deployed to train member countries in real-time RT-PCR techniques.
- PAHO supported Central American countries and the Dominican Republic in a third assessment of their NIPPs.
- PAHO hosted workshops in Central America to help implement hospital-based nationwide enhanced surveillance.

## **H1N1 Activities, FY 2009**

### Response and Containment

- PAHO deployed an outbreak investigation team to Mexico in May 2009 to support that country's response to the pandemic.
- PAHO hired an influenza consultant to help implement the GPIS in the Caribbean. The consultant also has been integral in responding to the pandemic. Most recently, he provided support to the investigation of the outbreak of pandemic 2009 H1N1 influenza on a cruise ship in Aruba.

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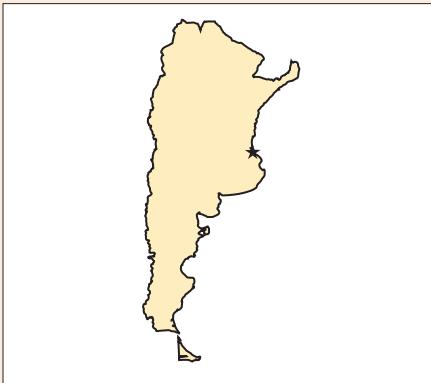
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# Pan American Region

## Argentina



- **Capital:** Buenos Aires
- **Area:** 2,766,890 sq km
- **Population:** 41,343,201 (July 2010 est.)
- **Age Structure:** 0–14 years: 25.8% (male 5,341,642/female 5,095,325); 15–64 years: 63.5% (male 12,807,458/female 12,884,745); 65 years or older: 10.8% (male 1,784,652/female 2,568,176) (2008 est.)
- **Life Expectancy at Birth:** Total population: 76.36 years; male: 73.11 years; female: 79.77 years (2008 est.)
- **Infant Mortality Rate:** Total: 11.78 deaths/1,000 live births; male: 13.12 deaths/1,000 live births; female: 10.37 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 97.2%; male: 97.2%; female: 97.2% (2001 census)
- **GDP:** \$585 billion (2008 est.)
- **GDP per Capita:** \$14,500 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Argentina has 3 regional NICs and its virologic surveillance network consists of laboratories in both public and private health care settings. Each NIC works with sentinel units located with local provincial health authorities to conduct virologic and epidemiologic surveillance. The centers also perform virus isolation and typing and subtyping of viral isolates and send virus isolates to the WHO collaborating center in Atlanta. The NICs report weekly information on influenza virus circulation through FluNet and provide technical expertise and training to surveillance sites and laboratories throughout the country.

The MOH of Argentina and its Integrated Pandemic Influenza Response Plan and 3 NICs have a long-standing and meaningful collaboration with the U.S. CDC that is focused on influenza surveillance (seasonal, pandemic, avian, and 2009 H1N1 influenza). This bilateral agreement has resulted in the preparation, planning, programming, and implementation of a national pandemic influenza response plan, which culminated in the creation of Directive 644/07. Argentina's ILI surveillance system has been augmented considerably through this agreement. Technical capacity in laboratories that participated in the virologic surveillance system has been improved considerably during the past year.

## **Surveillance**

- Epidemiologic surveillance has been improved by the implementation of the National Health Surveillance System (SNVS).
- Argentina has developed an Internet database that provides instant notification of influenza activity. The influenza data entered by sentinel surveillance sites and recorded in this system are summarized on a weekly basis.
- The software allows graphics to display and update epidemiologic, virologic, and clinical information.
- The Argentina MOH used the GPIS created by PAHO and U.S. CDC to implement the system throughout the provinces.
- The Argentina MOH created a specific pandemic influenza situation room and an influenza pandemic emergency operation center (EOC), which is equipped with desktop and notebook computers and an LCD-TV to display a large amount of data.
- These rooms facilitate the rapid analysis and transformation of data into actionable information and allow the MOH to quickly provide technical and epidemiologic advice to all epidemiologic units in the country.
- The situation room acts as the central place to store and distribute supplies for pandemic response (i.e., PPE, medicine, laboratory equipment) for both seasonal and novel influenza.
- The EOC also served as a contingency center to provide input into how to supply disposable PPE, medicine, and laboratory supplies to network laboratories. The EOC developed an epidemiology expert advisory committee that provides input into any pandemic emergency.
- The new integrated geographic information system (GIS) allows for the development of a health crisis management system. Health facility data necessary to analyze the epidemiology, transmissibility, trends, effects on health facilities, and severity of seasonal or pandemic influenza has been incorporated into the overall system. The system is being enhanced with information about ILI and climatic, geographic, and demographic data. The new system will help determine trends in influenza activity.



## **Laboratory**

- Argentina has 3 regional NICs that submit isolates to the WHO collaborating center at U.S. CDC for characterization.
- The 3 NICs in Argentina have worked closely with U.S. CDC to evaluate the capability of local laboratories and provide quality control. They also have undertaken extensive training of scientists in typing, subtyping, and characterizing of viruses, as well as in RT-PCR, real-time RT-PCR, and reverse genetics techniques. This training was enhanced during the first half of 2009, when many labs received U.S. CDC primers for the diagnosis of 2009 H1N1 influenza through RT-PCR techniques.
- The Respiratory Virus Laboratory Network has increased its capacity from 26 to 29 laboratories in 16 of 24 provinces over the past 3 years. PCR activity has been increased from 1 laboratory to 22 public and private laboratories with this capacity.
- The ILI sentinel surveillance system contains 20 sentinel units. Data from the system are incorporated in weekly reports. Collaborating laboratories in the sentinel surveillance network send positive samples and 10% of negative samples to the NICs for typing, subtyping, characterizing, and ensuring quality control.
- Argentina's NICs have been collaborating with U.S. CDC on several projects that include the following activities:
  - Sequencing influenza virus, RT-PCR, and HI techniques to analyze antigenic and genetic differences to determine the circulation of influenza viruses among different areas and times.
  - Providing recommendations for the selection of vaccine strains for the Southern Hemisphere.
  - Monitoring antiviral drug sensitivity to guide clinical treatment and prophylaxis of influenza.
  - Improving laboratory techniques to detect seasonal influenza in Argentina. These activities include strengthening the quality control system of laboratories in the influenza network and a serologic survey for 2009 H1N1 influenza in the Mar del Plata region.

## **Preparedness**

- The Argentina MOH continues to pursue its national pandemic preparedness plan (i.e., Integrated Response Plan for Pandemic Influenza Directive 644/07) and plans to consult with experts from PAHO and U.S. CDC on pandemic planning.
- The new pandemic influenza situation room is the focal point for all surveillance and response activities for pandemic influenza. The situation room also works closely with the IHR focal point and coordinating center.

## **Training**

- In the past 3 years, approximately 43 professional staff from 29 network laboratories became capable of doing HA and HI assays and conventional PCR, and 22 laboratories were trained in real-time RT-PCR.
- In 24 provinces, 80 professionals were trained on how to use the influenza surveillance system.
- In 24 provinces, 124 people were trained on how to use the influenza surveillance system.
- In the past 3 years, 6 pandemic exercises and several tabletop exercises were conducted.

## **H1N1 Activities, FY 2009**

- For the first time, rapid response teams with field epidemiologists and influenza experts were employed to work through the first wave of pandemic 2009 H1N1 influenza in Argentina.

## **Notable Achievements, 2009**

- Argentina created a crisis management system that uses GIS to integrate all health facilities in the country and the data needed to analyze the epidemiology, transmissibility, and trends of influenza infection, as well as the effect on health institutions and the severity of seasonal or pandemic influenza throughout the country.
- The crisis management system combines ILI, climate, geographic, and demographic data to explore trends in influenza activities and to understand the effect of these factors on the disease.

## **Principal Collaborator**

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Project Manager

Médico Neumonólogo, Epidemiólogo

9 de Julio 1925

Buenos Aires, Argentina



# Pan American Region

## Brazil



- **Capital:** Brasilia
- **Area:** 8,511,965 sq km
- **Population:** 201,103,330 (July 2010 est.)
- **Age Structure:** 0–14 years: 27% (male 26,986,909/female 25,961,947); 15–64 years: 66.8% (male 64,939,225/female 66,157,812); 65 years or older: 6.3% (male 5,182,987/female 7,113,707) (2008 est.)
- **Life Expectancy at Birth:** Total population: 71.71 years; male: 68.15 years; female: 75.45 years (2008 est.)
- **Infant Mortality Rate:** Total: 23.33 deaths/1,000 live births; male: 26.95 deaths/1,000 live births; female: 19.53 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 88.6%; male: 88.4%; female: 88.8% (2004 est.)
- **GDP:** \$2.03 trillion (2008 est.)
- **GDP per Capita:** \$10,300 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Brazil, the largest country in South America, launched its national influenza surveillance system in 2000. Brazil's influenza system comprises a network of sentinel surveillance provider units that collect clinical samples from suspect cases for laboratory diagnosis and consolidates data from outpatients with ILI. The influenza surveillance information system (i.e., SIVEP Gripe) is online and data are simultaneously available at all levels of the surveillance network.

Three NICs are able to isolate viruses, share samples with U.S. CDC, and routinely provide information to WHO's FluNet. The NICs have regular communication with local and regional laboratories. The 3rd version of the Brazilian influenza plan is on their Web site; it summarizes the current epidemiologic situation in Brazil, explains and adapts WHO guidelines, and describes the available infrastructure for managing the 2009 Surveillance.

- Influenza surveillance information is collected through Brazil's national surveillance information system of notifiable diseases (SINAN).
- Seasonal influenza case notification is not mandatory in Brazil unless a novel strain is detected or a severe seasonal outbreak occurs.

- Online forms were used to gather clinical and demographic information.
- Brazil has a surveillance network comprising 22 centers and a Strategic Information and Response Health Surveillance Network (CIEVS), which aims to develop activities for crisis management infections, including the monitoring of sentinel cases and management of epidemic emergencies.

### Laboratory

- Brazil has 3 regional NICs with BSL-3 capabilities.
- The NICs routinely isolate viruses, share samples with other international agencies, and provide information to FluNet.
- NICs have regular communication with local and regional laboratories to provide technical assistance and monitor influenza testing activities.
- Advanced molecular testing, such as real-time PCR and viral sequencing, are used for surveillance of circulating influenza viruses.
- Brazil's NICs have conducted training and provided additional equipment to enhance the diagnostic capacity of their reference laboratories.
- NICs provide technical assistance to local provincial laboratories to improve the virologic and disease-based surveillance capabilities.

### Preparedness

- The 4th edition of the national preparedness plan is being drafted to incorporate lessons learned from the H1N1 pandemic.
- Brazil has engaged neighboring countries in joint pandemic preparedness planning and border control activities.
- Brazil has weekly, national-level, rapid response, preparedness video conferences with the 26 states and the federal district. These video conferences discuss adjusting local rapid response team activities to improve and evaluate local preparedness issues.



## **Training**

- The NICs perform the diagnosis capacity training for all the state public health laboratories.
- The public health laboratories provide RT-PCR assay training for the 2009 H1N1 influenza diagnosis for the state laboratory network.
- Brazil continues to provide training to have rapid response teams in all states, including remote states.

## **H1N1 Activities, FY 2009**

- A total of 52 reference units were created to monitor cases of possible 2009 H1N1 influenza.
- An extensive H1N1 communication campaign was developed that included television, radio, newspapers, airport public service announcements, and social networking (i.e., Twitter, Orkut, Facebook, YouTube).
- A risk communication team was trained to work with clinicians and communities.
- The 63 reference hospitals were provided additional resources to enable them to treat possible cases of 2009 H1N1 influenza.
- Guidelines for notifying, investigating, and treating possible cases of H1N1 were developed.
- Additional antivirals and PPE were purchased for hospitals and other health care settings.

## **Notable Achievements, 2009**

- All the preparedness state plans were evaluated and updated on the basis of the lessons learned from the 2009 H1N1 influenza pandemic.
- The RT-PCR diagnosis for the 2009 H1N1 influenza pandemic was decentralized to state and local health agencies.
- The rapid response units within all states were expanded with emphasis on remote states.

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# Pan American Region

## Influenza Program of GDD Response

### Center for Central America and Panama

### (GDD-RC/CAP)

#### **U.S. CDC Direct Region Support**

Influenza is a core component of U.S. CDC's GDD in Guatemala, which covers 8 countries in CAP. The mission of the program is to provide leadership and programmatic guidance to prevent and control influenza and to contribute to preparedness and response to pandemic influenza in the PAHO area. Coverage extends to Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Belize, and the Dominican Republic.

#### **Surveillance**

The CDC-CAP has supported the implementation of national influenza protocols on the basis of the PAHO-CDC Generic Protocol for Influenza Surveillance. They provide the MOHs with technical assistance, training, and supplies to reinforce sentinel sites and laboratories. The influenza surveillance is coordinated to establish a regional influenza surveillance network. Regional influenza surveillance courses integrate each country's epidemiology and laboratory national teams.

#### **Laboratory**

The CDC-CAP supports the national laboratory of Guatemala and the Dominican Republic by providing RT-PCR equipment to all national laboratories with IF and PCR reagents and laboratory supplies. They support laboratory components in influenza sentinel units in Guatemala, El Salvador, and Nicaragua. In the Gorgas Institute Laboratory in Panama City, they developed 2 training courses about respiratory virus immunofluorescence and biosafety aspects to reinforce diagnosis capacity in sentinel units of influenza in the region, and they have supported regional meetings to harmonize laboratory diagnosis procedures among countries for the 2009 H1N1 influenza pandemic.

#### **Preparedness**

The inventory of core capabilities developed by U.S. CDC and the WHO checklist were implemented in the 8 countries of the region. This provided relevant information about preparedness and response components of each country, and this information was used to update the technical assistance needs in each country.

Rapid response activities are focused on the conformation and development of Rapid Response Teams (RRTs) at the subnational level. Standard operating procedures and guidelines were developed to contribute to the development of a regional network of RRTs on the basis of the national teams.

GDD-CAP conducted regional drills to test the pandemic response plan leading to regional updates and improvements. They supported and guided 7 tabletop exercises and 26 drills. Countries have been encouraged to conduct more functional exercises that will allow RRT members to develop better skills and become more knowledgeable about rapid operations. The

support also included developing and implementing national- and subnational-level drills and simulations that focus on influenza pandemic case investigation, case management, and health care services response.

During 2009, influenza staff as well as other GDD program staff (e.g., FETP, IEIP) were requested to participate in suspected influenza pandemic case or outbreak investigations in several countries in the region and were part of the team that conducted the evaluation process through WHO GOARN.

### **Training**

One hundred and fourteen training activities were conducted during 2009. Topics included preparedness and response, diagnostic testing for influenza, influenza and other respiratory virus surveillance, risk communication, infection control, and case management. In addition, 12,275 persons from 8 countries were trained (33.5% in rapid response, 29.5% in preparedness in general, and 15.8% in health care services preparedness, among others). The influenza program in collaboration with the FETP sponsors 15 health professionals from the region to be trained on field epidemiology focusing on influenza and acute respiratory infections.

Workshops were designed and conducted in

- Influenza surveillance strategies (Guatemala).
- Analysis strategies about influenza surveillance (Nicaragua).
- Writing skills (Guatemala).

An information system Web platform was designed for influenza surveillance by sentinel unit and developed and implemented a tool that facilitates the analysis of surveillance data (EpiVigila).



### **Influenza Vaccine**

CDC-CAP has worked with select countries to support vaccination against influenza. In El Salvador, they developed and evaluated the effectiveness of seasonal influenza vaccine. They conducted a rapid assessment exercise of the coverage of seasonal influenza vaccination and trained technical teams from 12 institutions in 4 regions, including epidemiologists and laboratory and field workers on surveillance, sampling, and monitoring.

### **H1N1 Activities, FY 2009**

- CDC-CAP assisted the Guatemalan national laboratory at the start of the pandemic and ran all H1N1 tests for 7 weeks until the national laboratory had the capacity to run its own samples on equipment purchased and donated by CDC-CAP.
- CDC-CAP donated several hundred kits from its stock to Costa Rica, Honduras, and Guatemala when they were running short. U.S. CDC sent thousands more.

- Two visits were made to Costa Rica in May. One visit was for H1N1 surveillance and information related to hospital infection control.
- Technical assistance visits with PAHO (GOARN) to Honduras, Guatemala, Dominican Republic, and Nicaragua were made to assist countries in their response to the pandemic.
- Intensified surveillance was provided for SARI, vaccines, community-based surveillance for U.S. CDC-funded H1N1 projects in Costa Rica, El Salvador, Nicaragua, Dominican Republic, and Guatemala.
- In the first 6 weeks of the pandemic, 7 regional alerts were sent. The 1st was issued the last week of April and provided an alert and information on the situation in Mexico; the other 6 alerts provided technical guidelines and recommendations on the basis of U.S. CDC guidelines.
- During the first 2 months of the pandemic, there were daily teleconferences with influenza epidemiologists that were subsidized by the influenza program in all the countries of the region.
- GDD-RC participated as PAHO GOARN team members during influenza pandemic country assessments and responses. Field epidemiologists were deployed to Mexico, Argentina, Dominican Republic, Honduras, Guatemala, and Nicaragua.
- GDD-RC supported the Council of Ministers of Health of Central America, which had an emergency meeting on April 28 at the beginning of the pandemic and agreed to develop a regional effort related to surveillance, information sharing, and risk communication. CDC-CAP assisted the Meeting of Central American Health Ministers in developing a unified, regional information system and carried out several risk communication workshops to assist in development of strategies and interventions to communicate with the public.



## **Notable Achievements, 2009**

- Influenza surveillance was coordinated in the region and helped to establish the regional influenza surveillance network on the basis of the PAHO-CDC Generic Protocol for Influenza Surveillance.
- All countries have identified the 2009 H1N1 influenza virus either at their own laboratories or by sending samples to U.S. CDC or to the CAREC laboratory in Belize.
- At the start of the pandemic, only 3 national laboratories had RT-PCR capacity (i.e., Panama, Costa Rica, Nicaragua). Currently all national laboratories except Belize have RT-PCR capacity.
- Laboratory capacity was increased to detect influenza and other respiratory viruses.
- Two new NICs were supported.
- The number of sentinel sites were increased thereby increasing the number of laboratory samples by 20%.
- A protocol was developed to install influenza sentinel units in Guatemala and El Salvador. We are in the process of adding sentinel sites in Costa Rica (Puntarenas), Panama (Chiriquí and Coclé), Dominican Republic (Santiago), and Belize (Belize City).
- Technical assistance was provided on immunization policies and practices to fight influenza in Central America, Panama, and Dominican Republic.



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# Pan American Region

## GDD-Guatemala

Established in 2006, the GDD center in Guatemala (GDD-Guatemala) builds on U.S. CDC's more than 30 years of history of programs, activities, and partnerships in Central America, the Dominican Republic, and Panama. Together with partners, including PAHO, U.S. CDC has helped the region detect and respond to serious public health threats, including influenza, diarrheal and neurologic diseases, and febrile illnesses, such as rickettsia and dengue.

### Coverage

GDD-Guatemala covers 8 countries: Guatemala, Belize, Honduras, Dominican Republic, Nicaragua, El Salvador, Costa Rica, and Panama. The influenza program subsidizes an epidemiologist in each of the 8 CAP countries, providing links to the MOHs and better collaboration during outbreak investigations. GDD-Guatemala has worked across the region in pandemic preparedness and rapid response activities in these countries with measurable success on the basis of PAHO's evaluation metrics.

### Activities

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

In 2009, GDD-Guatemala responded to 39 outbreaks, most of which achieved a measurable public health effect, and laboratory support was provided. They discovered 2 pathogens new to the region and increased their laboratory testing capacity by 35%. Laboratory support to test for 2009 H1N1 influenza was facilitated in all 8 CAP countries. Additionally, GDD-Guatemala trained more than 5,000 participants in short-term regional and national trainings.

### In-Country Field Staff

Isabella Danel, MD, MPH  
GDD-Guatemala Coordinator

Nivaldo Linares Pérez, MD, MSc, PhD  
Influenza Lead

### Principal U.S. CDC Program Collaborations In-Country

- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FETP.
- Laboratory Systems and Biosafety.
- All-Hazards Preparedness and Response.



# Pan America Region

## Mexico



- **Capital:** México (Distrito Federal)
- **Area:** 1,972,550 sq km
- **Population:** 112,468,855 (July 2010 est.)
- **Age Structure:** 0–14 years: 29.6% (male 16,619,995/female 15,936,154); 15–64 years: 64.3% (male 34,179,440/female 36,530,154); 65 years or older: 6.1% (male 3,023,185/female 3,666,472) (2008 est.)
- **Life Expectancy at Birth:** Total population: 75.84 years; male: 73.05 years; female: 78.78 years (2008 est.)
- **Infant Mortality Rate:** Total: 19.01 deaths/1,000 live births; male: 20.91 deaths/1,000 live births; female: 17.02 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 91%; male: 92.4%; female: 89.6% (2004 est.)
- **GDP:** \$1.578 trillion (2008 est.)
- **GDP per Capita:** \$14,400 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 is the 4th year of the cooperative agreement.

The Mexican National Laboratory Network consists of 31 state laboratories and the National Institute of Diagnosis and Epidemiologic Reference (InDRE), in which the country's NIC is located. In Mexico, the response to pandemic influenza is initiated at the local level with guidance from federal and state authorities.

### Surveillance

The major developments that took place in the surveillance system during 2009 include the following:

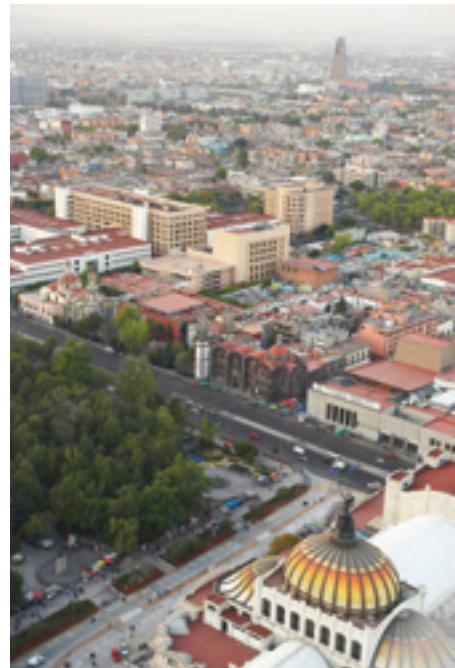
- Inclusion of surveillance of SARI and deaths; previously, sentinel sites reported only ILI.
- Increase in the number of reporting sentinel sites with the addition of hospitals; previously, most sites were primary care facilities.
- Developed a new Web-based reporting system to allow the combining of laboratory and epidemiologic information on ILI and SARI cases and deaths.
- Mexico's Influenza Surveillance System has been enhanced since 2006 to include more than 500 sentinel sites throughout the country.

## Laboratory

- In 2006, Mexico created the Laboratory Activities Coordination for Pandemic Influenza Preparedness at InDRE, which developed a comprehensive survey to evaluate the influenza surveillance capacity for all 31 state laboratories and one federal laboratory. The results were used to implement a plan to reinforce the influenza diagnostic testing in state laboratories.
- A total of 31 state laboratories across Mexico have the capacity to perform influenza diagnostic tests, such as IFA, 7 laboratories perform RT-PCR, 24 laboratories have incorporated real-time RT-PCR testing to confirm diagnosis, and 4 laboratories are in the process of implementing viral isolation from cell culture.
- InDRE routinely receives influenza samples from state laboratories for confirmation and diagnosis of influenza viruses. InDRE performs real-time RT-PCR testing, isolation (embryonated eggs and cell culture), HAI, and differential diagnostics; participates in FluNet; and sends samples to WHO collaborating centers for further analysis.

In addition, InDRE is working to strengthen seasonal and avian influenza detection in the state laboratory network by doing the following:

- Developing and enhancing a bioinformatics platform in the National Network of Public Health Laboratories (Red Nacional de Laboratorios de Salud Pública).
- Providing standard reagents, such as primers, to influenza network laboratories in Mexico.
- Evaluating available commercial rapid diagnosis kits for seasonal influenza particular to viruses circulating in Mexico.
- Strengthening the quality control system of influenza network laboratories.
- InDRE is in the process of becoming part of the Laboratory Response Network (LRN), whose members are charged with maintaining an integrated network of state and local public health, federal, military, and international laboratories that can respond to bioterrorism, chemical terrorism, and other public health emergencies.
- Mexico is in the process of restructuring its BSL-3 laboratory by using federal funding. The laboratory equipment was acquired with U.S. CDC funding.



## **Preparedness**

- The Mexican MOH developed a multisectorial operation strategy for pandemic planning that includes 7 strategic groups consisting of government and business representatives.
- Each group integrates its institutional contingency plan with the country's sector-wide preparedness strategy. Rapid response to outbreaks is integral to this strategy.
- Each state in Mexico has a rapid response team that includes medical doctors, epidemiologists, laboratory staff, and equipment.
- Each state has identified at least 1 hospital as an isolation facility in case of a major public health event.

## **Training**

- Mexico's MOH has conducted training of health care providers at all levels on diverse aspects of influenza, including epidemiologic surveillance. State, jurisdictional, and hospital epidemiologists were trained in a new Web-based reporting system and other surveillance procedures. A curriculum on data analysis is currently being developed.
- Mexico has provided updated training to its 31 state laboratories on diagnostic techniques for influenza, including the proper way to collect, ship, process, and handle specimens.
- During the 1st pandemic wave, with support from U.S. and Canadian colleagues, thousands of specimens were processed, and personnel from 6 state laboratories were trained on real-time RT-PCR. The technique has become standardized at InDRE.
- InDRE participated in the workshop on guidelines of IATA transportation for infectious substances, which was supported by PAHO.

## **H1N1 Activities, FY 2009**

As part of the response to the 2009 H1N1 influenza outbreak, weekly sessions were held with strategic agents at the federal level of the MOH and with state epidemiologists via the Internet. During those meetings, the current situation of influenza was reviewed, and mitigation and prevention efforts were discussed.

## **Notable Achievements, 2009**

A weekly national influenza bulletin that reports counts and trends of ILI, SARI, deaths, and confirmed 2009 H1N1 influenza cases was developed. The bulletin also includes other indicators, such as percentage of visits for ILI in sentinel sites.

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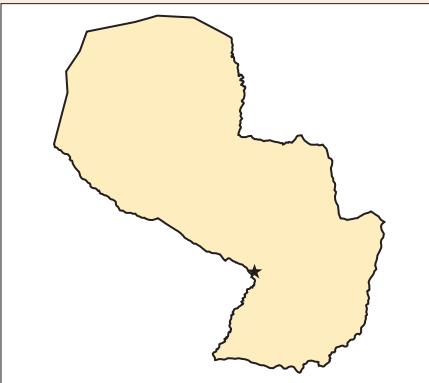
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# Pan American Region

## Paraguay



- **Capital:** Asuncion
- **Area:** Total: 406,752 sq km
- **Population:** 6,375,830 (July 2010 est.)
- **Age Structure:** 0–14 years: 29.5% (male 955,532/female 924,165); 15–64 years: 64.6% (male 2,068,545/female 2,048,207); 65 years or older: 6% (male 175,865/female 203,516) (2010 est.)
- **Life Expectancy at Birth:** Total population: 75.99 years; male: 73.39 years; female: 78.71 years (2010 est.)
- **Infant Mortality Rate:** Total: 23.83 deaths/1,000 live births; male: 27.84 deaths/1,000 live births; female: 19.62 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 94%; male: 94.9%; female: 93% (2003 est.)
- **GDP:** \$28.27 billion (2009 est.)
- **GDP per Capita:** \$4,100 (2009 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2009.
- FY 2009 is the 1st year of the cooperative agreement.

In 1997, Paraguay started virologic surveillance of influenza and other respiratory viruses at sites with the capacity to take samples and ship them to the Central Public Health Laboratory (El Laboratorio Central de Salud Pública) for detecting respiratory viruses by IFA. In 1998, the LCSP began performing cell culture to isolate and characterize viral strains, and the laboratory was designated as a NIC.

In 2004, influenza was included in the list of notifiable diseases to the National Office of Communicable Disease Surveillance. Paraguay prepared its 1st version of a National Influenza Pandemic Preparedness Plan in 2005. This plan was reviewed and in June 2007, a 2nd version was developed. In 2006, sentinel surveillance of influenza and other respiratory viruses was implemented, and in 2008, the nationwide enhanced surveillance of unusual or unexpected SARI was implemented.

Objectives for the coming year are to

- Implement Paraguay's NIPPP and communication strategy in the subnational levels.
- Strengthen national surveillance systems to be able to detect emerging infectious diseases, such as pandemic influenza.
- Develop national and subnational capacity to respond to outbreaks.

## Principal Collaborators

### Project Investigators

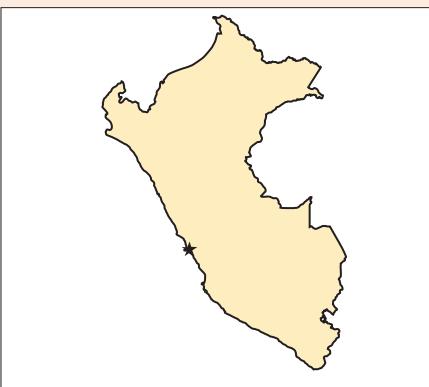
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# Pan American Region

## Peru



- **Capital:** Lima
- **Area:** 1,285,220 sq km
- **Population:** 29,907,003 (July 2010 est.)
- **Age Structure:** 0–14 years: 29.7% (male 4,409,227/female 4,253,836); 15–64 years: 64.7% (male 9,501,597/female 9,381,139); 65 years or older: 5.6% (male 770,389/female 864,711) (2008 est.)
- **Life Expectancy at Birth:** Total population: 70.44 years; male: 68.61 years; female: 72.37 years (2008 est.)
- **Infant Mortality Rate:** Total: 29.53 deaths/1,000 live births; male: 32.02 deaths/1,000 live births; female: 26.93 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 87.7%; male: 93.5%; female: 82.1% (2004 est.)
- **GDP:** \$249.5 billion (2008 est.)
- **GDP per Capita:** \$8,500 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began September 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Peru is the 3rd largest country in South America and has a population of approximately 28 million people. Peru has 15 regional laboratories involved in laboratory surveillance for influenza and other respiratory viruses by using IFA. IFA-positive samples are sent for virus isolation and identification to the NIC located in the National Institute of Health in Lima.

Peru has concentrated on developing local capacity for rapid response to outbreaks of respiratory disease, viral respiratory disease control, and risk communication by using workshops and information sharing among its 34 regional health directors. In addition, Peru has developed a national pandemic plan and recently modified their national pandemic response plan on the basis of lessons learned from the 2009 H1N1 influenza pandemic.

### Surveillance

- Sentinel surveillance has been implemented in 50 health centers throughout the country, including 30 health centers supported by U.S. CDC and U.S. Naval Medical Research Center Detachment (NMRCD). Of these 50 centers, 6 are newly implemented by the MOH. Nasal or pharyngeal swabs are processed at the Instituto Nacional de Salud (INS, Peruvian National Institutes of Health) and NMRCD.

- The MOH has recently implemented a Web-based database, whereby all groups (i.e., DGE, INS, and NMRCD) are submitting laboratory and epidemiologic data. Overall, 23 sites perform SARI surveillance in Peru.

### **Laboratory**

- After WHO declared the pandemic, the real-time RT-PCR protocol and method for detecting 2009 H1N1 influenza virus was implemented at INS and NMRCD for all samples collected at sentinel surveillance sites. Additional cell culture inoculation and nucleic acid sequencing was performed at NMRCD.
- The MOH is currently planning to implement real-time RT-PCR at several of the regional laboratories for the upcoming influenza season.

### **Training**

- Technical assistance has been provided by using video and teleconference and continues to be provided to national and regional alert response teams.
- Peru has offered assistance to all epidemiology networks to prepare for pandemic influenza.

### **H1N1 Activities, FY 2009**

On the basis of the case definition for 2009 H1N1 influenza in May 2009, the Peru MOH established a slightly modified surveillance system. After the WHO declaration of the pandemic, an active surveillance system was established to define the procedures for detecting, notifying, investigating, following, and controlling 2009 H1N1 influenza in Peru. This system was halted on July 7 and changed to a mitigation phase. During the H1N1 pandemic, Peru intensified influenza surveillance systems by

- Reinforcing sentinel surveillance of SARI through an online platform with information about hospitalization, comorbidities, outcomes, treatment, and other variables.
- Optimizing and defining the scope of the pandemic in Peru by reporting ARI cases in children less than 5 years of age and pneumonia cases and deaths for all age groups.



## **Control Measures**

- Active surveillance was implemented in all airports. For example, during the middle of the 2009 H1N1 influenza crisis, travel restrictions to Mexico were implemented.
- A telephone hotline was developed to receive public reports on respiratory diseases.
- The health department implemented antiviral treatment to symptomatic high-risk groups.
- The clinical and epidemiologic forms of influenza cases were entered into the NMRCD database or directly into the MOH Web-based platform.

## **Notable Achievements, 2009**

- The MOH-implemented and -supported telephone hotline helped to identify several cases among international travelers.
- Peer-reviewed publications by the MOH (i.e., DGE, INS) and NMRCD have described the clinical and epidemiologic features of pandemic 2009 H1N1 influenza.

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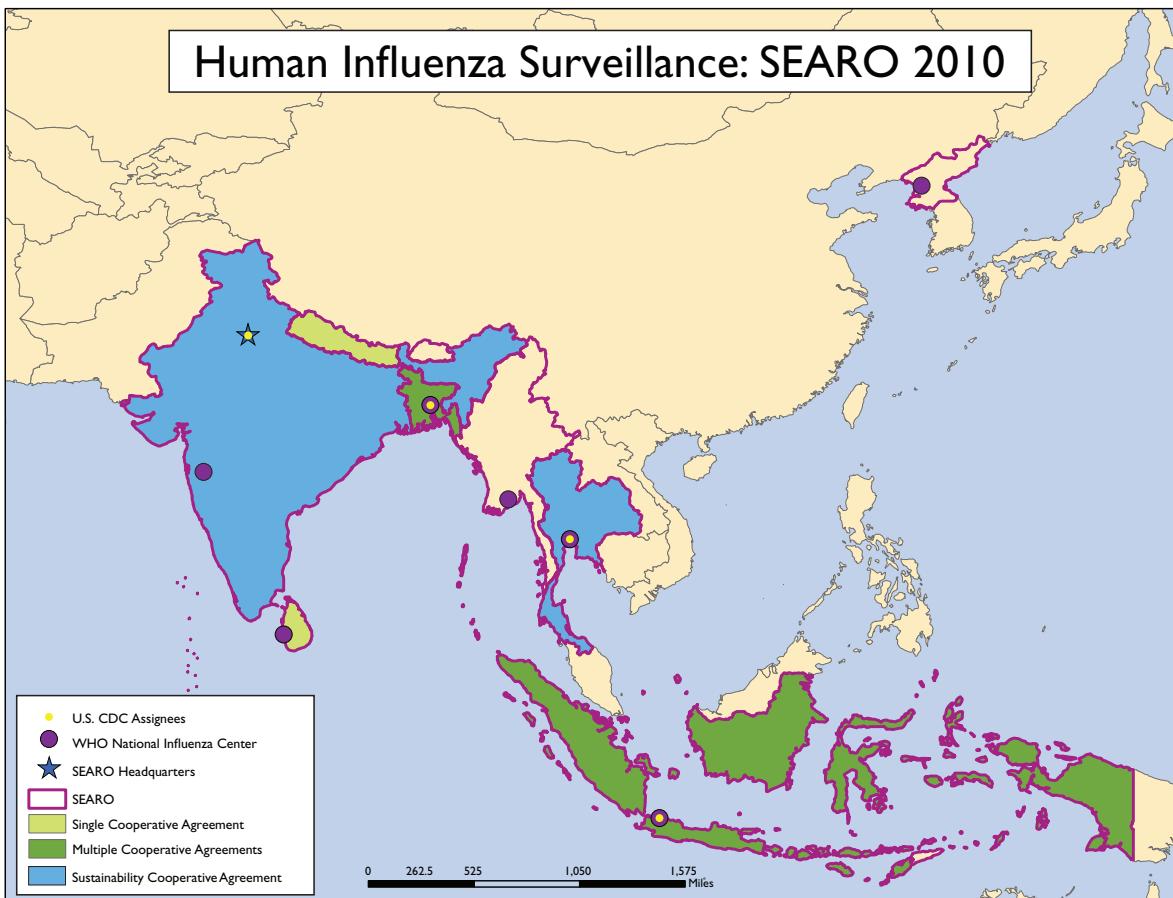
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# **South-East Asia Regional Office (SEARO)**



# South-East Asia Regional Office (SEARO)



## U.S. CDC Direct Regional Support

Surveillance and Response for Pandemic and Avian Influenza by Regional Offices of WHO

- Began September 2006.
- FY 2009 was the 3rd year of the cooperative agreement.

WHO-SEARO is located in New Delhi, India. The office serves 11 countries with more than 1.7 billion people. Member countries are Bangladesh, Bhutan, DPR Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, and Timor-Leste. Six of the 11 countries receive U.S. CDC Influenza Division cooperative agreement funds, including Nepal and Sri Lanka, which are receiving funds for the 1st time this year. In 2009, SEARO staff provided training, support, and technical assistance to member countries; developed standardized influenza laboratory procedures; and strengthened laboratory networking among member countries.

In 2010, SEARO will focus on the following:

- Enhance countries' capacities to more efficiently carry out surveillance and response for influenza.
- Assist countries in revising their pandemic preparedness plans to ensure they are in line with new WHO guidance.
- Set up a regional database to track and monitor results of specimens submitted by NICs in the region.
- Strengthen laboratory infrastructure and build laboratory and epidemiology capacities to accurately and promptly diagnose influenza with pandemic potential.

### **Surveillance**

- SEARO has assisted in strengthening pandemic influenza surveillance and response in WHO-SEARO member countries.

### **Laboratory**

- Standard operating procedures for laboratories have been revised and shared with member countries.

### **Preparedness**

- SEARO established bilateral arrangements among member countries for fast specimen shipping and processing.
- Standard laboratory procedures were reviewed.

### **Training**

- Rapid response and containment training at the sub-national level was conducted in Maldives, Bangladesh, India, Nepal, and Bhutan.
- Training of trainers for outbreak investigation and early warning alert and response took place in November 2008 in Indonesia, Maldives, and Sri Lanka.
- A regional workshop was held in June 2009 in Bangkok for NICS regarding H1N1 U.S. CDC test kits.
- Respiratory infection control and hospital preparedness and contingency planning workshops were held in different countries.

### **H1N1 Activities, FY 2009**

- SEARO established bilateral arrangements among member countries for rapid specimen shipping and processing.

### **Notable Achievements, 2009**

- SEARO developed a guide for enhanced surveillance and monitoring of ILI/SARI entitled, *A Practical Guide to Conducting ILI/SARI and Respiratory Event-based Surveillance*.
- SEARO established arrangements among member countries for influenza diagnosis with fast specimen shipping and processing.
- SEARO developed a training package for hospital preparedness and infection control for respiratory illnesses.

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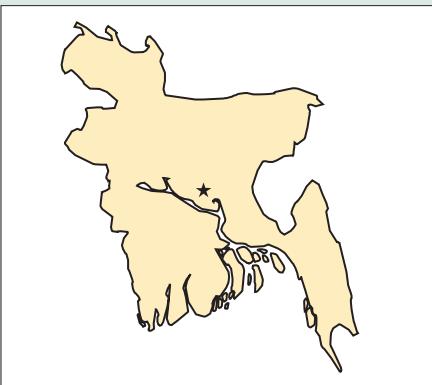
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# Southeast Asia Region

## Bangladesh



- **Capital:** Dhaka
- **Area:** 144,000 sq km
- **Population:** 158,065,841 (July 2010 est.)
- **Age Structure:** 0–14 years: 33.4% (male 26,364,370/female 24,859,792); 15–64 years: 63.1% (male 49,412,903/female 47,468,013); 65 years or older: 3.5% (male 2,912,321/female 2,529,502) (2008 est.)
- **Life Expectancy at Birth:** Total population: 63.21 years; male: 63.14 years; female: 63.28 years (2008 est.)
- **Infant Mortality Rate:** Total: 57.45 deaths/1,000 live births; male: 58.44 deaths/1,000 live births; female: 56.41 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 43.1%; male: 53.9%; female: 31.8% (2003 est.)
- **GDP:** \$228.4 billion (2008 est.)
- **GDP per Capita:** \$1,500 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began in 2006.
- FY 2009 is the 3rd year of the cooperative agreement.

The People's Republic of Bangladesh is one of the most populous countries in the world with an estimated 165 million people. Bangladesh faces serious challenges in controlling human and avian influenza. Each year, during April through October, seasonal influenza causes ILI in 10 Bangladeshis for each 100 person-years. Of people ill with influenza, 3% have laboratory-confirmed co-infections with different influenza types.

In June 2009, Bangladesh identified its 1st case of pandemic 2009 H1N1 influenza. The pandemic spread rapidly throughout the country, causing illness among an estimated 8.6 million people and a case fatality proportion among laboratory-confirmed cases of 0.9%. In September 2009, as the 1st wave of the pandemic was subsiding, animal health authorities and the International Center for Diarrheal Disease Research, Bangladesh (ICDDR,B) identified outbreaks of avian influenza among domestic poultry.

Bangladesh, a country with approximately 183 million poultry, has reported influenza A (H5N1) outbreaks in 287 farms throughout the country since February 2007. The spread of pandemic 2009 H1N1 influenza and these avian influenza outbreaks are of great concern because of the high population density and frequent interaction between humans and poultry.

Approximately 50% of Bangladeshis poultry are raised in backyards. Although transmission of avian influenza to humans occurs infrequently, in March 2008, the 1st human case of influenza A (H5N1) in Bangladesh was identified through a population-based human influenza study in Dhaka. Public health authorities are very concerned that the circulation of pandemic 2009 H1N1 along with the significant rate of co-infections of influenza A (H5N1) and other avian influenza A viruses (H2, H7, H9) in domestic poultry may predispose Bangladesh to the development of further novel influenza strains with pandemic potential.

To prevent and control human seasonal and pandemic influenza, as well as avian influenza, Bangladesh's Institute of Epidemiology, Disease Control, and Research (IEDCR) has taken a leadership role. The IEDCR has partnered with national and international organizations to understand the burden of disease caused by seasonal influenza and to guide the country through pandemic response. IEDCR is the organization within the Ministry of Health and Family Welfare that is responsible for disease surveillance and outbreak investigation.

### **Surveillance**

- The IEDCR partnered with the ICDDR,B to conduct ILI and SARI surveillance in 12 hospitals throughout Bangladesh. The main objectives were to identify clusters of SARI that may represent public health events of international concern and to characterize the epidemiology of seasonal influenza circulating in Bangladesh—information necessary to guide annual prevention and control efforts.
- Four of the sentinel surveillance hospitals have completed the 1st phase of a study, estimating the national burden of influenza disease in Bangladesh as 9 hospitalizations for each 1,000 children aged less than 5 years. The primary investigators of these efforts have circulated manuscripts for publication in peer-reviewed journals in an effort to disseminate their findings and better guide regional influenza control efforts.
- The IEDCR plans to strengthen the surveillance system by implementing a software system with the help of the U.S. HHS, CDC, and IEIP to allow public health officers throughout the country to report influenza cases by using the Internet.
- The IEDCR plans to expand influenza surveillance to 18 new sites throughout Bangladesh in the coming years.



## **Laboratory**

- The IEDCR laboratory is designated as the NIC by WHO and is capable of testing human samples by RT-PCR to identify seasonal, pandemic 2009 H1N1, and H5N1 influenzas.
- The IEDCR remodeled its facilities and in 2009, installed a prefabricated BSL-3 influenza laboratory. The BSL-3 laboratory will help IEDCR phase in influenza surveillance activities that are currently being conducted with the assistance of ICDDR,B's laboratory facility.
- USAID and U.S. CDC funding has been leveraged to assist ICDDR,B, an important IEDCR partner, to construct a state-of-the-art BSL-3+ facility and an animal BSL-2 facility to understand better the risk of avian and human influenza in Bangladesh and explore opportunities to control this risk.
- The ICDDR,B facilities have initiated poultry sample testing during 2009, leading to the identification of several outbreaks of avian influenza.

## **Preparedness**

- By request of the MOH, the IEDCR is currently revamping its pandemic response and avian influenza plan. The IEDCR is collaborating with the Department of Livestock Services, WHO, USAID, ICDDR,B, and DANIDA (i.e., the Danish government) to revise this living document.
- Standard operating procedures to roll out nonpharmaceutical interventions, triage, and alternate care facilities during a pandemic are currently being revised to reflect lessons learned during the 1st wave of pandemic 2009 H1N1 influenza.

## **Training**

- Although the IEDCR does not have a formal training program, the IEDCR has partnered with WHO and IDDCR,B to facilitate the prevention and control of influenza, as well as the informal and formal training of young government scientists.

## **Special Influenza Projects**

- The IEDCR has partnered with ICDDR,B on an ambitious research agenda to characterize the influenza strains circulating in Bangladesh, estimate the burden of influenza disease, explore long-term sequela of frequent influenza illnesses (e.g., cognitive developmental delays), and pilot and test nonpharmaceutical interventions to control influenza (e.g., handwashing and respiratory hygiene interventions).
- The IEDCR has partnered with ICDDR,B and the Department of Livestock Services to identify the risk factors associated with poultry and human infection with avian influenza (e.g., influenza A/H5N1).
- A comprehensive list of these research projects is provided in the Research Section of this book. These projects are beginning to yield publishable data to guide policy during 2009.

## **Principal Collaborators**

The IEDCR has a variety of funding and technical partners within the Bangladeshi government and with international organizations. Each partner provides a different perspective, core capacity, and funding source to leverage the various influenza prevention and control efforts of the government of Bangladesh. These partners include

- Department of Livestock Services (Government of Bangladesh).
- WHO.
- USAID.
- ICDDR,B.
- DANIDA (Danish government).
- CARE International.

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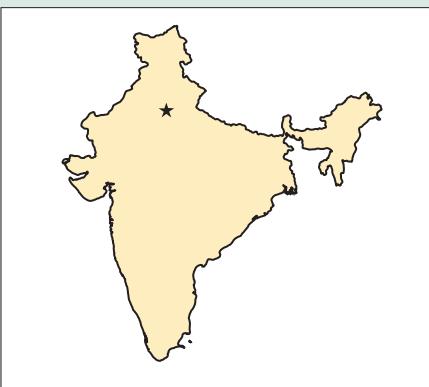
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# Southeast Asia Region

## India



- **Capital:** New Delhi
- **Area:** 3,287,590 sq km
- **Population:** 1,173,108,018 (July 2010 est.)
- **Age Structure:** 0–14 years: 31.5% (male 189,238,487/female 172,168,306); 15–64 years: 63.3% (male 374,157,581/female 352,868,003); 65 years or older: 5.2% (male 28,285,796/female 31,277,725) (2008 est.)
- **Life Expectancy at Birth:** Total population: 69.25 years; male: 66.87 years; female: 71.9 years (2008 est.)
- **Infant Mortality Rate:** Total: 32.31 deaths/1,000 live births; male: 36.94 deaths/1,000 live births; female: 27.12 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 61%; male: 73.4%; female: 47.8% (2001 census)
- **GDP:** \$3.319 trillion (2008 est.)
- **GDP per Capita:** \$2,900 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- First influenza cooperative agreement began in September 2004 and ended in September 2009.
- FY 2009 is the 1st year of a new 5-year sustainability cooperative agreement.

India provides a unique opportunity to study influenza transmission and prevalence among various populations because of the socioeconomic, ethnic, and geographic diversity of its population. The U.S. CDC, in coordination with other U.S. government agencies, supports international response measures against avian and pandemic influenza in India through multiple implementing partners.

India's NIC is part of the Indian Council of Medical Research (ICMR), Department of Health Research within the Ministry of Health and Family Affairs (MOHFW). The India NIC, which is located at the National Institute of Virology, Pune, has a long-standing collaboration with the U.S. CDC in seasonal, avian, and pandemic influenza surveillance. The bilateral agreement between the India NIC and the U.S. CDC has been ongoing since 2004 and has provided resources for a greatly expanded surveillance system, including surveillance for novel H1N1.

ICMR conducts epidemiologic and virologic influenza surveillance in different geographic areas of India by collaborating with 9 regional centers. Collectively, more than 16,000 specimens have been collected from surveillance sites, and approximately 800 isolates have been well characterized since the beginning of the CDC-ICMR influenza network, which started in 2004.

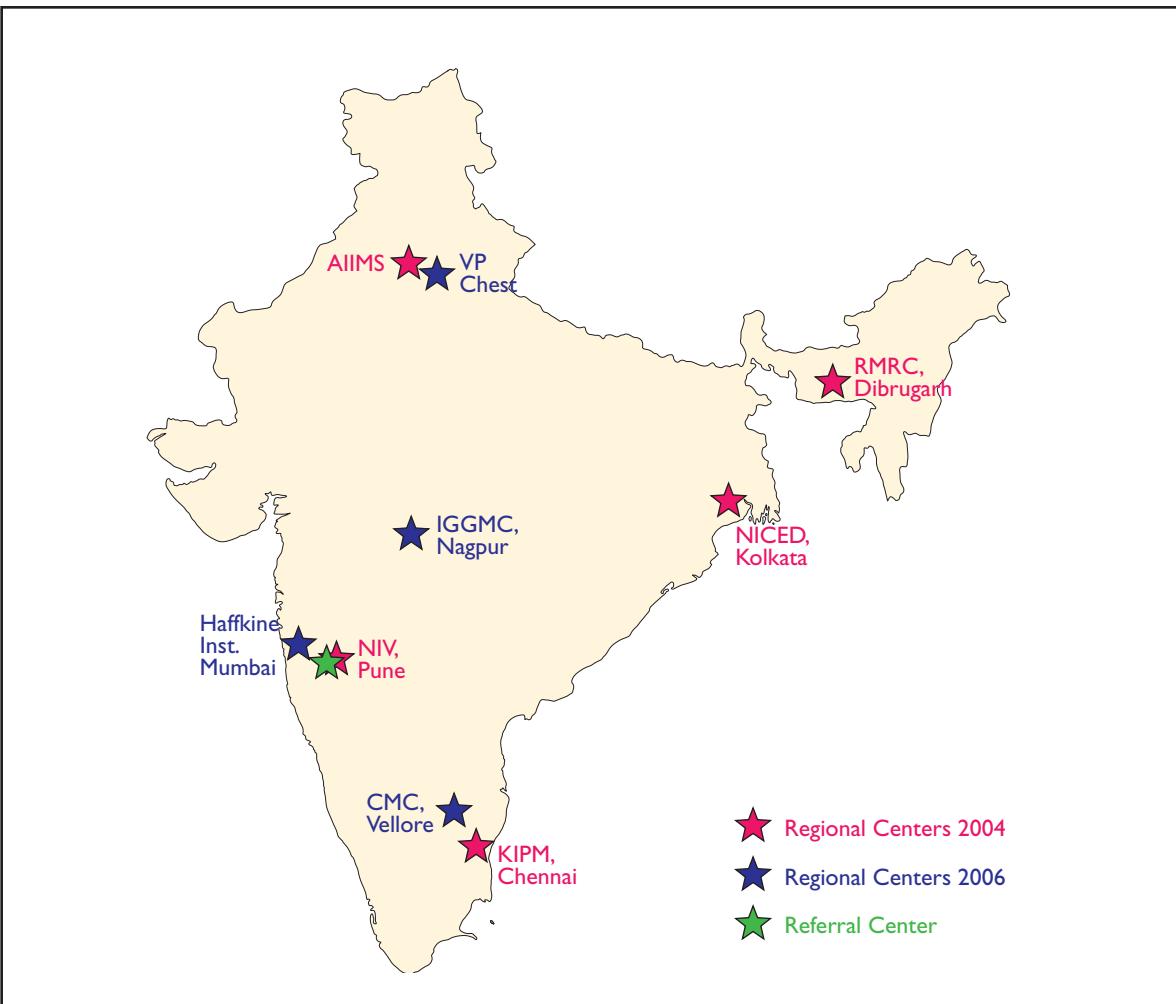
The India NIC has worked closely with U.S. CDC to establish state-of-the-art laboratories and has trained extensively with U.S. CDC scientists on typing, subtyping, PCR, real-time PCR, and reverse genetics techniques. Notable progress of laboratory surveillance capacity has occurred over the past 5 years, and the success of this partnership has led to significant enhancements benefiting both India and the global influenza surveillance network.

In 2010, ICMR plans to build on these activities and work closely with the influenza network by enhancing regional surveillance systems, developing standardized influenza laboratory procedures, conducting laboratory training workshops, enhancing preparedness plans, strengthening the capabilities of 4 of the regional centers, conducting expanded H1N1 surveillance in hospitalized cases, and supporting a health care facility preparedness initiative.

## **Surveillance**

- Assist ICMR with conducting virologic surveillance for seasonal influenza throughout India to understand the viral characteristics and seasonality of influenza in India.
- Advance influenza virus sequencing, real time RT-PCR, and HI techniques to analyze antigenic and genetic differences in order to ascertain influenza virus circulation among different geographic areas with different temperate zones.
- Provide isolates and data for vaccine representative strains.
- Provide technical guidance for surveillance activity to create disease burden estimates.
- Contribute seasonal influenza isolates for annual vaccine strain selection for influenza.
- The CDC-ICMR influenza network is coordinating with the National Center of Disease Control (NCDC) in Delhi to create a larger network of influenza surveillance units in India.
- Build capacity for disease surveillance and laboratory networks for rapid detection of avian influenza.
- Share influenza-related educational and informational materials and create public health messaging systems.
- Compare the influenza surveillance data with climate, geography, and demographic data to explore trends of influenza seasonality.
- Conduct antiviral drug sensitivity surveillance to guide clinical treatment and prophylaxis of influenza.

## Current Influenza Network Sites, India



## Laboratory

India has 9 influenza laboratories that are capable of influenza diagnostic tests, such as virus isolation, HA and HI, and RT-PCR and real-time RT-PCR testing to confirm diagnosis for seasonal influenza. Most of these laboratories can also test for H5N1 and H1N1. Laboratory techniques and guidance that further strengthen seasonal, avian, and pandemic influenza laboratorial detection in India include the ability to

- Build capacity by developing a network of 9 laboratories for influenza surveillance throughout India.
- Train staff at NIV, Pune, and extending training for additional network members in India and the region.
- Trained staff to detect pandemic H1N1 by using real-time PCR and create surge capacity at many laboratories in India.
- Provide technical guidance for creating BSL-3 plus and BSL-4 laboratories and developing standard operating procedures (SOPs).
- Provide standard reagents, such as HA/HI and PCR reagents, to influenza network laboratories in India.

- Strengthen the quality control system of influenza diagnostic network laboratories.
- Enhance rapid sequencing and phylogenetic analytic capability at NIV, Pune.

### **Preparedness**

- Assist government of India in training for early detection, rapid response, and containment of avian and pandemic influenza at its source.
- Assist the MOHFW in increasing awareness and response in order to minimize the risk of the spread of human infections and disease.
- Provide technical guidance for developing and implementing training modules for rapid response and containment, physician awareness, and infection control in health care facilities jointly developed by India MOH, U.S. CDC, and WHO.
- Make a self-assessment monitoring and evaluation tool available to enable India to take inventory of their capacity to handle potential pandemics and to identify possible gaps for future implementation of pandemic plans.
- Develop the skills and laboratory network capacity to detect novel influenza viruses with NIV, Pune, as the focal point for laboratory detection of an influenza pandemic.

### **Training**

- Extended training opportunities and developed capacity and human resources at the collaborating institutions in India.
- Provided hands-on training of laboratory staff in India to identify potential pandemic influenza by PCR.
- Conducted technical training workshops on seasonal influenza laboratory detection for all influenza surveillance network laboratories in NIV, Pune. This training is ongoing yearly.
- Provided technical guidance for the training physicians at the tertiary care level for early warning signs, developed a surveillance network, and identified possible H5N1 infections.
- Provided training for regional RRT teams made up of health and veterinary practitioners in India at the regional and district levels.



- Trained WHO-supported district, state, and regional surveillance medical officers of the National Polio Surveillance Program and state-level consultants of the Revised National Tuberculosis Control Program on Epidemic and Pandemic Preparedness and Response.
- Undertook state-level tabletop exercise related to implementing the pandemic plan in partnership with the MOH and the WHO country office.
- Provided training on respiratory infection control and prevention in health care facilities that included case management guidelines for avian and pandemic influenza and how to appropriately use of PPE for health care workers.
- Extended the following training to influenza network members in India and the region:
  - Real-time PCR assay training for Co-PI from the regional center: CMC Vellore, September 16–18, 2008.
  - The NIC at NIV, Pune, participated as an expert committee member and delivered a lecture on the principles of real-time PCR for influenza or avian influenza at the NICD-WHO hands-on laboratory training on influenza or avian influenza with special reference to molecular characterization: National Institute of Communicable Diseases, Delhi, December 18–20, 2008.
  - Two staff members from VPCI, Delhi, trained at NIV for influenza isolation and antigenic analyses techniques, February 2–6, 2009.
  - A 1-day orientation program for the influenza disease burden study for 29 physicians: Vadu study site, February 23, 2009.

### **Special Influenza Projects**

- Developed broad activities that encompassed the epidemiologic, basic, and applied research aspects of avian and pandemic influenza with multiple partners in India.
- Facilitated technology transfer for various research tools, including capacity to test for human exposure to H5N1 and creation of reverse genetics modified Indian H5N1 as potential vaccine candidate immunogens.
- Developed programs to assess host-viral interacting proteins at the molecular level that may eventually help explain the pathogenesis of influenza in different host species.

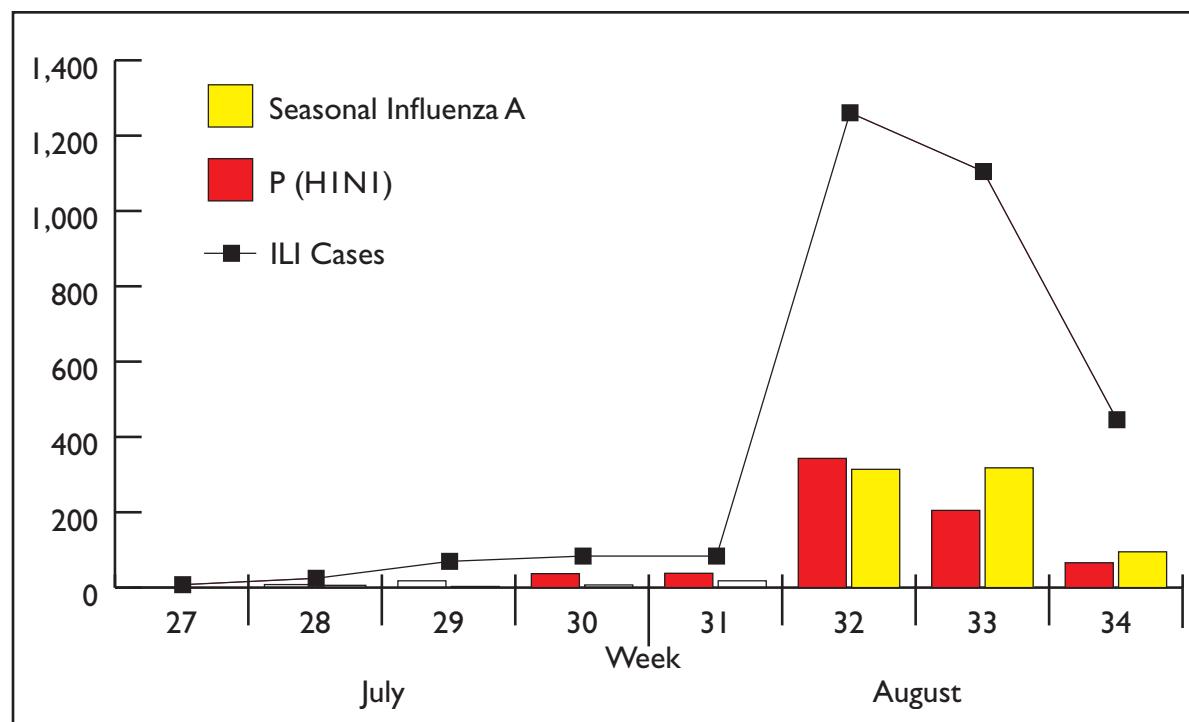
### **H1N1 Activities, FY 2009**

- U.S. CDC's Influenza Division provided the novel H1N1 detection kits within weeks of the H1N1 outbreak. Further, NIV provided scientific and technical support for real-time PCR, SOPs, reagents, and positive control to all regional laboratories.
- Refresher trainings for network laboratories involved in the diagnosis of H1N1 and laboratory-based surveillance of ILI, including the government of India's National Centers for Disease Control (NCDC).
- The following trainings for detection of 2009 H1N1 influenza by real-time PCR and conventional PCR were undertaken by NIV, Pune:
  - Real-time PCR-based diagnosis of 2009 H1N1 influenza, Southeast Asia (organized by WHO, SEARO); June 8–12, 2009, Bangkok, Thailand. Two staff members from NIV, Pune, were invited as advisory members for the workshop.

Twelve participants from 9 countries (i.e., India, Nepal, Bangladesh, Bhutan, Indonesia, Maldives, Sri Lanka, Timor Leste, Thailand) were trained in detecting 2009 H1N1 influenza by real-time and conventional PCR.

- Regional ICMR network members (14 staff from AIIMS, VP Chest, NICED, CMC Vellore, KIPM Chennai, RMRC Dibrugarh, and PGIMER Chandigarh) were given refresher courses in detecting H1N1 by molecular tests, June 17–18, 2009.
- Four ICMR network members (11 staff from Bhubaneswar, Patna, Jabalpur and Andaman and 2 from Jodhpur) were given refresher courses for H1N1 detection by molecular tests, August 24–25 and 27–28, 2009.
- Four staff members of Kasturba Hospital Mumbai (Maharashtra state health system) and 2 staff member of Jodhpur were trained in detecting 2009 H1N1 influenza by real-time PCR and conventional PCR, September 11–12, 2009.
- During the peak of the H1N1 outbreak in late July through August 2009, NIV, Pune, was handling more than 500 specimens each week for influenza testing by PCR.
- The NIC, Pune, recorded more than 11,000 cases of ILI and SARI in August 2009 (peak of H1N1 outbreak in Pune) with approximately 20% positivity for influenza A by real-time PCR. Approximately 50% of the influenza cases were novel H1N1, and the remaining were influenza H3 or seasonal H1.
- Of the 1,084 SARI cases, most patients had milder illness, and 25 deaths were recorded. A total of 44 isolates of novel H1N1 have been isolated, and 4 full-length sequences carried out.

#### **Surge of ILI Cases in Pune, India, August 2009 (approximately 50% novel H1N1 infections)**



## **Notable Achievements, 2009**

- The influenza network collected 4,030 respiratory specimens in 2009 and isolated and characterized 307 influenza viruses. Of these, 107 isolates have been sent to U.S. CDC's Influenza Division for further antigenic analysis. Data indicates that influenza A (H1N1 and novel H1N1), A (H3N2), and type B cocirculated in India.
- An extensive analysis of 4 years of seasonal influenza data collected has shown that seasonality varies according to geographic location:
  - North India demonstrates peak activity in winter and limited activity during rains.
  - Eastern and Western India demonstrate highest activity during rains and limited activity in winter.
  - South India demonstrates peak activity in cooler season during rains.
- Genetic analysis of HA sequences from influenza type A H1 (n = 137), H3 (n = 142), and type B (n = 124) demonstrated that all circulating strains in India clustered with corresponding vaccine strains during 2004–2009.
- Influenza is the causative agent in at least 5% of acute respiratory infections (isolation).
- In 2009, several isolates were identified with the oseltamivir resistance at H274Y in the Neuraminidase gene among H1 isolates and resistant to adamantane (S31N) in some H3 isolates.
- The NIC at NIV, Pune, served as a strong pillar of support for the in-country response to the pandemic H1N1 outbreak. It quickly handled the surge in testing for novel H1N1 by real-time PCR and provided in-country training for other centers for H1N1 testing.
- The NIC at Pune identified the outbreak of novel H1N1 within days and provided necessary support for further confirmation of infection elsewhere.
- Phylogenetic analysis of all 8 gene segments of 4 novel H1N1 identified that Indian isolates were genetically close to A/California-04 /2009, with greater than 99% identity at amino acid level.
- The novel H1N1 virus showed resistance for amantadine but sensitivity to oseltamivir.
- The India NIC developed a Web site: <http://www.idbi-india.org> to
  - Share techniques and experiences and enhance communication with network laboratories and other laboratories about influenza disease burden.
  - Strengthen communication and cooperation with others and improve management of network laboratories.
  - Collect and publish the latest seasonal, avian, and pandemic influenza news.
- In addition, 2 research studies addressing issues related to influenza disease burden and vaccine effectiveness are underway in India.

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# Southeast Asia Region

## Indonesia



- **Capital:** Jakarta
- **Area:** 1,919,440 sq km
- **Population:** 242,968,342 (July 2010 est.)
- **Age Structure:** 0–14 years: 28.4% (male 34,343,198/female 33,175,135); 15–64 years: 65.7% (male 78,330,830/female 77,812,339); 65 years or older: 5.8% (male 6,151,305/female 7,699,548) (2008 est.)
- **Life Expectancy at Birth:** Total population: 70.46 years; male: 67.98 years; female: 73.07 years (2008 est.)
- **Infant Mortality Rate:** Total: 31.04 deaths/1,000 live births; male: 36.14 deaths/1,000 live births; female: 25.68 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 90.4%; male: 94%; female: 86.8% (2004 est.)
- **GDP:** \$932.1 billion (2008 est.)
- **GDP per Capita:** \$3,900 (2008 est.)

### U.S. CDC Direct Country Support

There are 2 cooperative agreements between the Indonesian MOH and U.S. CDC. The 1st is the Developing Influenza Surveillance Networks Cooperative Agreement (with Center for Biomedical and Pharmaceutical Research and Development (Cbp-Rd), National Institute of Health Research and Development [NIHRD]).

- The 1st influenza cooperative agreement with NIHRD began in September 2004 and ended in September 2009.
- FY 2009 is the 1st year of a new 5-year sustainability cooperative agreement with NIHRD.
- The cooperative agreement with the Directorate General of Disease Control and Environmental Health [DDCEH]) began in September 2006.
- FY 2009 is the 3rd year of the cooperative agreement with the DDCEH.

The Republic of Indonesia is the world's 4th most populous country and has approximately 245 million people. The country spreads over 5,300 km and includes more than 17,000 islands, 6,000 of which are inhabited. Surveillance for influenza occurs within the MOH. The NIHRD is designated as the country's NIC and conducts surveillance for patients with ILI in a network of 20 primary care facilities and for patients with SARI in 15 hospitals. NIHRD also provides laboratory testing and support to the DDCEH for avian influenza surveillance activities.

In 2009, DDCEH implemented an early warning surveillance system (EWARS) for 22 priority diseases, including ILI, pneumonia, and avian influenza in the provinces of Lampung and Bali. DDCEH plans to expand the system to 2 other provinces in 2010: North Sulawesi and West Kalimantan. To raise awareness of influenza during the past year, DDCEH conducted training for doctors on detecting H1N1 and avian influenza, awareness training for industrial sectors on influenza (both avian and pandemic), and multisectoral training on pandemic preparedness across several provinces in Indonesia.

### **ILI and SARI Surveillance**

- In 2009, data collection instruments were revised to better capture ILI disease burden data. In addition, specimen referral systems were developed to establish frontline testing for both ILI and SARI patients at the regional reference laboratories.
- The SARI surveillance system was expanded in Tangerang district to capture population-based data on the effect of novel H1N1 (nH1N1) in Indonesia. Both surveillance systems were useful in monitoring the emergence of nH1N1 in Indonesia.
- There are plans to conduct a national workshop on long-term plans for influenza surveillance in January 2010 followed by an in-depth review of surveillance activities. Objectives of this mission will be to integrate various logistic and data management activities and ensure long-term support of influenza surveillance in Indonesia.
- DDCEH implemented community-based surveillance in 2 provinces: East Java (2 districts) and Lampung (2 districts). Village surveillance workers were recruited to collect morbidity data from the community and private practitioners and risk factor data.
- During the first quarter 2010, the surveillance subdirectorate will conduct an in-depth review and on the basis of the results, the subdirectorate hopes to expand the system nationwide pending availability of resources.



## **Laboratory**

- Over the past 5 years, NIH RD used cooperative agreement funds to develop an extensive network of 12 regional laboratories and several hospitals with real-time PCR laboratory capacity.
- NIH RD engaged the regional laboratories in ILI and SARI surveillance activities.

## **Preparedness**

- Given the wide scale H5N1 epizootic in Indonesia and the continued occurrence of H5N1 infection in humans, epicenter containment and pandemic preparedness are a high priority for the MOH.
- To test protocols for epicenter containment, the MOH conducted an operational simulation exercise in South Sulawesi province in April 2009.
- EWARS was successfully implemented in 2 provinces this year by using a combination of U.S. CDC and WHO funding.
- The MOH developed an influenza pandemic surveillance guideline for field health officers and a surveillance guideline for officers at the Port Health Office.
- DDCEH developed a national contingency plan to respond to an influenza pandemic. The drafts of that plan were used to inform decision makers during the H1N1 pandemic.

## **Training**

By using U.S. CDC funds, the MOH established the following training activities in 2009:

- EWARS surveillance, epidemiology, laboratory, and information management.
- Simulation exercises for epicenter containment in South Sulawesi province.
- Surveillance for H1N1 and H5N1 for doctors of primary care facilities and private doctors.
- Pandemic preparedness and business continuity for industrial sectors.
- Multisectoral pandemic preparedness and response in 10 provinces and 84 districts.

## **Special Influenza Projects**

- A community-based KAP survey was conducted in North Sumatra where clustered cases of H5N1 occurred.
- Population-based surveillance for patients with SARI has been implemented in Tangerang district to characterize the burden of disease associated with novel H1N1 infection in Indonesia.

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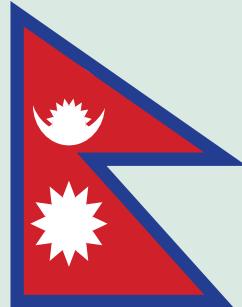
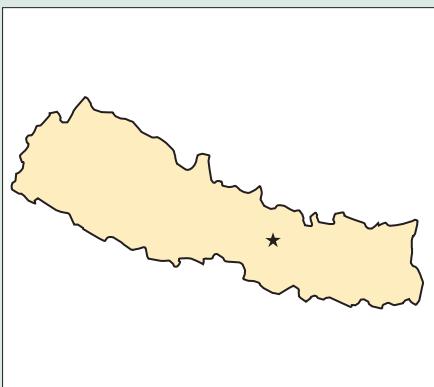
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# Southeast Asia Region

## Nepal



- **Capital:** Kathmandu
- **Area:** Total: 147,181 sq km
- **Population:** 28,951,852 (July 2010 est.)
- **Age Structure:** 0–14 years: 35.6% (male 5,253,150/female 5,056,249); 15–64 years: 60.1% (male 8,328,202/female 9,074,562); 65 years or older: 4.3% (male 581,872/female 657,817) (2010 est.)
- **Life Expectancy at Birth:** Total population: 65.81 years; male: 64.62 years; female: 67.05 years (2010 est.)
- **Infant Mortality Rate:** Total: 46 deaths/1,000 live births; male: 45.97 deaths/1,000 live births; female: 46.04 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 48.6%; male: 62.7%; female: 34.9% (2001 census)
- **GDP:** \$33.25 billion (2009 est.)
- **GDP per Capita:** \$1,200 (2009 est.)

### U.S. CDC Direct Country Support

- In FY 2009, Nepal applied for and was awarded their 1<sup>st</sup> U.S. CDC Surveillance and Response to Avian and Pandemic Influenza cooperative agreement.
- Grant awarded on August 1, 2009.

Nepal is a mountainous country with most people living in rural areas, and many are dependent on poultry and animal farming. With support from the World Bank, Nepal prepared a joint Health and Agriculture National Avian Influenza and Influenza Pandemic Preparedness and Response Plan in 2006, and later that year, an Operational Influenza Plan. In 2008 and 2009, eastern Nepal experienced an H5N1 avian outbreak; no human cases were detected. The U.S. CDC grantee, the Patan Academy of Health Sciences will collaborate with Nepal's Ministry of Health and Population (MOHP) to build capacity in the country to monitor and detect circulating influenza viruses.

### Surveillance

- Nepal proposes to set up 3 sentinel surveillance sites at 3 key hospitals: Patan in Katmandu, Nepalganj Medical College in western Nepal, and BP Koirala Institute of Health Sciences in eastern Nepal.
- With U.S. CDC support, Nepal plans to increase capacity to create and maintain a mechanism for regular virologic and epidemiologic surveillance. Currently, there is no routine virologic sample collection protocol in place in Nepal. To date, hospitals only take swabs from patients who are severely ill.

## **Laboratory**

- Currently, the government's National Public Health Laboratory, the national reference laboratory, has real-time RT-PCR and is testing for the H1N1 virus. The Patan Academy laboratory, with the support of the U.S. CDC grant, plans to purchase a real-time RT-PCR and upgrade their laboratory to conduct routine molecular diagnostic testing.
- Nepal aspires to move toward fulfilling the terms of reference to become a WHO NIC. This will include collecting and sharing influenza virus isolates and maintaining active communication with the WHO Global Influenza Surveillance Network.

## **Preparedness**

- With support from the World Bank, Nepal prepared a joint Health and Agriculture National Avian Influenza and Influenza Pandemic Preparedness and Response Plan in 2006 and later that year an Operational Influenza Plan. Nepal will prepare the 3 sentinel hospitals to mobilize technical teams capable of responding at the district level to an influenza outbreak.

## **Training**

- The MOHP offered lab technicians training on correct techniques for taking and handling nasopharyngeal swabs and specimens.

## **H1N1 Activities, FY 2009**

- As with other outbreaks, when a cluster of cases are reported, the government sends a medical team to investigate. During the current H1N1 epidemic, cases were 1st concentrated in the countryside, but then spread to the more populated Katmandu valley.
- An increasing number of samples are being collected and sent to the laboratory. Tamiflu, masks, gloves, and shipping ice packs are being provided to all zone and regional hospitals.
- Airport screening (native or foreigners) is ongoing. Passengers with possible cases of H1N1 are sent to an infectious diseases hospital for further work-up and therapeutic interventions.

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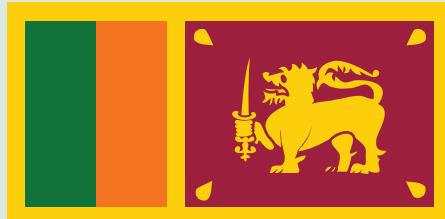
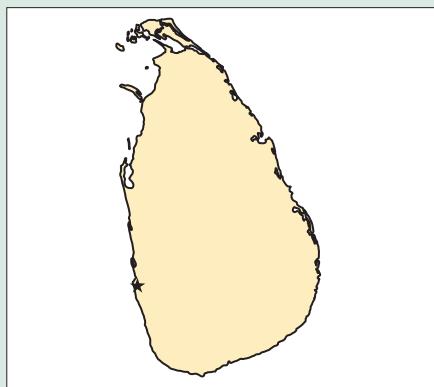
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# Southeast Asia Region

## Sri Lanka



- **Capital:** Colombo
- **Area:** Total: 65,610 sq km
- **Population:** 21,513,990
- **Age Structure:** 0–14 years: 23.6% (male 2,593,007/female 2,490,631); 15–64 years: 68.1% (male 7,153,250/female 7,488,816); 65 years or older: 8.3% (male 825,361/female 962,925) (2010 est.)
- **Life Expectancy at Birth:** Total population: 75.3 years; male: 73.22 years; female: 77.47 years (2010 est.)
- **Infant Mortality Rate:** Total: 18.14 deaths/1,000 live births; male: 19.9 deaths/1,000 live births; female: 16.3 deaths/1,000 live births (2010 est.)
- **Literacy Rate:** Total population: 90.7%; male: 92.3%; female: 89.1% (2001 census)
- **GDP:** \$96.43 billion (2009 est.)
- **GDP per Capita:** \$4,500 (2009 est.)

### U.S. CDC Direct Country Support

- In FY 2009, Sri Lanka applied for and was awarded their 1st U.S. CDC Surveillance and Response to Avian and Pandemic Influenza cooperative agreement.
- Grant awarded August 1, 2009.

Sri Lanka is a high-risk country for avian influenza because it attracts migratory birds and has a large poultry industry and a large number of people keeping poultry in their backyards. The country has only one major port of entry. Sri Lanka's Pandemic Influenza Preparedness and Response activities began in 2005 with support from the WHO and the World Organization for Animal Health (OIE). With additional support from the World Bank in 2008, the country initiated the National Pandemic Influenza Preparedness and Response Program headed jointly by the MOH and Livestock Development and Agriculture. The Epidemiology Unit in the MOH will oversee the new U.S. CDC-funded program, which will complement current and ongoing influenza-related activities.

### Surveillance

Sri Lanka currently has 20 sentinel hospitals selected as centers of influenza surveillance. U.S. CDC funding will be used to increase their capacity to conduct regular virologic and epidemiologic surveillance and to monitor and detect circulating influenza strains. As many as 30 samples of ILI are to be collected each month from the inpatient and outpatient departments. Data on ILI patients are routinely included in the national influenza surveillance database. With U.S. CDC funding, this activity will be strengthened.

## **Laboratory**

Sri Lanka's main government laboratory, the Medical Research Institute (MRI), is a WHO NIC. The laboratory is equipped with real-time RT-PCR and can test for the H5N1 and H1N1 viruses. Sri Lanka collects and shares influenza virus isolates and maintains communication with the WHO Global Influenza Surveillance Network. With U.S. CDC support, the MOH proposes to strengthen their influenza laboratory surveillance by improving laboratory diagnostic facilities. Sri Lanka proposes to set up an information management computer network that links the NIC, the Epidemiology Unit, and the regional influenza sentinel sites.

## **Preparedness**

Sri Lanka has prepared a National Pandemic Influenza Preparedness Plan and has a National Steering Committee and a National Technical Committee on Avian and Pandemic Influenza Preparedness that all meet regularly. Preparedness plans for all 26 administrative districts have been developed. The National Communication Strategy on Avian and Pandemic Preparedness was developed and is periodically updated. The MOH has stockpiled Tamiflu that can be used during the H1N1 pandemic.

## **Training**

With U.S. CDC funds, the MOH Epidemiology Unit and the MRI is planning to train regional epidemiologists, hospital infection control nursing officers, and laboratory technicians on influenza laboratory and epidemiologic surveillance.

## **H1N1 Activities, FY 2009**

There have been 115 confirmed H1N1 cases from June 2009, when the first H1N1 case was identified to October 15, 2009. More than 90% of these were visitors from other affected countries. Most were detected by using airport surveillance and screening. Sustained community transmission was confirmed on October 16, 2009. As a result, strategies in case identification and laboratory surveillance were modified: airport screening was suspended, and only epidemiologically important patients, or those with severe illness from treating hospitals, were tested. There has been another 70 confirmed cases since then. Sri Lanka reports weekly to WHO and U.S. CDC on confirmed H1N1 cases by location, age, and sex.



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## **Partners**

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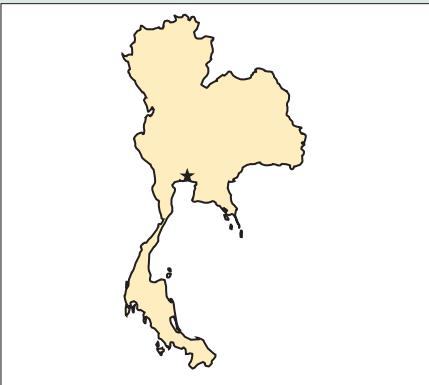
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# Southeast Asia Region

## Thailand



- **Capital:** Bangkok
- **Area:** 514,000 sq km
- **Population:** 66,404,688
- **Age Structure:** 0–14 years: 21.2% (male 7,104,776/female 6,781,453); 15–64 years: 70.3% (male 22,763,274/female 23,304,793); 65 years or older 8.5% (male 2,516,721/female 3,022,281) (2008 est.)
- **Life Expectancy at Birth:** Total population: 72.83 years; male: 70.51 years; female: 75.27 years (2008 est.)
- **Infant Mortality Rate:** Total: 18.23 deaths/1,000 live births; male: 19.5 deaths/1,000 live births; female: 16.89 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 92.6%; male: 94.9%; female: 90.5% (2000 census)
- **GDP:** \$570.1 billion (2008 est.)
- **GDP per Capita:** \$8,700 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- First influenza cooperative agreement began in September 2004 and ended in September 2009.
- FY 2009 is the 1st year of a new, 5-year sustainability cooperative agreement.

The Thai National Institute of Health (NIH) is located within the Department of Medical Sciences (DMSc), Thailand Ministry of Public Health (MOPH) and employs 215 permanent and 237 project-based staff. The Thai NIH has been recognized by WHO as a NIC since 1972. The Thai NIH comprises many scientific groups within its public health laboratory infrastructure and serves as the country's national reference laboratory and the research and development arm of the MOPH for infectious and noninfectious diseases. The Thai NIH laboratory is compliant with ISO standards and accredited by the Bureau of Laboratory Quality Standard, Thailand, and other international organizations, including WHO. The role of the NIC is to act as the national reference laboratory for influenza and other respiratory viruses, including influenza surveillance and research in close collaboration with the U.S. CDC.

### Surveillance

- There are 10 established sentinel influenza surveillance hospitals throughout the 5 regions of Thailand and the Bangkok metropolitan area.

- The Thai MOPH has recently integrated an additional 8 sites as part of its efforts to enhance the country's influenza surveillance program.
- In 2009, the NIC processed 3,428 specimens with 811 (23.7%) positive results for seasonal influenza from the 10 sentinel sites, and approximately 20 influenza specimens from neighboring regional countries were sent for confirmation. The surveillance data and influenza viral strains obtained were shared with WHO and U.S. CDC.
- Surveillance data was reported to the Thai MOPH to be used in policy decisions to enhance the national influenza prevention and control in Thailand.
- During the last 5 years, the NIC expanded the virologic surveillance system, which is fully capable of monitoring circulating influenza strains and detecting new variants and drug resistant strains.
- Since 2008, the NIC and Bureau of Epidemiology (BOE) integrated and harmonized virologic and epidemiologic surveillance to establish an effective and timely influenza surveillance system capable of detecting and reporting an increase in influenza activity for the country's alert system.
- Passive surveillance data from BOE is used to estimate seasonal, specific, baseline rates of reported influenza.



## Laboratory

The NIC has the capacity for the following: viral RNA extraction; RT-PCR for detection of influenza A and B; influenza virus isolation by cell culture method by using MDCK-cell; influenza A subtyping by real-time RT-PCR; strain analysis by hemagglutination inhibition (HI); immunofluorescence testing; whole genome sequencing of novel viruses; and sequence analysis of selected specimens to describe influenza genetic diversity for vaccine development purposes.

- Antiviral drug resistance testing was implemented in 2008 by using neuraminidase gene sequencing and fluorescence-base NA enzyme inhibition assay.
- The DMSc has 1 NIC and 14 regional medical science centers (RMSCs) that conduct PCR testing for influenza specimens.
- During the novel H1N1 pandemic, the capacity for influenza testing at the NIC laboratory was approximately 400–500 specimens each day and a total for all the RMSCs of 700–1,400 specimens each day.

## Preparedness

- The Thai National Committee on Avian Influenza Control and Pandemic Influenza Preparedness, chaired by the deputy Prime Minister, developed the first national strategic plan for avian influenza control in 2005 on approval of the Thai cabinet.
- In 2008, this plan was modified as the 2nd National Strategic Plan for Avian Influenza and Influenza Pandemic Preparedness, 2008–2010.

- On April 28, 2009, the *National Action Plan for Preparedness Response to Pandemic Outbreaks of Influenza Virus* was approved by the Thai cabinet and published.
- The action plan for Laboratory Diagnosis of Pandemic Influenza and Avian Influenza Virus (2006) was updated to the action plan for laboratory diagnosis of the pandemic 2009 H1N1 influenza virus.

## **Training**

- In support of the WHO influenza program, the NIC provided technical support to organize hands-on workshops in PCR technology specific to pandemic 2009 H1N1 influenza virus to 14 NIC laboratory staff from 7 countries (i.e., Bangladesh, Bhutan, Indonesia, Maldives Nepal, Sri Lanka, Timorese), in addition to training 14 DMSc regional network laboratory staff and 32 Thai regional hospital staff.
- The NIC hosted laboratory scientists from Laos, Myanmar, and North Korea in PCR diagnostics testing, virus isolations, laboratory quality assurance, and biosafety systems.

## **Networking**

- The Thai NIC provides a monthly report to the WHO Global Influenza Surveillance Network (GISN) to support vaccine strain selection decisions.
- The NIC participated in the WHO EQAP and performed continuous quality improvements in accordance of WHO criteria.
- The NIC provides technical support and confirmatory testing for the national laboratories of neighboring countries.

## **H1N1 Activities, FY 2009**

- At the onset of the pandemic 2009 H1N1 influenza outbreak, Thailand had the capacity to process specimens for the H1N1 virus by using real-time PCR technology and supported national efforts to combat the influenza pandemic.
- In collaboration with the university laboratories, the Thai NIC conducted drug resistance monitoring and follow-up of genetic variations by virus characterization. Approximately 150 viral isolates were shared with WHO.
- The capacity of the Thai DMSc (i.e., Thai NIH and RMSCs) is 22 PCR units that were deployed strategically among the NICs, 14 regional medical centers, and 7 mobile laboratories to cover the pandemic 2009 H1N1 influenza testing during May–October 2009. A total of 67,769 specimens were tested with 26,231 (38.7%) positive results for the H1N1 virus. The facilities operate 24 hours a day, 7 days a week, and provide results within 24 hours.

## **Notable Achievements, 2009**

In collaboration with the MOPH, the NIC has integrated the virologic and epidemiologic ILI surveillance for early warning system and effectively developed rapid response capacity for testing pandemic 2009 H1N1 influenza virus and drug resistance strains. The Bureau of Epidemiology, Department of Disease Control, plans to adapt and model their surveillance system on the basis of the success of the NIC project.

## **Thailand's Future Plans for Expansion of Laboratory Facilities with Capability of PCR Testing**

The Thai government has initiated plans to expand the number of testing sites. In phase I, approximately 25 laboratories located in provincial hospitals are being included through training and upgrading of infrastructure. Initial plans indicate that these will be used for testing of influenza only; however, to have a better return on investment and to provide comprehensive support to national surveillance activities, it has been considered prudent to use these facilities for diagnosis of other emerging infectious diseases too.

In phase II, the country likely will have a network of approximately 100 PCR facilities that will provide invaluable support to any infectious diseases program at local and national levels.

## **Principal Collaborators**

### **Thailand's Key Partners**

- The MOPH.
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- The BOE, Thai Department of Disease Control.
- The National Institute of Health, Department of Medical Sciences (Thai NIH, DMSc).
- The RMSC.
- The Sentinel Influenza Surveillance Hospitals.
- The Provincial Health Office.
- The International Health Policy Program.
- The Ministry of Interior.

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- The Influenza Foundation of Thailand.

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# Southeast Asia Region

## GDD-Thailand

Established in 2004, GDD-Thailand and national and regional partners support essential public health functions to rapidly detect and respond to Southeast Asia's emerging and reemerging infectious diseases. These health threats range from pneumonia, including influenza and pandemic influenza threats, to hand, foot, and mouth disease (HMFD), tuberculosis, and zoonotic diseases.

### Coverage

GDD-Thailand is connected by field activities throughout Southeast Asia and is founded on U.S. CDC's history of collaboration, which dates back to the establishment of the world's 1st FETP in 1980. This foundation has provided some of the most innovative public health work in the world, including the 1st site of U.S. CDC's IEIP in 2001 and support responses to the post-September 11th anthrax events, SARS, and the subsequent and continued threat of avian influenza.

### Activities

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

### Effect

In 2009, GDD-Thailand responded to 9 outbreaks within 24 hours. They discovered 1 pathogen new to the world and increased their laboratory testing capacity by 107%. In addition, GDD-Thailand trained 10 FETP graduates and more than 1,500 participants in short-term regional and national trainings.

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#### *Principal CDC Program Collaborations In-Country*

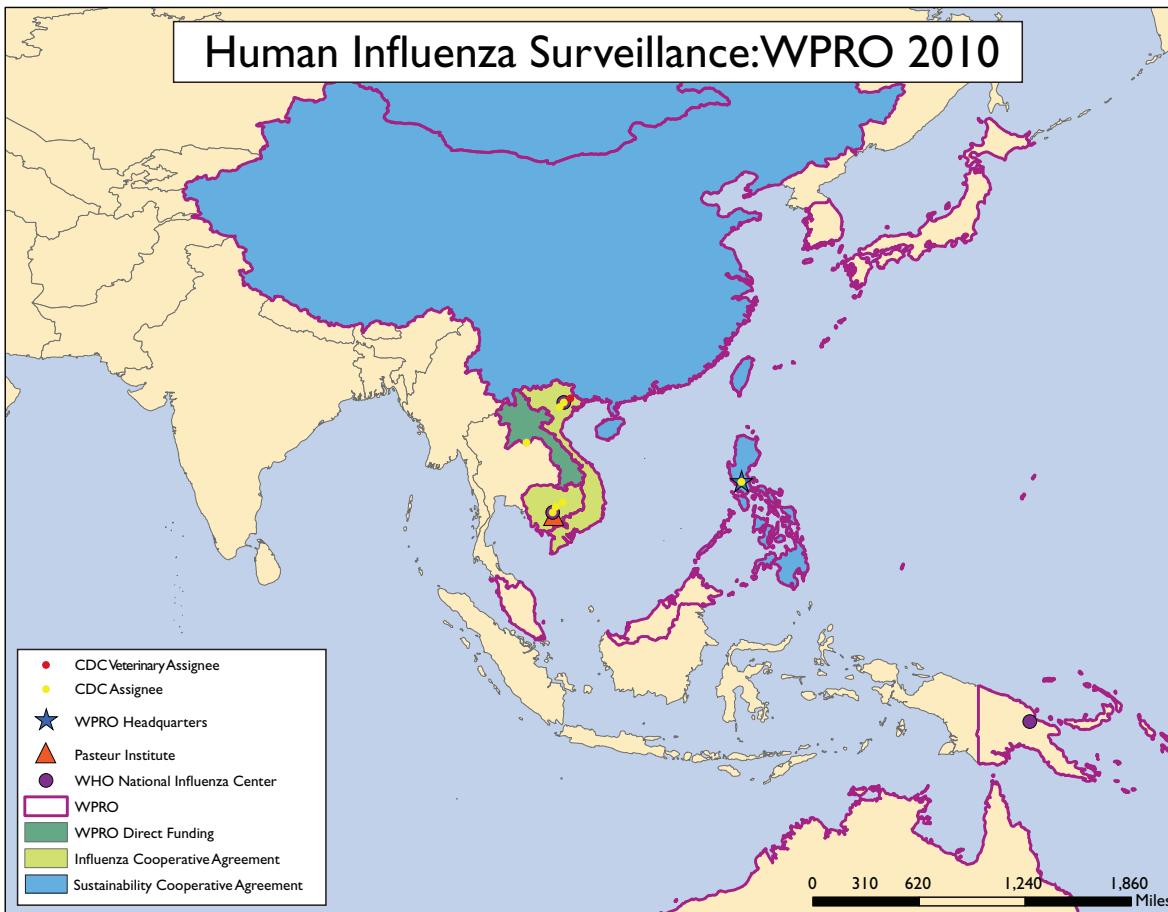
- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FETP.
- Immigrant, Refugee, and Migrant Health.
- All-Hazards Preparedness and Response.



# **Western Pacific Regional Office (WPRO)**



# Western Pacific Regional Office (WPRO)



## U.S. CDC Direct Region Support

Surveillance and Response to Pandemic and Avian Influenza by Regional Offices of the World Health Organization

- Began September 2006.
- FY 2009 is the 4th year of the agreement.

The Western Pacific Regional Office (WPRO) is located in Manila, Philippines. The office serves 37 countries and territories, covering approximately one-third of the world's population—approximately 1.6 billion people. WPRO is one of the most diverse WHO regions because its member states range from the highly developed (e.g., Australia, Japan, New Zealand, the Republic of Korea, Singapore), to the rapidly developing (e.g., China, Vietnam), and those with few health resources (e.g., Laos). WPRO staff continue to provide training, support, and technical assistance to member countries. During the past 7-year period, U.S. CDC assistance and support has focused on pandemic preparedness, epidemiologic and virologic surveillance, infection control, rapid response for containment, and outbreak investigation throughout the region. In addition, several countries get funding support directed to the MOH through their WHO country office. These countries are Laos, Cambodia, China, Vietnam, Fiji, and Papua New Guinea.

## **Surveillance**

WPRO published its surveillance guidance for countries in WPRO in November 2008. The document is entitled, *A Practical Guide to Harmonizing Virological and Epidemiological Influenza Surveillance*; it can be located online at the following Web site: <http://www.wpro.who.int/internet/resources.ashx/CSR/Publications/GuideToHarmonizingInfluenzaSurveillance-revised2302.pdf>.

### **China**

- WPRO-China supported the weekly data collection and analysis activities at the China NIC throughout the year. They also supported virus isolates identification and validation at the China NIC.
- WPRO funded 6 Chinese official study tours at the WHO collaboration center for reference and research on influenza at the Office of Health Protection in Australia from February 23 to February 26, 2009 to learn about seasonal influenza surveillance experiences and pandemic preparedness plans and to visit influenza laboratories and sentinel hospitals in order to study surveillance activities.

### **Cambodia**

- The number of sentinel sites was increased from 5 to 7 sites as of May 2009.
- The following activities have been supported to enable ILI surveillance:
  - Refresher training for staff from ILI sentinel sites.
  - Supervision of ILI sentinel sites by U. S. CDC-supported WHO and MOH staff.
  - Training workshop for the staff in the newly added 6th and 7th sentinel sites.
  - Financial support to Institute Pasteur Cambodia to provide laboratory services for the ILI surveillance program.
  - Quarterly report from the ILI surveillance system.
  - Publication of the annual ILI report.
- The Cambodia Early Warning and Response Network (CAM EWARN) activities include
  - Ongoing upgrades to the U.S. CDC Web site.
  - Production of monthly surveillance bulletins.
  - Installation of remote SMS systems in all operational health and provincial health departments has been completed. The CAM EWARN surveillance data form for these sites is now automatically updated to the servers.

### **Lao People's Democratic Republic (PDR)**

- WPRO participated with the Mekong Basin Disease Surveillance Project and Kenan Institute's cross-border surveillance exercises and drafted a case scenario on a human AI case to assist with these cross-border needs.
- Support was provided to the Lao National Center for Laboratory and Epidemiology (NCLE) with interpretation, investigation, and response to suspected human AI at the national level and by providing human resource support in the field in border areas.

- WPRO worked with national surveillance staff to improve and disseminate influenza outbreak surveillance and control training to provincial- and district-level staff. The training has occurred during poultry AI outbreaks and fever or respiratory disease outbreaks in numerous provinces. WHO staff have travelled with central-level staff to the outbreaks to support surveillance and control efforts and provided on-the-spot training about PPE, appropriate Tamiflu use, isolation and quarantine, and line listing efforts.
- WPRO has installed an electronic indicator-based surveillance tool, the Lao Early Warning and Response Network (Lao EWARN). WHO trained provincial staff from all provinces in Lao PDR and national staff on the use of this electronic format to facilitate rapid reporting of 19 reportable conditions, including acute respiratory illness to the central level and rapid local response at the provincial level. This new database has significantly enhanced national weekly surveillance efforts.
- As part of International Health Regulations, community event-based surveillance (CEBS) pilot, projects were established in 4 provinces of Lao PDR. One such pilot has been supported by WHO and the Vientiane Capital Public Health Department. These pilots have been developed to increase the capacity at the community and district levels to detect disease clusters that include human and animal AI outbreaks. A formal evaluation of all 4 pilots is underway, which will be used to inform the potential rollout of CEBS to the rest of the country.



## **Laboratory**

- Patrick Reading was recruited as temporary advisor to Mataika House, Fiji, from February 22 - 28, 2009, for influenza laboratory training and technical assistance on real-time PCR diagnosis of influenza, good laboratory practice, and development of recommendations on the management of the laboratory and future development.
- A laboratory freezer and refrigerator were procured for the national influenza laboratory in Mataika House, Fiji.

## **Laos**

- WHO supported NCLE to roll out a laboratory-based ILI surveillance project to receive laboratory specimens from patients experiencing ILI symptoms at large hospitals in 3 new sentinel sites in 2 provinces in June 2009. The program will build on the success and experience of the current ILI program within Vientiane capital.

## **Preparedness**

The Consultation for the Establishment of the Regional Clinical Advisory Network on Emerging Infectious Diseases (EID) in WPRO was held in Manila, Philippines, December 17–18, 2008.

- The meeting was attended by 11 Temporary Advisors from 10 countries. The WHO secretariat consisted of 7 representatives from Geneva Headquarters, WPRO, and the Country Office in the Philippines.
- The objectives of the consultation were to
  - Develop draft terms of reference and operational procedures for the regional clinical advisory network.
  - Discuss the membership of the network.
- The terms of reference, operational procedures, and membership of the regional, clinical advisory network were discussed and drafted during the consultation. The meeting concluded with recommended next steps for the members of the consultation and WHO.

## **Lao PDR**

- The 1st provincial pandemic plan was drafted in Vientiane Province with support by U.S. CDC and WHO. This first provincial plan is an operational plan for responding to a pandemic influenza and uses the national plan drafted in early 2008 as a guideline. It has been used since as a model for drafting provincial operational plans in all Lao provinces.

## **Training**

- A hands-on training workshop on laboratory database software was conducted to address the data management needs of the NICs in WPRO, November 19–21, 2008.
- At least 1 person from each of the following NICs in the region participated: Cambodia, China, Lao PDR, Fiji, South Korea, Malaysia (2), Mongolia, Philippines, PNG, Singapore, and Vietnam.
- Four major activities were conducted during the workshop:
  - Introduction of the database software.
  - Options for transferring data from the existing database to the new database software.
  - Hands-on practice on each module of the software.
  - Feedback from the participants on how to improve the database software.
- At the end of the training, the participants were able to properly set up the database software system, manage data for daily activities in the NICs efficiently, and perform analysis and general reports by using the database software.

- A 5-day training workshop on influenza virus isolation and characterization of seasonal influenza viruses was completed from March 30, 2009 to April 3, 2009, in Singapore. This workshop was co-sponsored by the Regional Emerging Diseases Intervention Center and WHO WPRO. This workshop aimed to teach basic laboratory techniques essential for the isolation and subsequent characterization of seasonal influenza viruses for the purpose of influenza surveillance. The training was held at the Singapore Polytechnic.
- Fourteen trainees from the WPRO and SEARO regions attended the workshop, and the countries represented were Cambodia, Laos, Fiji, Papua New Guinea, Bangladesh, Indonesia, Nepal, and Sri Lanka.

### **Special Influenza Projects**

WPRO published disease burden guidance for countries in WPRO in November 2008. The document is entitled, *A Practical Guide for Designing and Conducting Influenza Disease Burden Studies*, and can be found online here: <http://www.wpro.who.int/internet/resources.ashx/CSR/Publications/GuideforDesigningandConductingInfluenzaStudies.pdf>.

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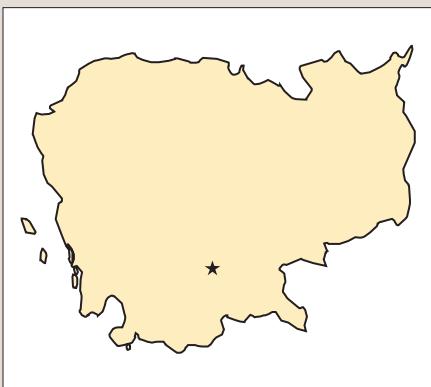
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# Western Pacific Region

## Cambodia



- **Capital:** Phnom Penh
- **Area:** 181,040 sq km
- **Population:** 14,753,320
- **Age Structure:** 0–14 years: 33.2% (male 2,389,668/female 2,338,838); 15–64 years: 63.2% (male 4,372,480/female 4,627,895); 65 years or older: 3.6% (male 193,338/female 319,421) (2008 est.)
- **Life Expectancy at Birth:** Total population: 61.69 years; male: 59.65 years; female: 63.83 years (2008 est.)
- **Infant Mortality Rate:** Total: 56.59 deaths/1,000 live births; male: 63.76 deaths/1,000 live births; female: 49.1 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 73.6%; male: 84.7%; female: 64.1% (2004 est.)
- **GDP:** \$29.24 billion (2008 est.)
- **GDP per Capita:** \$2,100 (2008 est.)

### U.S. CDC Direct Country Support

Developing Influenza Surveillance Networks Cooperative Agreement

- Began June 2006.
- FY 2009 was the 4th year of the cooperative agreement.

Cambodia 1st reported a case of 2009 H1N1 influenza virus infection in June 2009. As of October 2, 2009, 120 cases of H1N1 have been reported from 8 provinces. Three of the cases have been fatal.

Under the MOH, the Cambodia Communicable Disease Control Department (CCDC) conducts infectious disease surveillance, monitoring 12 diseases and syndromes. Data on these conditions are collected and recorded in each provincial health department and compiled nationally. In the case of a suspected outbreak of the H5N1 subtype, rapid response teams have been trained to verify the outbreaks, conduct early mitigation and containment interventions, and immediately implement infection control measures, if necessary. One functioning, nongovernmental National NIC, the Pasteur Institute, which performs diagnostic testing for influenza, including the H5N1 and H1N1 subtypes, is currently in the country.

The United States Naval Medical Research Unit No. 2 (NAMRU-2) upgraded its detachment in Phnom Penh beginning in July 2006. In that year, an Influenza Division epidemiologist was assigned to the detachment as director and received partial funding from the U.S. CDC Influenza Division to conduct influenza studies. Since December 2006, the Navy has conducted

clinic-based surveillance for the causes of acute fever and by using that data, provided the government with information on the epidemiology, symptomatology, and viral characteristics of influenza. These results complement the MOH's ILI surveillance.

## **Surveillance**

- SARI surveillance has been implemented for the 1st time at 3 hospitals in Phnom Penh and Kandal Province. All specimens are tested for influenza viruses at the National Institute of Public Health (NIPH). Training on reporting requirements, such as completion of case report forms and proper specimen collection and transport, was conducted before commencement of surveillance at each site.
- National ILI surveillance was expanded to 2 new sites in Siem Reap and Svay Rieng Provinces. Initial training was conducted for staff from these new sites.
- Weekly ILI surveillance reporting from sentinel sites has been upgraded from paper submissions to electronic transfer directly to the MOH ILI database by using SMS mobile devices.
- In response to the H1N1 pandemic, the MOH set up a new toll-free hotline as part of event-based surveillance to disseminate information and detect and coordinate response to suspected H1N1 cases in communities or hospitals.
- New guidelines and operational plans for emerging disease outbreaks, including AI, are under review by the Division of Communicable Disease Control, MOH.



## **Laboratory**

- Technicians in the molecular laboratory of NIPH completed training conducted by staff from the U.S. CDC Influenza Laboratory on real-time RT-PCR testing for influenza viruses. In addition, the molecular laboratory completed acquisition of equipment, reagents, and consumables for RT-PCR testing.
- RT-PCR testing at NIPH for influenza viruses began April 2009 with samples from 1 national ILI surveillance site. Since then, NIPH has expanded influenza testing responsibilities to include testing of all samples from SARI surveillance and outbreak investigations of respiratory disease.
- NIPH acquired testing capability for H1N1 virus in June 2009 and has confirmed H1N1 infection in cases detected through ILI surveillance, SARI surveillance, and contact investigations of confirmed cases.
- NIPH purchased a 2nd real-time RT-PCR machine (BioRad PCR IQ5 Detection System).

## **Preparedness**

- A 17-month provincial multisector pandemic planning pilot project in Siem Reap Province was completed. The aim of the pilot was to inform national-level decision makers on policy requirements to support implementation of local-level plans and to provide a model planning process for use in other provinces.
- A functional pandemic simulation exercise was conducted involving approximately 60 players, 30 observers, 6 facilitators, and an exercise management and logistics support team of 25.
- The National Health Sector Pandemic Response Plan is currently being revised and adapted to accommodate the H1N1 virologic and epidemiologic characteristics.

## **Training**

- Four refresher MOH-WHO training courses on ILI surveillance were conducted for staff from participating sentinel sites in Cambodia. The objectives of these courses were to go over surveillance procedures, share ILI data, and discuss general or site-specific problems or concerns. Courses were held in Prey Veng Province, November 2008, and in Sihanoukville, March, June, and September 2009. Each course lasted 2 days and was attended by 40–50 participants.
- During October 2008 and June 2009, the MOH’s Department of Hospital Services, with support from WHO, conducted a 2-day training course about infection control for AI in humans at 18 referral hospitals throughout Cambodia. Course participants included physicians, medical assistants, nurses, midwives, and other hospital personnel. Each course was attended by approximately 30–35 hospital staff members. The objectives of each course were to provide basic information on infection control of AI in hospital settings and information about the disease and case management. WHO and Calmette Hospital (a designated AI referral hospital in Cambodia) staff also helped to conduct parts of the training.
- A National Hospital Emergency Preparedness Workshop organized by the MOH’s Department of Hospital Services and supported by WHO was held in Kampong Cham Province, September 7–8, 2009. A total of 78 senior hospital and provincial health department management staff who are responsible for hospital emergency response plans attended. NGOs involved in hospital support also attended. The objectives of the workshop were to determine priority activities for hospital management during epidemics, particularly low-resource settings, and identify gaps in hospital preparedness to manage major epidemics and make recommendations to address these gaps. During the workshop, participants received training on H1N1 infection control, surge capacity issues, and clinical management of severe H1N1 cases.



- Rapid containment training and community awareness for H1N1 was conducted in 10 provinces by MOH's Rapid Response Teams. Participating provinces were Bathambang, Siem Reap, Kampong Chhnang, Pursat, Pailin, Banteay Mean Chey, Kampong Thom, Preah Vihear, Oudar Mean Chey, and Kampong Speu. Training sessions were conducted May–September 2009. A total of 1,240 individuals participated from Rapid Response Team members and physicians at the provincial, operational district, and health community levels.

## **Special Projects**

- The Cooperative for Assistance and Relief Everywhere, Inc. (CARE) completed its pilot project on village-based surveillance in Koh Kong Province, along with external evaluations conducted by human and animal health partners. In addition, CARE completed focused group discussions with Village Surveillance Teams, an end line survey, and qualitative and quantitative data analyses for the project.
- A draft of the National Guidelines on Infection Control was completed by a working group led by the Department of Hospital Services, Cambodian MOH. The guidelines were initially written in the Khmer language, subsequently translated into English, and forwarded to experts in infection control for external review and comments. Once finalized, these guidelines will be used to develop training materials for hospitals nationwide.
- A national infection control policy and strategic operational plan are currently under development.
- WHO supported printing of information, education, and communication materials for infection control among health care workers and in the community during a pandemic.

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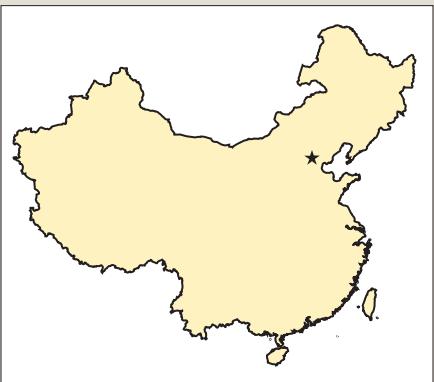
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# Western Pacific Region

## China



- **Capital:** Beijing
- **Area:** 9,596,960 sq km
- **Population:** 1,330,141,295 (July 2010 est.)
- **Age Structure:** 0–14 years: 20.1% (male 142,085,665/female 125,300,391); 15–64 years: 71.9% (male 491,513,378/female 465,020,030); 65 years or older: 8% (male 50,652,480/female 55,472,661) (2008 est.)
- **Life Expectancy at Birth:** Total population: 73.18 years; male: 71.37 years; female: 75.18 years (2008 est.)
- **Infant Mortality Rate:** Total: 21.16 deaths/1,000 live births; male: 19.43 deaths/1,000 live births; female: 23.08 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 90.9%; male: 95.1%; female: 86.5% (2000 census)
- **GDP:** \$7.8 trillion (2008 est.)
- **GDP per Capita:** \$6,100 (2008 est.)

### U.S. CDC Direct Country Support

Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza

- Began August 2009.
- Previous agreement (Developing Influenza Surveillance Networks Cooperative Agreement) began September 2004 and ended August 2009.

Influenza is a core component of U.S. CDC's GDD program in China, which is identified in-country as an important emerging infectious disease for decades. The United States has been able to provide data derived from analysis of Chinese influenza viruses to assist the WHO with the twice annual influenza vaccine strain consultations.

For more than 20 years, the U.S. CDC has supported Chinese influenza work through assistance to the WHO. In addition, for approximately 20 years, the U.S. CDC influenza group has provided support to the national-level Chinese influenza laboratory. Most recently, this support has been provided through the Developing Influenza Surveillance Networks Cooperative Agreement, (September 2004–August 2009). Since late 2007, the Influenza Division has had 1 medical epidemiologist assigned in China.

The pandemic 2009 H1N1 influenza virus challenged all aspects of the clinical and public health systems in China. To avert serious complications and excess deaths from this pandemic, China actively responded by using vigorous community mitigation activities, public education,

improved clinical guidelines, vaccine development and deployment, and rapid expansion of laboratory capabilities. The existing Chinese influenza surveillance network, which consisted of a widespread hospital-based sentinel surveillance system and laboratory network, had to process a significant influx of cases and samples more quickly and conduct sophisticated tests of the viruses' genetic characteristics, including drug resistances.

## **Surveillance**

At the beginning of FY 2009, there were 197 sentinel surveillance hospitals located throughout China that fed into 63 network laboratories. As the pandemic progressed, the surveillance system expanded to 556 sentinel hospitals and 411 network laboratories capable of performing PCR tests on influenza specimens. Other surveillance activities in FY 2009 were

- An improved influenza surveillance Web site that includes an online forum for network laboratories to discuss issues of mutual interest, including surveillance techniques, troubleshooting, and exchanging results. In addition, other functions were added to collect, manage, and analyze influenza surveillance results (<http://www.cnic.org.cn>).
- Continuing to develop and distribute influenza weekly reports in Chinese and English to share information with national and international partners.



## **Laboratory**

After several years of peer review, assessments, and training, the Chinese NIC applied to become the 5th WHO Collaborating Center for Surveillance, Epidemiology and Control of Influenza in 2007. Much progress has been made toward achieving this goal. The WHO conducted an on-site review of progress in November 2009 with favorable results. This positions China as an even stronger global partner in influenza laboratory surveillance and provides another major source of technical assistance for other countries. Other laboratory accomplishments in FY 2009 include the following:

- Selected and sent representative influenza virus strains circulating in mainland China to the WHO Collaborating Centers for Surveillance, Epidemiology and Control of Influenza at the U.S. CDC (110 strains) and to Japan's National Institute of Infectious Diseases (70 strains) during the 2008–09 influenza season.

- Drafted pandemic preparedness guidelines that included storage and administration guidelines for vaccines and antiviral drugs during the different pandemic phases.
- In response to the spread of the pandemic 2009 H1N1 influenza virus, supported the expansion from 63 to 411 network surveillance laboratories.
- Developed M2 and neuraminidase (NA) genotyping methods for antiviral drug susceptibility surveillance. In addition, conducted antiviral susceptibility tests, establishing biologic methods for NA inhibitors (NAIs) and adamantine drugs.

## **Preparedness**

Preparedness planning was widely tested during the H1N1 pandemic in China. Like other countries, China discovered which preparedness activities were worth keeping and which needed to be changed. Before the pandemic, guidelines were drafted on the storage and use of vaccines and antiviral drugs during different pandemic phases.

## **Training**

China continued to provide up-to-date training on influenza testing, infection control, and epidemiology to medical practitioners through relevant on-site and classroom discussion. Key features of trainings in FY 2009 were

- Trained 306 people from the initial 63 network laboratories on seasonal influenza laboratory detection: HA/HI assay, PCR, rapid diagnostic kits detection, chicken embryo passage technique, and single radial hemolysis technique.
- Trained 40 provincial staff on infection control for respiratory diseases. In turn, these participants will take the curriculum to their provinces and train others in these techniques.
- Trained 130 laboratory technicians and managers from the initial 63 network laboratories on influenza surveillance quality control and Good Laboratory Practices.
- Trained 12 people from 6 provincial U.S. CDCs on avian influenza nucleic acid detection technology.
- Provided hands-on training for 27 people from 10 provincial U.S. CDCs on laboratory techniques.

## **H1N1 Activities, FY 2009**

- Developed nucleic acid detection kit for influenza A H1N1.
- Urgently provided influenza A H1N1 nucleic acid detection kits to the national surveillance network and other countries.
- Conducted training on pandemic 2009 H1N1 influenza laboratory detection techniques for 34 U.S. CDC staff from 11 important port cities and 30 members of China CDC rapid response teams.
- Convened “China—ASEAN Training Course on Influenza A (H1N1) Laboratory Detection Techniques” for 16 laboratory technicians from 8 ASEAN countries.
- Developed surveillance guidelines for pandemic 2009 H1N1 influenza.

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# **Western Pacific Region (WPRO)**

## **GDD-China**

### **EID**

Established in 2006, the China-U.S. Collaborative Program on EID integrates essential public health functions to rapidly detect and respond to China's infectious disease and health threats. For more than 20 years, U.S. CDC has supported and collaborated with the Chinese national influenza laboratory. In 2001, the China FETP began its 1st cohort and today has graduated more than 100 public health officers who work in leadership positions throughout China's public health community. The EID program integrates these established activities with new abilities in emerging infections and health communication for greater health effect.

Activities in China are directed at helping the country reach its population of 1.5 billion people. The program strengthens infectious disease outbreak investigations and response at the national and provincial levels, enhancing avian influenza and pandemic preparedness, and improving the strategic development of infectious disease surveillance systems. Responses have included pandemic 2009 H1N1 influenza, multidrug-resistant tuberculosis, human enterovirus 71 (i.e., a dangerous form of hand, foot, and mouth disease), *Streptococcus suis*, plague, and foodborne risks, such as salmonella, brucellosis, cholera, and botulism.

### **Activities**

- Outbreak response.
- Pathogen discovery.
- Training.
- Surveillance.
- Networking.

In 2009, EID responded to 13 outbreaks, 73% of which achieved a measurable public health effect, and communication support was provided. They trained 13 FETP graduates and more than 1,000 participants in short-term regional and national trainings.

## **Staff**

### **In-Country Field Staff**

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EID Coordinator and Influenza Lead

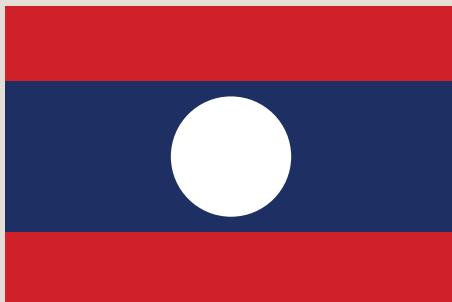
### **Principal CDC Program Collaborations In-Country**

- Influenza Preparedness, Detection, and Response Program.
- IEIP.
- FETP.
- All-Hazards Preparedness and Response.
- Health Communication.



# Western Pacific Region

## Lao People's Democratic Republic (Lao PDR)



- **Capital:** Vientiane (Viangchan)
- **Area:** 236,800 sq km
- **Population:** 6,993,767 (July 2010 est.)
- **Age Structure:** 0–14 years: 41% (male 1,374,966/female 1,362,945); 15–64 years: 55.9% (male 1,846,375/female 1,885,029); 65 years or older: 3.1% (male 91,028/female 117,191) (2008 est.)
- **Life Expectancy at Birth:** Total population: 56.29 years; male: 54.19 years; female: 58.47 years (2008 est.)
- **Infant Mortality Rate:** Total: 79.61 deaths/1,000 live births; male: 88.9 deaths/1,000 live births; female: 69.88 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 68.7%; male: 77%; female: 60.9% (2001 est.)
- **GDP:** \$14.22 billion (2008 est.)
- **GDP per Capita:** \$2,100 (2008 est.)

### U.S. CDC Direct Country Support

Laos receives support through the WHO WPRO cooperative agreement and CARE International.

- Began February 2006.
- FY 2009 was the 4th year of support to Laos.

U.S. CDC operations in Lao PDR were recognized and legitimized through bilateral arrangements between the governments of Lao PDR and the United States (represented by the U.S. Embassy) in May 2006 with both Ministries of Health and Agriculture. This agreement has opened the door for U.S. CDC assistance in addressing emerging disease concerns principally through capacity-building measures in countering the AI threat through pandemic preparedness.

### Surveillance

- The U.S. CDC-WHO collaboration organized a National Workshop on Surveillance and Response of Notifiable Selected Diseases, July 8–10, 2009. A total of 95 participants from 17 provinces and various concerned sectors from the MOH (e.g., secretariats office, 6 central hospitals, Department of Hygiene and Prevention, Curative Dept.) attended. The purpose workshop was to review the situation of the surveillance system and make recommendations for further progress and improvement.
- A U.S. CDC-CARE hotline was used to identify the Phongsaly HPAI outbreak of January 2009 and the fowl cholera outbreak of March 2009. The hotline functioned during the

pandemic 2009 H1N1 influenza outbreak and averaged 1,200 calls daily since June 2009. Hotline operations were successfully transitioned to the National Emerging Infectious Disease Coordinating Office (NEIDCO) with support from the World Bank.

- With support from the U.S. CDC-WHO Lao Collaboration, NCLE is now regularly contributing to the WHO Global Influenza Surveillance Network.
- The U.S. CDC-WHO Lao Collaboration supported transformation of routine national surveillance into the Lao EWARN contributing to significantly improved accuracy and completeness of reporting.
- Expansion of the Influenza-Like Illness (ILI) Virologic Surveillance Network to the north and south of the country, provided first time virologic evidence of seasonal (H1, H3, and FLU B) influenza in Laos, as well as capturing A/H1N1 clusters throughout the country.
- Completion of a uniform CEBS evaluation by using CARE-supported activities targeting remote ethnic minorities. Lessons learned are being used to develop the Lao National CEBS Strategy.
- The National Center for Laboratory and Epidemiology is now producing the 1st daily and weekly influenza report that takes advantage of the various surveillance systems and laboratory findings.

## Laboratory

- Completion of biosafety enhancements and equipment procurement and installation for the new laboratory extension at the NCLE in December 2008 was accomplished through the U.S. CDC-WHO collaboration in partnership with Pasteur Laos.
- U.S. CDC experts provided training to NCLE staff in establishing cell culture and improved testing reliability of real-time PCR, enabling NCLE to submit its 1st viral influenza isolates to the WHO Global Influenza Surveillance Network in the near future.
- NCLE's increased laboratory capabilities allowed for detection of 2009 H1N1 influenza by using U.S. CDC provided primers and reagent that led to the early detection of the pandemic virus in June 2009 with more than 270 cases subsequently identified.
- NCLE received its 1st shipment of essential materials and reagents to support laboratory diagnostic functions through a 2-year arrangement with U.S. CDC IEIP Thailand, April 2009.

## Training

- The 1st Field Epidemiology training class started in February 2009 through the U.S. CDC-WHO Lao Collaboration. Eight students from 5 provinces (and representation from the animal health sector) began a year-long training activity consisting of three 4-month modules; each consisting of 1 month classroom training and 3 months of supervised



Participants are trained in establishing first-time cell culture and HIT capabilities for influenza viral isolation at National Laboratory, February 2009.

field activity. The purpose of this training activity was to develop and decentralize epidemiology capabilities in support of provincial and district surveillance and outbreak response activities.

## **Infection Control**

- U.S. CDC-WHO supported the training on case management and infection control of 2009 H1N1 influenza for 6 central hospitals (63 people), May 28–29, 2009. The purpose of this training workshop was to inform central hospital staff about the 2009 H1N1 pandemic, clinical management of pandemic H1N1 cases, and appropriate infection control measures.
- A train-the-trainer course on clinical management and infection control of 2009 H1N1 influenza in 3 regions of Lao PDR (i.e., Luang Prabang, Savannakhet, Champasak provinces) was held June 23–30, 2009. The training course was attended by 256 participants.

## **Principal Collaborators**

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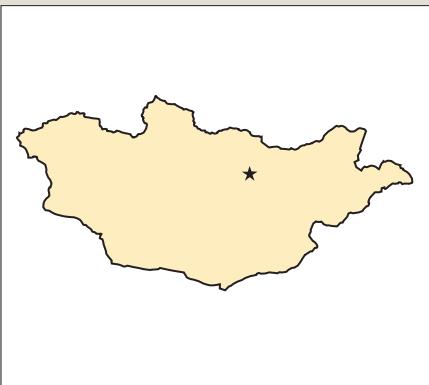
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# Western Pacific Region

## Mongolia



- **Capital:** Ulaanbaatar
- **Area:** 1,564,116 sq km
- **Population:** 3,086,918 (July 2010 est.)
- **Age Structure:** 0–14 years: 28.4% (male 433,835/female 416,549); 15–64 years: 67.7% (male 1,013,215/female 1,015,221); 65 years or older: 3.9% (male 51,093/female 66,168) (2008 est.)
- **Life Expectancy at Birth:** Total population: 67.32 years; male: 64.92 years; female: 69.84 years (2008 est.)
- **Infant Mortality Rate:** Total: 41.24 deaths/1,000 live births; male: 44.41 deaths/1,000 live births; female: 37.92 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 97.8%; male: 98%; female: 97.5% (2000 census)
- **GDP:** \$9.792 billion (2008 est.)
- **GDP per Capita:** \$3,300 (2008 est.)

### U.S. CDC Direct Country Support

Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza

- Began August 2009.
- Previous agreement (Developing Influenza Surveillance Networks Cooperative Agreement) began September 2004 and ended August 2009.

Landlocked between Russia and China, Mongolia is an expansive country of sparse population and harsh geographic and climate extremes. The influenza surveillance cooperative agreement between Mongolia and U.S. CDC started in 2004 and has enabled advances in the development and enhancement of laboratory capacity during the past 5 years. With the support of the cooperative agreement, sentinel surveillance sites for outpatient and hospital-based surveillance have been established in the capital city of Ulaanbaatar (UB) and several provinces (i.e., Darkhan-uul, Dornod, Dornogobi, Khovd, Orkhon, Uvurkhangai) in the different geographic regions of the country. National influenza workshops have been held each year since 2005 to educate and update representatives of all stakeholders of the influenza pandemic preparedness plan.

### Surveillance

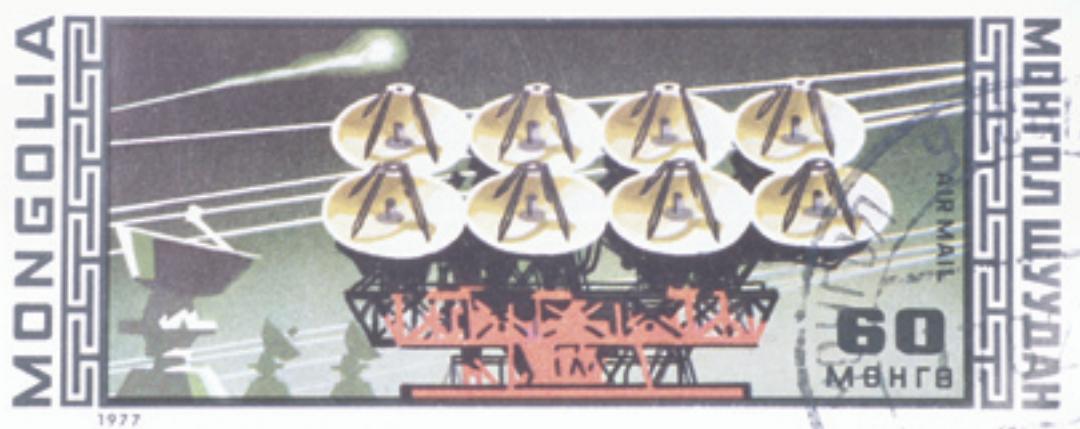
During the 2009 influenza season, activity was low, and there was only a small increase of ILI cases. Sentinel site specimen collection remained vigilant throughout the year, subsequently detecting the 1st case of H1N1 in Mongolia in fall 2009.

Mongolia has 2 tiers of influenza surveillance, epidemiologic and virologic:

- Epidemiologic surveillance is based on clinical diagnosis of ILI outpatient and inpatient visits.
- Routine weekly information about ILI and all outpatient visits from all 21 provinces and 9 city districts of UB city.
- Daily active reporting by phone about ILI for all outpatient visits at 64 sentinel sites in UB and 7 provinces.
- Weekly active reporting by phone for pneumonia hospitalizations and all patients from 15 hospital-based sentinel surveillance sites.
- Virologic surveillance is based on daily collections of samples in sentinel sites following influenza virus detection by real-time RT-PCR and virus isolations by using MDCK cell culture and embryonated hen eggs.

### **Laboratory**

- Routine influenza virus detection and isolation is performed at the Virology Department, NIC, National Center for Communicable Disease in UB. Laboratory staff is skilled in real-time PCR and other critical techniques for the detection of influenza viruses and antiviral resistance.
- Mongolia joined the WHO EQAP in 2007, and the last 5 panels sent were deciphered 100% by the NIC Mongolia laboratory.
- During the 2008–09 influenza season, 6,100 samples were tested with 309 (5.1%) positive results, mostly seasonal influenza A (H1N1) viruses.
- Thirteen representative influenza viruses were sent to WHO collaborating centers in Tokyo and the United States for further characterization.
- During FY 2009, 522 nasopharyngeal samples were collected from SARI surveillance sites (i.e., Selenghe province and Baganuur district, UB). Of these, 522 specimens were tested by real-time RT-PCR, and 132 (25.2%) tested positive.



## **Preparedness**

The Fourth National Influenza Workshop (NIW4) was organized October 9–10, 2008 in UB. This meeting was well attended by 220 participants from many agencies across the Mongolian government: the MOH; the National Emergency Management Center; the Ministry of Food and Agriculture; the State Professional Inspection Agency; WHO country offices; UNICEF; the U.S. Embassy in Mongolia; the UB city Professional Inspection Agency, VI; Health Sciences of University of Mongolia; NCHD; directors of health departments from 21 provinces and UB districts; heads of selected family general practitioners; epidemiologists; officers of emergency departments from all provinces and UB districts; the National Center for Communicable Disease (NCCD); and the Center for Infectious Diseases with Natural Focci. In addition, representatives from U.S. CDC, Japan, WPRO, and WHO attended.

At NIW4, a pandemic influenza inventory assessment took place by using a modified U.S. CDC tool to address Mongolia's needs. Preparedness plans began to develop at the aimak (county) district levels. Preparedness materials can be viewed at the NIC, Mongolia Web site: <http://www.flu.mn/eng/index.php?option=com.content&task=view&id=110&Itemid=52>.

Other preparedness activities include

- A 1-day retrospective assessment of nationwide pandemic preparedness for the 2003–04 influenza seasons.
- An evaluation of the Influenza Pandemic Preparedness Plan (IPPP) in Khan-Uul and Bayanzurkh districts of UB took place December 2008 at the NCCD with 30 participants, including 2 district chancelleries of governors and the heads of the district health department, District Emergency Management Agency, district hospitals, epidemiologists, and physicians.
- A new version of the IPPP assessment tool for provinces and UB districts is based on the U.S. CDC assessment tool. P. Nymadawa was appointed by the project team as a consultant for drafting the new tool and for organizing the entire exercise.
- Five teams (25 participants) from the Mongolian government were trained and conducted the assessment in 21 provinces and 9 districts of UB city March 2009.
- In each province or city districts, 15–25 officers from all relevant branches (approximately 600 officers) participated in the IPPP assessment workshops. The final report has been produced in English and Mongolian. Please see the report at the NIC, Mongolia Web site: <http://www.flu.mn/eng/index.php?option=com.content&task=view&id=110&Itemid=53>.

## **Training**

Throughout 2009, staff development and training continued to be a priority for Mongolia as several scientists attended training in Asia, Europe, and the United States about monitoring and evaluation, emerging infectious diseases, SARI surveillance, and influenza burden of disease issues.

## **H1N1 Activities, FY 2009**

On April 27, 2009, when WHO announced that pandemic phase alert would be raised from 3rd to 4th because of the increasing number of 2009 H1N1 influenza virus infections in United States and Mexico, the Mongolian State Emergency Committee held a meeting and requested the related ministries and agencies take urgent actions. In Mongolia, the 1st suspected case

of 2009 H1N1 influenza was registered on May 6, 2009, when 7 artists from Mongolia, who were travelling in Mexico, returned home. They were monitored by camera at the airport in Moscow, and 2 of them were isolated because they were feverish. When the other 5 returned to Mongolia, the MOH took rapid response measures and isolated all 103 passengers and 7 aircraft staff at the NCCD. They were given prophylactic doses of Tamiflu and samples were taken from 5 suspected cases. No influenza viruses were detected. Since May 2009, the NIC in Mongolia has been asked to investigate more than 50 suspected cases and more than 700 contact cases of 2009 H1N1 influenza virus.

### **Notable Achievements, 2009**

- Gradual shift to test all samples collected by real time RT-PCR.
- Mongolia has developed a Web site in English and Mongolian (<http://www.flu.mn>) for rapid sharing of information. The Web site has been functional since April 2009.

### **Principal Collaborators**

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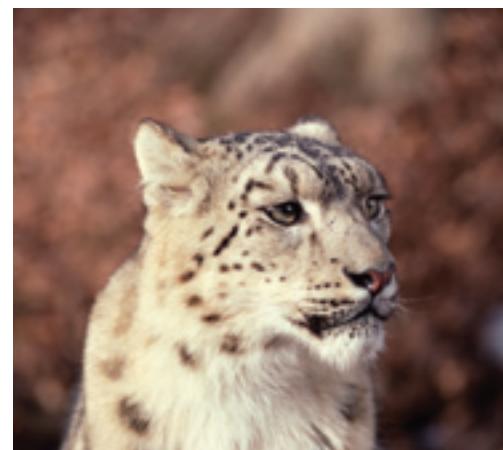
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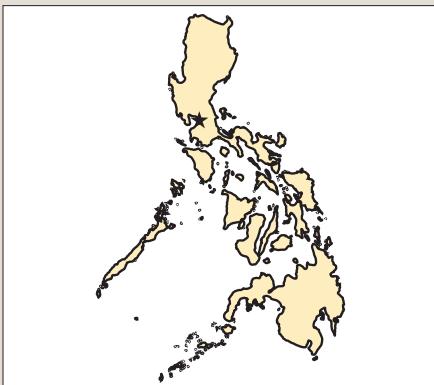


### **Other Partners**

- World Bank, especially on IPPP activities.
- National Emergency Management Agency (NEMA), especially on IPPP activities.
- USAID, especially on IPPP activities.
- WHO, technical consultation.
- Ministry of Food and Agriculture and Industry (MOFALI), surveillance of influenza viruses in wild and domesticated animals and sharing of BSL-3 facility in case of need.

# Western Pacific Region

## The Philippines



- **Capital:** Manila
- **Area:** 300,000 sq km
- **Population:** 99,900,177 (July 2010 est.)
- **Age Structure:** 0–14 years: 35.5% (male 17,392,780/female 16,708,255); 15–64 years: 60.4% (male 28,986,232/female 29,076,329); 65 years or older: 4.1% (male 1,682,485/female 2,215,602) (2008 est.)
- **Life Expectancy at Birth:** Total population: 70.8 years; male: 67.89 years; female: 73.85 years (2008 est.)
- **Infant Mortality Rate:** Total: 21.2 deaths/1,000 live births; male: 23.86 deaths/1,000 live births; female: 18.42 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 92.6%; male: 92.5%; female: 92.7% (2000 census)
- **GDP:** \$327.2 billion (2008 est.)
- **GDP per Capita:** \$3,400 (2008 est.)

### U.S. CDC Direct Country Support

Developing Sustainable Influenza Surveillance Networks and Response to Avian and Pandemic Influenza

- Began August 2009.
- Previous agreement (Developing Influenza Surveillance Networks Cooperative Agreement) began September 2004 and ended August 2009.

The Research Institute for Tropical Medicine (RITM) is the NIC of the Philippines and continues to receive the U.S. CDC grant for its 5th year of operations to complete the DISN. In addition to continuing its surveillance activities at established sentinel sites, the NIC initiated the influenza burden of disease (BOD) activity in 1 of the regions of the country, increasing its partners and stakeholders. The fifth year also marked the occurrence of the 2009 H1N1 influenza pandemic internationally and locally, and highlighted the significance of the role of the NIC.

### Surveillance

For FY 2009, the network maintained the number of sentinel sites it had established in the first 4 years of the grant.

- The influenza sentinel surveillance network is set up in 11 of the 17 regions of the Philippines. There are 17 Influenza Surveillance Officers working on influenza throughout the country.
- A total of 23 sentinel sites were added to the existing system, increasing the number of sentinel sites from 35 to 54 (33 health centers, 20 hospitals, and 1 processing zone).

- A total of 16 health centers and 6 hospitals were added in the Cordillera Autonomous Region, where BOD activity is conducted for the Philippines.
- An influenza sentinel site was opened at the One Stop Processing Zone, an immigration site where testing was conducted on Filipino deportees arriving in boats from Malaysia and Indonesia. This site was operated in collaboration with the Department of Social Welfare and Development and the Region IX Bureau of Quarantine.
- Appropriate quality control and assurance activities were implemented on influenza laboratory and data management activities throughout the country.
- Monitoring of sentinel sites was conducted to ensure adherence to standard operating procedures and validate some information collected.

The primary activity of the NIC involves initial identification of influenza virus type and subtype, as well as isolation of other viruses, such as adenovirus, enterovirus, HSV-1, and RSV through viral culture. In addition, the NIC performs rapid viral identification for specimens from suspected respiratory infection outbreaks by using real-time PCR.

- The NIC continued to provide representative isolates on a regular basis to the WHO Collaborating Center for Influenza Reference and Research, Melbourne, Australia, for confirmation and higher antigenic characterization.
- Performance in the WHO External Quality Assessment Program (EQAP) demonstrated the competence of the NIC to identify seasonal influenza, and satisfied the WHO global standards.
- The EQAP showed its proficiency in identifying avian influenza viruses by using PCR.
- The NIC provided weekly updates on influenza activity in the country to the WHO FLUNET.

### **Preparedness**

The NIC was actively involved in pandemic preparedness planning with the Department of Health. Discussion topics relevant to the NIC included algorithms used in specimen receipt, processing, testing, and communication flow of results and data. The efficiency of the algorithms was put to the test once pandemic 2009 H1N1 influenza started in the Philippines. The surveillance network established under the U.S. CDC grant was pivotal in alerting health officials of the outbreak of H1N1 in the country.

Influenza surveillance officers (ISOs) were crucial in extending assistance to health workers in the nonsentinel sites on the basis of correct specimen collection, storage, and shipment. The NIC was commended by the WHO-WPRO for its prompt and efficient response during the pandemic. As a result of working through the H1N1 pandemic, the NIC can be further strengthened through the following lessons learned:

- The NIC's surge capacity plan should be revised and upgraded on a regular basis.
- Communication flow between the NIC and National Epidemiology Center (NEC) should be upgraded and strengthened to encourage optimal response to pandemics and other public health emergencies.
- Data communication systems currently in place among different departments within the NIC should be reviewed and strengthened to enhance awareness and share information.
- Future plans should include adopting a bar coding system by the NIC for specimen receipt, processing, and reporting of results.

## **Training**

The NIC and NEC collaborated to provide all ISOs in the sentinel sites with refresher training on the collection of epidemiologic, clinical, and specimen collection. This training was conducted for both the old and new ISOs to ensure operations across all the sites were standardized.

- Intensive training was conducted in the data entry processing, cleaning, validation, and reporting procedures to the regional offices.
- Similar training was performed among the ISOs assigned in the BOD sites in the Cordillera Autonomous Region.
- Nurses and medical technologists from nonsentinel sites and other government and private hospitals were trained on data and specimen collection, storage, and shipment immediately after the onset of the pandemic 2009 H1N1 influenza outbreak.
- At least 10 of these training sessions were conducted during May–June 2009, resulting in noticeable improvement in the receipt of specimens for pandemic H1N1 processing at RITM.
- The NIC's epidemiologist and biostatistician attended the Practical Aspects of Conducting Burden of Disease Studies at the University of Queensland in Brisbane, Australia, through a fellowship program in November and December 2008. Their exposure to this training will assist with conducting the BOD study.
- The NIC participated in the China-ASEAN Training Course on Influenza A (H1N1) Laboratory Detection Techniques in Beijing, June 2009.



To increase laboratory capacity in response, the Department of Health (DOH) upgraded and procured a complete line of real-time PCR equipment for 5 government hospitals, September 2009. These hospitals included the Baguio General Hospital and Medical Center in northern Philippines; the San Lazaro Hospital, Lung Center of the Philippines in Metro Manila; the Vicente Sotto General Hospital in Central Visayas, and the Davao Medical Center in southern Philippines. Laboratory staff were trained in these new techniques and given a certificate of proficiency after being tested on these techniques by the NIC.

## **H1N1 Activities, FY 2009**

The NIC assumed the lead role in detecting cases of the pandemic 2009 H1N1 influenza outbreak in the Philippines. Through the Influenza Surveillance Project, real-time PCR detection of circulating human and avian influenza subtypes was established at RITM. This same technology was adopted for detecting the pandemic 2009 H1N1 influenza virus by using primers and probes developed by CDC and made available through the WHO. To date, more than 11,500 samples were tested by the NIC for the pandemic subtype. The NIC also established close links with the DOH and the NEC for rapid reporting of cases detected in the country.

## **Notable Achievements, 2009**

The network has attained broader surveillance coverage in its 5th year, thus, is confident in the representation of its results. The initiation of the BOD study will provide the DOH with information critical to the development of policies relative to influenza control. Its response to the pandemic 2009 H1N1 influenza outbreak was appropriate, timely, and gained recognition from the different parts of the country and from WHO-WPRO.

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## **Other Partners**

- Regional centers for health development.
- Regional Epidemiology and Surveillance Unit.
- Local government units.
- Bureau of Quarantine, Region IX.
- Department of Social Welfare and Development, Region IX.
- National Children's Hospital, Manila.
- St. Louis University Hospital, Baguio City.
- Notre Dame Hospital, Baguio City.
- Baguio Medical Center, Baguio City.
- Pines City Hospital, Baguio City.

# **Western Pacific Region**

## **Secretariat of the Pacific Community, Pacific Public Health Surveillance Network**

### **U.S. CDC Direct Country Support**

Developing Influenza Surveillance Networks Cooperative Agreement

- Began in 2005.
- FY 2008 was the 4th year of the agreement.



The Secretariat of the Pacific Community (SPC) is an international organization with a membership of 22 Pacific Island Countries and Territories (PICTs). Established in 1947, SPC was created to carry out activities on social, economic, and health issues to develop the region's land, marine, and human resources. Within the framework of SPC is the Pacific Public Health Surveillance Network (PPHSN), which is dedicated to communicable control and surveillance with a specific focus on outbreak-prone diseases.

The current Influenza Surveillance Networks Cooperative Agreement between SPC PPHSN and the U.S. CDC supports the development of influenza surveillance networks across a vast geographic area, including both the north and south Pacific, covering 10 time zones and wide geographic, sociopolitical, and cultural diversity. In addition to H1N1 influenza, a broad spectrum of outbreak-prone diseases in PICTs such as dengue, cholera, and dysentery, and natural disasters, including floods and tsunamis stretched the resources of SPC and PPHSN in FY 2009.

### **Surveillance**

There was increased focus during implementation and follow-up visits on the integration of laboratory and ILI surveillance during FY 2009. Limited surveillance infrastructure and human resources in many PICTs continued to be a constraint to strengthening influenza surveillance, yet SPC PPHSN was able to accomplish several surveillance activities in FY 2009 that included

- Increasing the number of sentinel sites to 45 located in 13 PICTs following new implementations and follow-up visits.
- Strengthening laboratory-based and syndromic surveillance for influenza through frequent follow-up visits to PICTs by project staff.
- Developing a standard operating procedure for ILI surveillance and promoting its use in PICTs.
- Continuing support for PICTs provided through scheduled follow-up visits and regular communication.

- Training of sentinel site and laboratory personnel on how to correctly collect nasopharyngeal samples occurred during all implementations and follow-up visits.
- Developing a joint SPC-WHO proposal for a regional approach to syndromic surveillance; this includes ILI and SARI syndromic surveillance. The PPHSN meeting in March provides a venue for PICTs to discuss this proposal.

## **Laboratory**

FY 2009 saw the number of testing sites with IFA microscopy capability increase from 10 to 14 in 13 PICTs as 4 new sites were established in 2009 in the Pacific Region. Several follow-up visits to PICT laboratories provided on-site training on IFA and influenza sample packaging and shipping. The status of infrastructure, trained staff, and resources in many PICT laboratories has challenged the implementation and sustainability of a laboratory-based surveillance project. There is a compelling need to establish a regional reference laboratory in the North Pacific to make significant enhancements with the public health laboratory services in the region. With these challenges in mind, activities leading toward stronger influenza laboratory surveillance in the Pacific included

- Increased the number of samples sent to reference laboratories; 623 of 3,077 samples tested at the WHO in Melbourne since January 1, 2009, came from PICTs.
- Developed and implemented standard operating procedures for laboratory influenza testing sites, revising SOPs as needed, during all follow-up visits.
- Established streamlined sample shipping arrangements to additional reference laboratories (i.e., Institute of Environmental Sciences and Research, Wellington, NZ; Mataika House, Suva, Fiji; and Hawaii State Laboratory) that allowed faster and more reliable sample transport.
- Worked closely with the Pacific Island Health Officers Association (PIHOA) to ship influenza samples for laboratories in the U.S.-affiliated Pacific Islands (USAPIs). PIHOA also provides support and technical expertise as a key partner in the project in USAPIs.
- Supported influenza sample shipping arrangements from PICTs to reference laboratories through funding and training workshops.
- Worked towards developing a strategic approach for further enhancement of testing capabilities with stakeholders with the aim of implementing expanded PCR capabilities and strengthening influenza sample shipping arrangements in the Pacific Island region.



## **Preparedness**

The Pacific Islands experienced severe disease outbreaks and natural disasters in FY 2009, and although the effects of these events were profound, the region responded to these trials by strengthening its network of preparedness activities. Through SPC's Public Health Surveillance and Communicable Disease Control Section and the Pacific Regional Influenza Pandemic Preparedness Project (PRIPPP) of PPHSN, technical assistance and consultation on influenza preparedness was provided to all 22 PICTS. Some of the preparedness activities for 2009 included

- Implemented routine influenza surveillance in 4 new sites and support in 10 existing sites.
- Strengthened sample shipping arrangements to facilitate the transportation of samples for outbreak-prone and emerging diseases.
- Provided educational materials on the prevention of transmission of influenza.
- Provided templates of educational materials to PICTs to adapt for local use, including the translation into local languages of key messages on cough and sneeze etiquette and proper use of PPE.

A close working relationship with PRIPPP continued as the program has been involved in developing procurement and stockpile strategies, pandemic planning, and reviewing existing plans, emergency exercises, and communication plans.

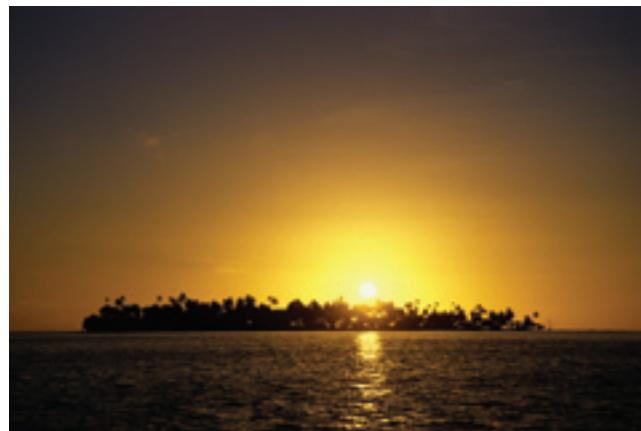
## **Training**

One of the major challenges with influenza surveillance in the Pacific is the shipping of samples. Resolution of this issue is paramount as laboratory staff throughout the PICTs were trained to package influenza samples according to International Airport Transport Association (IATA) requirements. Efforts continue to address technical training to increase laboratory capability throughout the Pacific. Some of these training efforts in FY 2009 were as follows:

- Clinicians, nurses, and laboratory staff were trained on sample collection, storage, and transportation.
- Presentations on influenza surveillance were provided during all implementation and follow-up visits.
- At least 2 laboratory technicians were certified as sample shippers in each of 10 USAPI laboratories; the PIHOA Regional Laboratory Coordinator provided training.
- Over the course of the project, 33 laboratory technicians were trained in IFA methods at the 14 sites, and 10 laboratory technicians were sent for further training at WHO-Melbourne.

## **H1N1 Activities, FY 2009**

The Pacific Islands faced an enormous challenge presented by the pandemic 2009 H1N1 influenza during spring and summer 2009. With enhanced communication through PacNet and PacNet Restricted, the PPHSN Web site, and person-to-person communication from technical experts proved to be the primary communications tools for the region. Complicated solutions were needed to address the volume of information and conflicting data from many agencies.



The SPC PPHSN and PICTs faced challenges in applying or modifying recommendations to suit the Pacific Island context. Limited surveillance infrastructure and human resources in some PICTs meant that fragile surveillance systems for H1N1 started slowly and were difficult to sustain. The SPC PPHSN used available resources to find solutions and mount a widespread H1N1 response that included the following:

- Led discussions with WHO about options available to PICTs regarding border closure and quarantine. These discussions considered the International Health Regulations and recognized the unique situation faced by small, isolated, and vulnerable Pacific Island communities.
- Developed posters, advisories, and guidance posters on cough and sneeze etiquette that were widely used throughout the region and translated into local languages.
- Provided antiviral medication, PPE, and additional influenza testing reagents to PICTs.
- Provided ongoing support to pandemic task forces and health personnel. Visits were made to Vanuatu, the Solomon Islands, the Cook Islands, and Kiribati.
- Encouraged and supported PICTs to develop surveillance systems and share information collected on PacNet during technical advisory visits.
- Evaluated the response to pandemic 2009 H1N1 influenza in the 22 PICTs.
- Improved pandemic and risk communication is underway through a an agency collaboration approach among SPC, UNICEF, and WHO that focused on producing educational materials, media training, and developing new communication plans and systems.

## **Notable Achievements, 2009**

During the pandemic, samples from PICTs represented the 2nd largest group of samples sent to WHO-Melbourne after Australian specimens.

SPC is working with partners to facilitate a regional approach to surveillance and laboratory testing of influenza and other diseases. SPC led discussions with WHO about options available to PICTs regarding border closure and quarantine. These discussions considered the International Health Regulations and recognized the unique situation faced by small, isolated, and vulnerable Pacific Island communities.

At the 39th Committee of Representatives of Governments and Administrations and Conference of the Pacific Community, a meeting held in Tonga, October 2009, PICTs acknowledged the work of the SPC Public Health Division during a particularly challenging period.

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## **Partners**

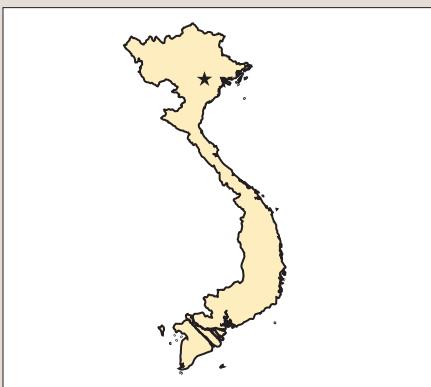
- U.S. CDC (funding agency since 2005).
- WHO.
- PIHOA.
- Ministries of Health in Pacific Island Countries and Territories.
- AusAID and NZ Aid through the Pacific Regional Influenza Pandemic Preparedness Project implemented by SPC.

## **Reference Laboratories**

- WHO Collaborating Center, Melbourne.
- Institute of Environmental Science and Research (ESR) Wellington, New Zealand.
- Pasteur Institute, Noumea, New Caledonia.
- Mataika House, Suva, Fiji.
- Hawaii State Laboratory, Honolulu, Hawaii.

# Western Pacific Region

## Vietnam



- **Capital:** Hanoi
- **Area:** 329,560 sq km
- **Population:** 89,571,130 (July 2010 est.)
- **Age Structure:** 0–14 years: 25.6% (male 11,418,642/female 10,598,184); 15–64 years: 68.6% (male 29,341,216/female 29,777,696); 65 years or older: 5.8% (male 1,925,609/female 3,055,212) (2008 est.)
- **Life Expectancy at Birth:** Total population: 71.33 years; male: 68.52 years; female: 74.33 years (2008 est.)
- **Infant Mortality Rate:** Total: 23.61 deaths/1,000 live births; male: 24.01 deaths/1,000 live; female: 23.19 deaths/1,000 live births (2008 est.)
- **Literacy Rate:** Total population: 90.3%; male: 93.9%; female: 86.9% (2002 est.)
- **GDP:** \$246.6 billion (2008 est.)
- **GDP per Capita:** \$2,900 (2008 est.)

### U.S. CDC Direct Country Support

Development of Influenza Surveillance Network in Vietnam

- Began April 2005.
- FY 2009 is the 5th year of the cooperative agreement.

Surveillance and Response to Avian and Pandemic Influenza in Vietnam, 2006–2010

- Began September 2006.
- FY 2009 is the 4th year of the cooperative agreement.

Community Mobilization for Enhanced Surveillance and Prevention of Avian Influenza in Vietnam (Development of a Model)

- Began September 2006.
- FY 2009 is the 4th year of the cooperative agreement.

Influenza and Other Emerging Infectious Diseases in Vietnam

- Began August 2009.
- FY 2009 is the 1st year of the cooperative agreement.

## Animal-Human Interface Studies: Pilot Surveillance Project for Influenza Viruses Infecting Humans and Animals in Vietnam

- Began September 2009.
- FY 2009 is the 1st year of the cooperative agreement supplement.

Since January 2009, H5N1 outbreaks have resulted in 4 human cases, all of which were fatal. The last human case was reported in April 2009. In total (i.e., January 2003–October 2009), there have been 111 A (H5N1) human cases and 56 deaths reported from 36 provinces and municipalities throughout Vietnam, representing the highest rates per population experienced by any country.



In April 2009, North America confirmed cases of human infection caused by a “quadruple reassortment” virus not previously detected in animals or humans. Vietnam reported its 1st case of pandemic 2009 H1N1 influenza May 31, 2009, and its 1st death August 3, 2009. By October 11, 2009, more than 10,000 cases had been laboratory confirmed, and more than 36 deaths were reported.

In August 2009, the U.S. CDC Influenza Division placed a Veterinary Medical Epidemiologist in the Influenza Program of CDC-Vietnam, at the U.S. Embassy in Hanoi. Along with this position, the Influenza Program began the Animal-Human Interface (AHI) initiative in Vietnam. The Chief of the AHI initiative works in collaboration with the Chief of the Influenza Program.

The AHI initiative is a collaborative effort between CDC-Vietnam and Vietnamese collaborators to identify and study gaps in knowledge related to the influenza virus and other zoonotic diseases, such as animal-to-human transmission characteristics, virus reassortment, geographic cohabitation, risk of transmission, and other risk factors associated with disease transmission.

### Surveillance

- Data collected from Vietnam’s 15 sentinel sites since implementation indicate that more than 2.4 million outpatients were screened, of whom 332,301 (14%) met the WHO case definition for ILI; of these, 24,012 patients were tested by RT-PCR, and 5,163 (22%) were found to be infected with influenza viruses.
- The outpatient sentinel surveillance was helpful in documenting the shift in influenza subtypes over the 1st several months of the pandemic. By September 2009, 52% of the influenza-positive samples were pandemic 2009 H1N1 influenza, whereas by October, that proportion dramatically increased to 93%. In 2009, 50 seasonal influenza virus isolates were sent to the WHO Collaborating Center, Atlanta, for characterization and vaccine strain selection, of which 2 isolates contained the pandemic 2009 H1N1 influenza strain.
- The Severe Viral Pneumonia (SVP) surveillance component of the National Influenza Surveillance System has identified 719 cases across the country to date. Ten percent of these were confirmed to be caused by influenza. Of note, seasonal influenza (A/H1,

A/H3, and B) was responsible for more than twice the number than those caused by H5N1 (40 vs. 17, respectively). This component has proved to be sensitive for human H5N1 infections, detecting 17 of the 18 infections reported in Vietnam since the inception of the SVP surveillance. In the first 5 months of the current pandemic, this system captured 7 cases of 2009 H1N1, 2 of which were fatal.

### **Laboratory**

- The National Institutes of Infectious and Tropical Diseases, Hanoi, and the Hospital for Tropical Diseases, Ho Chi Minh City, in partnership with National Institute of Health (NIH) / Health and Human Services (HHS) and the Oxford Research Group, have advanced diagnostic and research capacity to study influenza viruses, including pandemic 2009 H1N1 influenza.

### **Preparedness**

- Since March 2008, the U.S. CDC Influenza Division has assigned an epidemiologist to the WHO country office in Vietnam to provide technical support to the MOH, United Nations (UN) agencies, bilateral development agencies, and nongovernmental organizations for communicable disease surveillance and control programs, particularly activities related to influenza A (H5N1) and pandemic 2009 H1N1 influenza. The technical support has helped with developing, revising, and testing of avian influenza and pandemic influenza preparedness plans for the government agencies and organizations; coordinating activities and sharing information among partners; and developing and disseminating communication messages and materials.

### **Training**

- A series of 3 training courses were held from May 1–20, 2009, to train preventative medicine staff on increasing capacity for avian influenza surveillance and epidemiology. A total of 70 participants were trained from 63 provinces, 4 regional institutes, and the General Department of Preventative Medicine and Environmental Health.
- Two training courses were held December 2008 for preventative medicine staff at state and private health units on the early detection and reporting of A (H5N1) clusters and methods for epidemic control. The training was held for 60 preventative medicine staff trainees in Nha Trang and Dak Lak provinces.

### **Special Influenza Projects**



- An AHI pilot project was initiated in 2009 as part of a supplement to the U.S. CDC surveillance cooperative agreement with the National Institute of Hygiene and Epidemiology (NIHE). The AHI initiative, which is part of the Influenza Program, U.S. CDC-Vietnam, including the in-country placement of a veterinary medical epidemiologist and a medical epidemiologist, works side-by-side with MOH and Ministry of Agriculture and Rural Development professionals to find people, pigs, and poultry living in close proximity, and seeks to determine how the influenza virus is transmitted from animals to humans and vice versa. During the study, human and animal health workers at the commune level will identify people confirmed to have the current 2009 H1N1 influenza strain of the pandemic influenza virus and who live in close proximity to pigs and poultry. Samples will be collected for laboratory analysis, which will allow NIHE and National Center for Veterinary Diagnostics scientists to determine human and animal populations potentially at risk. With this information, scientists will be able to follow exposed populations of animals and study which risk factors lead to dangerous genetic mutation of the influenza virus.
- A newly developed U.S. CDC cooperative agreement for research on influenza and other emerging infections was approved 2009. This cooperative agreement will address molecular co-evolution of human and avian influenza viruses in Vietnam, burden of influenza illness studies, development of risk factor studies, and evaluation of new diagnostic methodologies, as well as other topics.



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# **Research and Training**



# Research and Training

The Influenza Division's international programs conduct a wide range of laboratory, clinical, and epidemiologic research. The general goals of the research address critical gaps in knowledge that advance programs towards prevention and treatment of influenza. Areas of research include the following: clinical studies to evaluate the effectiveness of antiviral medications and vaccines; the development of new diagnostic tests; work to understand risk factors for severe influenza infection; laboratory studies to better design vaccines and improve vaccine production; work to understand the effect of influenza on various populations; studies of the interface between animals and humans; and other areas. The research agenda is designed to complement and extend the core programmatic work of the Influenza Division in building capacity for influenza prevention and control globally.

**Understanding H1N1 Flu**

H1N1 Flu is a recently emerged new influenza virus from a mixture of avian, swine and human flu viruses. It is a contagious respiratory disease caused by influenza viruses (germs). The virus generally causes mild and moderate disease and is spread from person to person.

H1N1 Flu is spread by coughing or sneezing and unclean hands.

**4 ways to help prevent H1N1 Flu:**

1. Frequent hand washing will help protect from germs.
2. Cover your mouth and nose when coughing or sneezing.
3. Avoid touching eyes, nose or mouth to avoid spread of germs.
4. Avoid close contact with people who have flu.

**Be Alert. Protect Yourself. Report.**



# Meeting on Influenza Research and Preparedness at the Animal-Human Interface

During April 1–3, 2009, the 2nd meeting on Influenza Research and Preparedness at the Animal-Human Interface was held at U.S. CDC. The purpose of the meeting was to provide updates on the research activities of the Avian Influenza Cooperative Research Centers and to enhance communication and coordination among investigators, U.S. CDC, and human and animal health authorities regarding influenza research at the animal-human interface. A second goal of the meeting was to improve preparedness at the animal-human interface through discussions of the animal and public health agency roles, responsibilities, notification plans, communication strategies, and plans of action related to the detection of potential or confirmed human novel influenza A infections in the United States.

To facilitate this planning, 3 brief tabletop exercises that simulated the detection of novel zoonotic swine, avian, and human influenza A infection in the United States were performed. This meeting was attended by zoonotic influenza researchers, animal and health officials from the United States and other countries that had previous experience with the detection and control of H5N1 and other novel influenza A viruses, U.S. CDC, the U.S. Department of Agriculture, the U.S. Department of the Interior staff, and other guests from academia, professional animal and health organizations, and the poultry and pork industries.

The screenshot shows the homepage of the Influenza Reagent Resource (IRR) website. At the top, there is a navigation bar with links for Home, Catalog, Deposits, Register, and About. To the right of the navigation bar is a search bar labeled "Select a Reagent" with a "Go" button and a link to "Advanced Search". Above the search bar is a link to "Access your Web Portal Account: Login". The main content area features a large image of two scientists in lab coats and face masks. Below this image is a "Home" link. On the left side, there is a "Quick Links" sidebar with links to Forms, Suggest a Reagent, Upcoming items, Announcements, Contact Us, Quick Order, and WHO Kit Forms. There is also a "Highlights" section with a message: "IRR website goes live!". In the center, there is a large image of a virus with the word "Catalog" overlaid. Below this image is a message: "Please [register](#) and [login](#) to view a complete list of available materials." Below this message is a statement: "Influenza Reagent Resource (IRR) was established by the Centers for Disease Control and Prevention (CDC)". To the right of the central image is a "Products" sidebar with links to Kits, Proteins, Reagents, Viruses, Antisera, and Plastics. At the bottom of the page, there is a footer with a mail icon and the text "Click [here](#) to join Mailing List". The footer also includes a toll-free phone number and email address: "Call Us Toll-Free: (866) 951-2822 | E-mail: [contact@influenzareagentresource.org](mailto:contact@influenzareagentresource.org)". Below this are links to Home, Site Map, FAQs, Privacy Policy, Careers, Contact Us, and Terms of Use. To the right of the footer is the CDC logo. The footer also contains the copyright notice: "© 2009 ATCC. All Rights Reserved."

Influenza Reagent Resource's (IRR's) roles in pandemic preparedness and influenza research are

- To manufacture and distribute influenza diagnostic kits, viruses, and reagents to public health, commercial, domestic, and international research laboratories.
- To improve pandemic preparedness, enhance detection and control of seasonal influenza, and provide better access to reagents via a secure, Web-based system.
- To augment U.S. CDC's international pandemic preparedness plan to provide a surge option (~\$10+ M per year) which can be exercised to distribute reagents and diagnostic kits to domestic and international public health laboratories.

During the H1N1 pandemic, U.S. CDC and IRR coordinated with WHO to provide RT-PCR H1N1 and seasonal influenza diagnostic kits and other materials to 150 countries supporting more than 300 laboratories internationally. These kits and reagents were also provided to more than 120 public health laboratories domestically in 50 states and territories. IRR also facilitated the manufacture and distribution of an H1N1 supplemental WHO influenza reagent kit to approximately 100 laboratories globally and the 2009–2010 WHO influenza reagent kit to more than 150 laboratories globally.

Product	Total Kits Int	# Countries Distributed	# Int Labs Distributed	Total Kits Dom	# Domestic Distributed	# State Labs Distributed	Total Kits Int & Dom
H1N1 RT-PCR	873	150	306	665	50 + DC+ PR	124	1,538
Seasonal RT-PCR	118			398			516
WHO H1N1 HI Supplemental	44	36	44	48	43	48	92
WHO H1N1 HI Kit	96	79	96	71	45	71	167

In addition to augmenting the H1N1 pandemic response, IRR will provide better access to quality influenza-related reagents by manufacturing and distributing influenza viruses a la carte and as panels, recombinant proteins, antisera, monoclonal antibodies, RNA standards, noninfluenza respiratory pathogens and more. Institutions that have access to these reagents are qualified domestic and international WHO national influenza centers and public health laboratories, commercial test developers, vaccine manufacturers, and research institutions.

# **Burden of Disease and Risk Factors**

## **Bangladesh**

### **Population-based Surveillance in Kamalapur**

Kamalapur is a densely populated, urban, low-income community in Dhaka, Bangladesh, where influenza surveillance has been ongoing since 2004. The study in this community will measure the incidence of influenza, assess the proportion of persons infected with pandemic influenza (H1N1) who develop severe illness, measure the rate of secondary household transmission of influenza, and characterize the full spectrum of illness among persons who are infected with pandemic influenza. Because this site was established before the emergence of A (H1N1) influenza, it has been invaluable in understanding the epidemiology of pandemic influenza.

### **Progress and Initial Conclusions**

Several manuscripts have been submitted for publication during 2009, and more are being drafted to share this site's important findings.

### **Mirpur Population-based Study**

This study aims to assess the rate of pandemic 2009 H1N1 influenza in relation to attributable risk of secondary tobacco exposure, indoor air pollution, and infrequent handwashing to the frequency, duration, or severity of laboratory-confirmed influenza. The study also explores genome-wide associations (e.g., potential associations between single nucleotide polymorphisms in genes involved in the toll-like receptor signaling immune response pathway) with duration and severity of 2009 H1N1 influenza. In addition, the study assesses potential associations among the duration and severity of influenza disease and delayed cognitive development in a birth cohort of Mirpur children participating in an ongoing amebiasis study.

### **Initial Findings and Progress**

Preliminary data analyses of the 1st year of incidence of respiratory viruses and household data is ongoing.

### **Surveillance and Epidemiology of Influenza**

The purpose of this study was to estimate national influenza rates among outpatient populations in Bangladesh by establishing surveillance at sentinel hospitals and clinics throughout Bangladesh.

### **Findings and Conclusions**

This study is entering its 3rd year of data collection and has yielded important estimates of national influenza rates among outpatient populations. The findings from the 1st phase of this study were instrumental for guiding pandemic response (e.g., allocating masks and oseltamivir to rural hospitals during the 1st phase of the pandemic). A manuscript presenting these data has been prepared and is currently under review. The study now intends to provide robust burden of disease data from hospitalized case-patients, estimate mortality rates, and quantify the pandemic 2009 H1N1 influenza burden of disease in rural Bangladesh.

## **Analyses of Pandemic 2009 (H1N1) Epidemiology**

Investigators at IEDCR and ICDDR,B have compiled data from all laboratory-confirmed pandemic 2009 H1N1 influenza case-patients to quantify and explore their epidemiologic characteristics, including case severity, case fatality rates, association with risk factors for severe disease, and secondary attack rates.

### **Findings and Conclusions**

The preliminary findings of this investigation have been published in an open-source journal and are being updated for publication in a peer-reviewed journal to guide regional response to the pandemic. The data were useful to WHO and other international partners in assessing the epidemiology and severity of the pandemic.

## **Cambodia**

### **U.S. CDC-Supported Studies at the U.S. Naval Medical Research Unit No. 2 (NAMRU-2) Detachment, Cambodia—Surveillance Initiation at 9 Health Centers Outside Phnom Penh**

Although greatly improving, Cambodia still lacks sufficient information on the epidemiology, clinical presentation, and etiology of infectious diseases, including influenza.

#### **Approach**

To improve public health interventions beginning in December 2006, NAMRU-2 initiated surveillance at 9 health centers in 2 provinces outside Phnom Penh. Patients 2 years and older with acute fever (i.e., temperature greater than 38°C) of at least 24 hours in duration were enrolled following written informed consent.

#### **Timeline**

The study is planned to continue until 2012.

#### **Progress and Initial Conclusion**

Our data published in *Epidemiology and Infection* in 2009 suggested that 15.1% of 2,257 patients were RT-PCR-positive for influenza. When compared to influenza-negative patients, influenza-positive patients were more likely to have cough and sore throat. Each year, influenza peaked during the rainy season. In 2008, the predominant subtype was A H1N1 and antigenically related to A/Solomon Island/O3/2006. Data suggested that influenza was an important contributor to health care use with nearly 1 in 5 fever patients infected with this virus.

### **U.S. CDC-Supported Studies at the U.S. NAMRU-2 Detachment, Cambodia—Burden of Disease in 2 Cambodian Communes**

#### **Purpose, Approach, and Timeline**

In mid-2009, to further characterize the burden of disease from influenza, we established a longitudinal study of 15,500 persons residing in 2 Cambodian communes with the help of the MOH. At baseline, persons were polled to obtain health care use patterns and estimate the incidence of influenza morbidity and mortality. Passive surveillance will be established at 5 government and private health clinics for influenza infections.

### **Progress and Initial Conclusion**

Census results suggested that during the 2-week reporting period, which was the peak season for influenza, 18% of patients reported having symptoms consistent with an ILI. Of these patients, only 5% sought care at a government clinic, whereas most sought help at a pharmacy or from a private medical clinic. In addition to research, this site will be used to train government staff on methods for studying influenza epidemiology and interventions. The study will continue for 5 years.

### **CDC-Pasteur Cambodia Study—Epidemiology of Human Influenza in Kampong Cham Province, Cambodia, 2008–2009**

Population-based surveillance for influenza has never been conducted in Cambodia in the past. Information on disease burden of influenza in Cambodia is lacking, but is critical to create data to support possible introduction of seasonal influenza vaccination in this country.

#### **Approach**

- Prospective, active, community-based surveillance for estimating the incidence of influenza in 20 semirural villages in 2–3 districts in Kampong Cham Province (one of the most populated provinces in Cambodia), as well as 5 districts in Kampong Cham City. Persons of all ages with a documented fever of greater than or equal to 38°C are eligible for enrollment.
- Case-control study to determine risk factors for severe outcomes of influenza by using patients recruited under a current hospital-based study (Kampong Cham Provincial Hospital) on etiologies of acute lower respiratory infections (SISEA).
- Population-based, active, death surveillance in a high-risk area by using verbal autopsies for estimating frequency of influenza-related mortality and risk factors.

#### **Timeline**

The project began in early 2009 and is expected to conclude in the 2nd half of 2010.

#### **Progress and Initial Conclusions**

Case enrollment at the community and hospital levels is ongoing.

## **Kenya**

### **Transmission of Pandemic and Seasonal H1N1 in Urban and Rural Communities in Kenya**

The justification is to understand better household and community transmission of seasonal and pandemic influenza.

#### **Approach**

Weekly visits to all households in Kibera and Lwak catchment areas combined with surveillance at a free clinic will allow us to trace the spread of laboratory-confirmed influenza among household members and within compounds in Kenya.

### ***Timeline***

Weekly surveillance started September 2009 in Kibera and will likely start November 2009 in Lwak. Biweekly surveillance has been ongoing since 2006.

### ***Progress and Initial Conclusions***

Analyses on seasonal influenza transmission patterns are currently being conducted.

## **India**

### **Population-based, Longitudinal Burden of Disease Study of Influenza in India**

The burden of disease related to influenza virus infection in India is not yet well defined but likely to be substantial given that India accounts for 20% of global childhood deaths caused by acute respiratory infections. To address this issue, a population-based, longitudinal, burden of disease study has been implemented at 2 sites in rural India, both of which have ongoing community and demographic surveillance systems.

#### ***Study Aims and Objectives***

- Estimate the incidence of laboratory-confirmed influenza among persons hospitalized for acute respiratory illnesses and acute exacerbations of chronic medical conditions.
- Characterize the clinical spectrum of inpatient and outpatient disease related to influenza; evaluate different clinical case definitions and syndromes to predict influenza; and describe the seasonality of influenza.
- Determine risk factors for severe disease caused by influenza, including underlying chronic conditions, demographics, smoking, and socioeconomic status.
- Describe the health care use of the population and define the burden of respiratory disease for those who did not seek care or refused hospitalization for severe respiratory illness. Describe obstacles to care.
- Estimate the annual mortality rate from severe respiratory disease and influenza in the population.

#### ***Approach***

Persons living in the Ballabhgarh (Delhi suburb) and Vadu (Pune suburb) Demographic Surveillance Study areas that seek inpatient medical attention and meet the specific study enrollment case definition are enrolled in the study. Clinical and epidemiologic information and oropharyngeal and nasal swab specimens are collected from all consenting and enrolled persons, as per protocols. As of October 2009, Ballabhgarh has enrolled more than 3,300 households; 1,900 patients have been screened; and 77 patients have been enrolled, of which 7 are laboratory-confirmed to be positive for influenza. Likewise, Vadu has enrolled 954 households, screened 1,054 patients, and enrolled 423 patients, of which 56 are positive for influenza. The study is in progress to determine the incidence of influenza, especially the presence of novel H1N1 in these communities.

### ***Timeline***

April 2009–May 2011

# Indonesia

## Enhanced SARI Surveillance during the 2009–2010 Pandemic

The epidemiology of novel H1N1 infection in tropical countries is not well described. On June 24, 2009, novel H1N1 was 1st identified in Indonesia. To characterize the epidemiology of novel H1N1 in Indonesia, we implemented enhanced surveillance for hospitalized patients with SARI in a network of 12 hospitals in Tangerang District, Indonesia, in early June 2009.

### Approach

We identified all hospitals that manage patients with respiratory illness in Tangerang District and trained clinicians to identify SARI patients, collected clinical specimens, and completed a standardized case investigation form. Throat and nasal swabs were tested by RT-PCR in the Indonesian NIC by using primers from the U.S. CDC.

### Timeline

Surveillance was implemented in late June 2009 and will continue throughout 2010.

### Progress

During June 28–September 3, 2009, we identified 216 patients with SARI, including 19 patients (9%) with novel H1N1 infection. Patients with novel H1N1 infection were identified in 7 hospitals and ranged in age from 11 months to 54 years (median age 20 years); 59% were male. The age specific rate for hospitalization ranged from 5.7 per 100,000 population in persons 0–4 years of age to 0 among persons more than 60 years of age. The number of patients with novel H1N1 infection peaked in mid-July, which is the low season for seasonal influenza transmission in Banten, Indonesia. The median time from symptom onset to hospital admission was 2 days, ranging 1–8 days. Six patients with novel H1N1 infection had complicated courses of illness, including 2 patients who died. Among the 19 patients with novel H1N1, 6 had underlying medical conditions, including asthma and tuberculosis. All patients with novel H1N1 infection were treated with oseltamivir.

### Conclusion

We observed a rapid rise in the number of SARI patients with novel H1N1 infection shortly after introduction of this virus in Indonesia. The age distribution, clinical features, and mortality of hospitalized patients are similar to that observed in other countries. We anticipate much higher rates of disease during peak season for influenza transmission in Indonesia. This work will continue to monitor influenza after the pandemic.

# Kenya

## Population-based Surveillance for Influenza and Other Respiratory Diseases in Nairobi and Kisumu, Kenya

The purpose of this project is to understand the burden of influenza and other respiratory viruses in an urban and rural setting in an equatorial African country, and to understand the contribution of ILI and SARI to morbidity and mortality in these same communities.

### **Approach**

In each catchment area (approximately 25,000 people per catchment area), weekly household visits are performed to record episodes of respiratory illness. All residents have access to a free clinic in each site where samples are collected, if patients meet the case definition criteria for ILI or SARI. In Kisumu, the clinic is attached to an inpatient facility. In Kibera, follow-up is performed on patients who are hospitalized at the referral hospital.

### **Timeline**

Started October 2006; no scheduled end date.

### **Progress and Initial Conclusions**

Burden analysis is currently being done; projected draft of results are expected December 2009.

## **Case-Control Study to Assess Risk Factors for Severe Influenza Infection, Bondo, Kenya, 2007–2009.**

This project was conducted to understand risk factors for severe influenza infection.

### **Approach**

Cases from active hospital-based surveillance in Bondo District, Western Kenya, were selected, and age-matched community controls have been identified. Approximately 60 cases and twice as many controls have been identified.

### **Timeline**

Enrollment is complete. Analysis is being completed. A draft manuscript is projected for December 2009.

### **Progress and Initial Conclusions**

Initial findings identified potential risk factors for infection.

## **Surveillance for Hospital-Acquired Infections, Kenya**

This project was undertaken to understand the burden of hospital-associated respiratory infections (HAIs) in Kenya and the relative contribution of influenza and other viruses to HAIs.

### **Approach**

Surveillance has been established in multiple wards in 3 hospitals in Kenya. Testing for multiple pathogens is conducted at the CDC-Kenya IEIP laboratory.

### **Timeline**

Surveillance started July 2009 and is scheduled to continue for 2 years with a plan for the introduction of interventions, such as improved safe water access after the 1st year.

Preliminary results are expected early 2010.

## **Prospective Evaluation of Admitted Patients with Pandemic H1N1 in Kenya**

The purpose of this prospective evaluation is to understand the clinical presentation, course, and risk factors associated with severe pandemic H1N1 infection.

### **Approach**

Surveillance is being performed on all H1N1 patients admitted to area hospitals. Standard data are being collected on H1-positive patients.

### **Timeline**

Surveillance is ongoing.

## **Peru**

### **NMRCD-CDC Burden of Illness and Risk Factors for Transmission of Seasonal Influenza in 4 Distinct Regions of Peru**

The epidemiology, incidence, and economic burden of influenza disease are not well characterized in Peru.

### **Approach**

This study includes a prospective cohort to estimate incidence and disease burden and assess risk factors and seasonality patterns for influenza (i.e., seasonal and pandemic H1N1 influenza), and to evaluate alternative routes of viral transmission. To accomplish these goals, a prospective population-based cohort study was implemented in 4 locations that are representative of the geographic and climatic diversity of Peru (i.e., coastal, highlands, jungle, tropical dry forest) for a 3-year period, June 2009–June 2012).

A total of 375 households (i.e., approximately 1,500 persons per site) are enrolled in each location. ILI screening is conducted 3 times each week among each of the household's occupants (active site visits). Once ILI cases have been identified, they are sampled by using throat and nose swabs for laboratory identification of etiologic agent. In addition, they receive follow-up visits for 15 days to assess the economic burden of influenza by using in-depth questionnaires.

### **Progress and Initial Conclusions**

As a result of this active surveillance, we have identified 938 ILI cases; 540 (44%) were positive for H1N1. We have also identified a cumulative attack rate of 7.7% for H1N1 and 3.3% for other etiologies in Lima. Data generated throughout this study will allow us to determine groups at high risk for influenza infection. This data will allow Peruvian policy makers and program managers to make more informed decisions regarding development of prevention and control measures for the country. Furthermore, our data will likely be quite useful in understanding the transmission dynamics of influenza in other developing tropical countries.



# **Development and Validation of Enhanced Surveillance and Diagnostics**

## **Evaluation of Case Definitions for SARI Associated with Influenza**

To understand the burden of influenza worldwide, appropriate and standard methods to identify cases are required. U.S. CDC and others have advanced SARI as a surveillance and research case definition in recent years. U.S. CDC has engaged partners in projects to understand how well SARI captures the true burden of influenza and other respiratory viruses. Work in Guatemala, Egypt, and Thailand IEIP sites have been undertaken in recent years, and this work will lead to improved surveillance guidelines and the ability to understand the influenza-associated disease burden across regions and sites.

## **Kazakhstan**

### **Validation of a Real-Time PCR Test Commercially Available in Central Asia for the Detection of Influenza A and B Viruses**

For logistical reasons, it is more convenient and less expensive for the regional laboratories in Kazakhstan to use commercial influenza primers from Russia (Amplisense) than to use the primers provided by U.S. CDC for real-time PCR testing of respiratory specimens. Very limited comparison testing suggests that the Amplisense kits work well, but a larger sample is needed to confirm this data.

#### ***Approach***

Seven sentinel site laboratories will use Amplisense to detect influenza A and B. All positive results and a subset of negative results will be sent to the RSES for testing by using U.S. CDC primers and protocols. The sensitivity and specificity of the Amplisense tests will be calculated by using the U.S. CDC test results as a reference (gold standard).

#### ***Timeline***

The timeline for this project is Kazakhstan's influenza season, which is week 39 of 2009 to week 16 of 2010.

## **Kenya**

### **Comparative Study of Relative Yield of Nasopharyngeal (NP) Swabs Versus Oropharyngeal (OP) Swabs in Detecting Seasonal and Pandemic Influenza, Kenya**

This project was conducted to evaluate use of single NP or OP swabs in detecting influenza by RT-PCR.

### **Approach**

Surveillance samples in 2 refugee camps in Kenya (i.e., Dadaab and Kakuma) are being separated into separate cryovials and tested separately. Testing for influenza is performed at the CDC-Kenya IEIP laboratory.

### **Timeline**

The project started May 2009 and is expected to continue for a year. Preliminary analysis will be performed November 2009.



# Influenza Prevention Projects

## Bangladesh

### Prevalent, High-Risk, Respiratory Hygiene Practices in Urban and Rural Bangladesh

The 1st phase of this project, which aimed to explore and pilot scalable nonpharmaceutical interventions to improve respiratory hygiene, documented that study participants frequently coughed or sneezed into the air and did not wash their hands after covering their mouth or nose while coughing or sneezing. The study suggests that culturally appropriate, cost-effective, and scalable interventions need to be developed in order to improve respiratory hygiene practices and assess their effectiveness in reducing respiratory pathogen transmission.

A manuscript that details study findings is being circulated for review and publication in a peer-reviewed journal. Investigators are preparing the concept and funding requests for the next phase of the study that plans to assess the health effects of a scalable public health intervention to improve respiratory hygiene.

### Prevention of Secondary Transmission of Novel A (H1N1) Influenza by Promoting Handwashing with Soap (BISTIS Study)

This study, which is completing its 1st phase, measures the secondary attack ratio of influenza among household contacts of index cases with influenza, tests the efficacy of an intervention promoting handwashing with soap for prevention of intrahousehold transmission of influenza, and identifies risk factors, other than handwashing with soap, for intrahousehold transmission of influenza in rural setting.

#### ***Initial Findings and Progress***

This study will be entering its 2nd phase during 2010, at which time a series of manuscripts to share findings from phase one will be drafted and shared with stakeholders.

## India

### Direct and Indirect Protection by Influenza Vaccine Given to Children in India

Influenza vaccines are in routine use in children in the United States, and although licensed in India, they are seldom given. Indeed, it is not known whether influenza vaccine efficacy in a tropical, developing country will be the same as in developed countries. This study will determine whether immunization of young children with influenza virus vaccine will protect the immunized children and older children and adults who are around them. By undertaking these studies in India, the 2nd most populous country in the world, information can be obtained that will be useful in India and in other tropical, developing countries.

#### **Approach**

This study is being conducted in 3 rural villages outside of Delhi, India. It has 2 parts: weekly household surveillance for FARI for persons of age groups, and vaccination of children aged 6 months to 10 years (randomized at the household level) with either Trivalent Influenza Vaccine (TIV) or the control vaccine, IPV. FARI surveillance data will be used to evaluate the direct effects of vaccination among children, as well as the effect of vaccinating only children on the

incidence of influenza among these older persons (herd immunity). The total population under surveillance for all 3 villages is approximately 20,000, with an estimated 3,500 children eligible for vaccination. In addition, a small subset of vaccinated children ( $n = 200$ ) will be enrolled into an immunogenicity study, which will measure their immune response to vaccination and risk factors affecting immunogenicity.

#### **Progress**

The site preparatory work, site sensitization, and training of field and laboratory staff have been completed. Successful development of a household randomization strategy to address the direct effects of influenza vaccine protection has been completed. All required human subject approvals and drug controller clearances have been obtained. Proformas developed, piloted, and data management issues are being addressed. A vaccine campaign will start by the end of November 2009.

#### **Timeline**

July 2008–June 2011

## **Senegal**

### **Direct and Indirect Protection by Influenza Vaccine Given to Children in Senegal**

Influenza vaccines are in routine given to children in the United States, and although licensed in Senegal, they are seldom given. It is not known whether influenza vaccine efficacy in a tropical, developing country will be the same as in developed countries. This study will determine whether immunization of young children with influenza virus vaccine will protect the immunized children and the older children and adults who are around them. By undertaking these studies in Senegal, information can be obtained that will be useful in Senegal and in other tropical, developing countries.

#### **Approach**

This study is being conducted in a rural site in Niakhar, Senegal. The total population under surveillance is approximately 18,000, with an estimated 3,500 children eligible for vaccination. Twenty communities have been randomized into 2 arms of 10. In 1 arm, all children aged 6 months to 10 years receive the southern formulation of trivalent inactivated vaccine (TIV). In the other arm, children receive inactivated polio vaccine (IPV). Weekly household surveillance for febrile acute respiratory illness for persons of all age groups will be conducted. Both the total (direct plus indirect) effects of vaccination among children, as well as the indirect effect on unvaccinated persons in the community, will be measured. In addition, a small subset of vaccinated children have been enrolled into an immunogenicity study that will measure their immune response to vaccination and risk factors affecting immunogenicity.

#### **Progress**

The study completed vaccination in June 2009 and is nearing the end of a complete year of follow-up among communities. The 2nd round of vaccination will be underway in May and June 2010.

#### **Timeline**

July 2008–June 2011

# Thailand

## Household Influenza Transmission in Bangkok and Effectiveness of Nonpharmaceutical Interventions To Reduce Transmission

The influenza section of the U.S. CDC IEIP in Thailand collaborates with the Queen Sirikit National Institute of Child Health and the Armed Forces Research Institute of Medical Sciences to conduct a study of household influenza transmission (HITS) in Bangkok.

### Approach

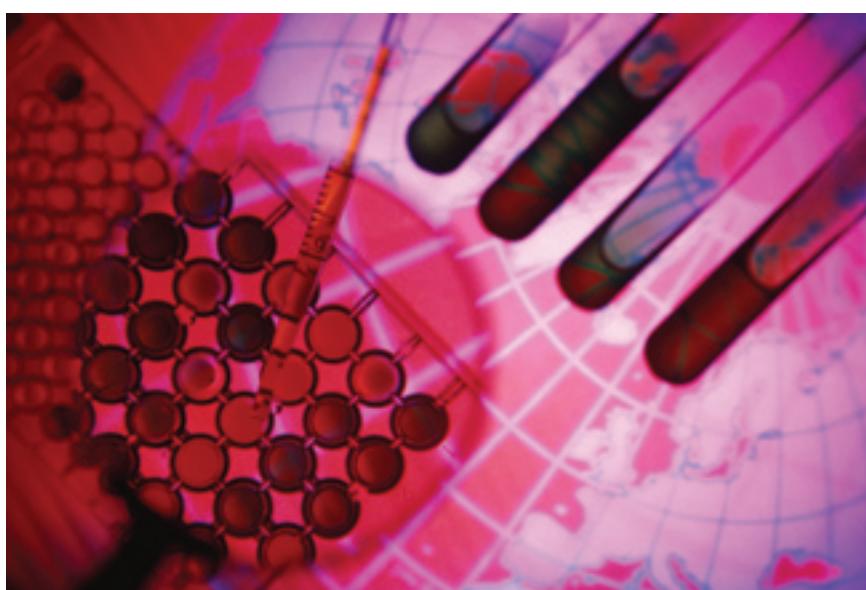
HITS enrolls the families of children with laboratory-confirmed influenza infection to study the effectiveness of nonpharmaceutical interventions to reduce influenza transmission. Index cases are prospectively identified by rapid influenza testing and then confirmed by RT-PCR testing. Consenting households are randomized to 1 of 3 study arms: control, handwashing, and handwashing plus surgical face mask use. To identify secondary infections, research nurses conduct home visits on days 1, 3, and 7 following enrollment. During these visits, respiratory swab specimens are collected from all household members and tested for influenza. The duration of viral shedding is also measured in the pediatric index cases from each household. Finally, blood is drawn from participants for antibody testing to detect mild and asymptomatic influenza infections.

### Timeline

Enrollment began in April 2008, and as of October 2009, 499 households had been enrolled.

### Progress and Initial Conclusions

Secondary transmission of influenza has occurred in 37% of all households and 18% of all family members. More than 90% of ill children in the HITS study sleep in the same room as their parents, a factor that may explain the high secondary transmission rates. Preliminary analysis has not demonstrated a protective effect of the interventions against secondary influenza infections. Further analysis is ongoing. The human and laboratory infrastructure established to conduct the HITS study has also been used to study the performance of influenza rapid tests and explore the prevalence of influenza virus surface contamination on common household surfaces.





# **Animal-Human Interface Activities**

## **Assessment of Health-Seeking Behaviors and Animal-to-Human Interface**

### **Approach**

Involving 1,200 households (principal sampling unit) from paraurban and rural communities in Laos, this work will be carried out in collaboration with CARE International and the National University for Health Sciences, Laos.

### **Proposed Timeline**

- Design completed January 2009.
- Training completed March 2009.
- Field activities March–April 2009.
- Analysis June–July 2009.
- Presentation and publication March–April 2010.

# **Bangladesh**

## **Avian Influenza Surveillance, Influenza A Surveillance in Bangladesh Poultry During the Pandemic**

This surveillance aims to identify any influenza A strains that are cocirculating in domestic poultry in Bangladesh to identify poultry die-off caused by influenza and related viral disease and to conduct passive surveillance in order to identify unusual poultry die-off suspected of novel influenza. Findings of this surveillance system have demonstrated that outbreaks of influenza A (H5N1) and other viruses are circulating concurrently with pandemic 2009 H1N1 influenza.

## **Serosurvey Among Poultry Workers Exposed to Influenza A (H5N1)**

The investigative team has recently collected epidemiologic data and serum from people who worked in farms with influenza A (H5N1). The team has also completed data collection among persons in rural Bangladesh who work at poultry wet markets. At the end of the study, during 2010, investigators intend to quantify rates of seroconversion among poultry workers to influenza A (H5N1) and other avian influenza viruses—an important issue in a country in which 69% of the population raise poultry as an important protein source.

## **National Influenza Surveillance and a Case-Control Study on Avian Influenza**

These complementary projects are collecting national representative information about poultry-rearing practices and exploring risk factors for the infection of backyard poultry and dispersion of avian influenza in the community. Data collection is entering its final quarter of 2009 but is expected to continue during 2010. Preliminary findings suggest that current multilateral response efforts may be ineffective to control avian influenza. These preliminary findings are being incorporated into manuscripts to help guide regional response to avian influenza.

## **Evaluation of CARE Intervention To Promote Safer Animal Husbandry**

This study intends to assess community awareness before and after and adoption of government recommended avian influenza prevention strategies. Baseline findings have been sent to local health authorities. These findings suggest that the rural population of Bangladesh is unaware of the risk posed by influenza circulating among poultry. A peer-reviewed manuscript is being prepared for the wider dissemination of study findings pending the postintervention evaluation. CARE Bangladesh will complete its intervention to promote the safer husbandry of poultry during early 2010 when the postintervention evaluation will take place.

### **Avian Influenza Ethnographies**

IEDCR and ICDDR employ the expertise of anthropologists who are exploring how people in rural Bangladesh raise poultry and perceive avian influenza outbreaks. The findings of this ethnography have yielded a wealth of information that challenges traditional concepts of community education as a mainstay of avian influenza prevention and control. Findings have been shared among regional stakeholders, and a 2nd phase of these projects intends to develop scalable, culturally appropriate interventions that may have more effect than those currently promulgated by international bodies.

# **Cambodia**

## **Active Surveillance for Avian Influenza Viruses in Rural Adults, Cambodia**

### **Approach**

NAMRU-2 and U.S. CDC in Bangkok completed a full year of active surveillance for avian influenza viruses among 1,600 rural adults. Each week, field staff follows up with enrolled adults in their homes and asks about influenza symptoms. If symptomatic, serum samples and throat and nasal swabs are obtained. Serum samples are also collected at baseline and annually thereafter.

### **Timeline**

The study will continue for 2 additional years.

### **Progress and Initial Conclusion**

At baseline, Cambodia serology data suggested that high and low pathogenic avian influenza virus infections were rare events, despite adults being routinely exposed to poultry. Preliminary data from Thailand indicated that H5 infections were slightly more common but final confirmation is pending.

# **Kenya**

## **Surveillance in Migratory Birds in Kenya**

Surveillance has been conducted to understand the prevalence and distribution of circulating viruses in migratory birds in Kenya.

### **Approach**

Annual surveillance is performed on birds at multiple sites around Kenya before, during, and after the migratory bird season. This project is a joint one with Walter Reed Project, Kenya National Museums, and the Division of Veterinary Services, Kenya. Testing was performed at CDC-Kenya laboratories with additional testing at U.S. CDC in Atlanta. Results are pending.

### **Timeline**

The study started 2006 and will continue through 2010.

### **Progress and Initial Conclusions**

A summary of the first 3 years is being drafted.

## **Analysis of Poultry Trade Networks, Kenya**

The spread of avian influenza A (H5N1) around the world has been a source of great concern for several years. H5N1 has been reported in birds in more than 60 countries, and understanding how the virus spreads globally will help predict transmission patterns and design better intervention and control measures. Some debate exists about whether the virus is spread primarily through the movements of migratory birds or through the international trade of poultry.

### **Approach**

The Influenza Division has collaborated with the Kenya Ministry of Agriculture, Division of Veterinary Services to undertake an analysis of poultry trade in Kenya. The project seeks to use network analysis to characterize the density of the trade network and then model the spread of virus through this network to gain a better understanding of the role that trade might play in the spread of avian influenza. A better understanding of poultry trade networks will aid in developing interventions to stop the spread of virus in areas prone to sustained transmission through domestic poultry populations.

## **Poultry Trade Network Analysis, Kenya**

This study is being conducted to understand the national poultry trade network so that timely and effective interventions can be implemented in the case of an avian influenza outbreak.

### **Approach**

Joint project with U.S. CDC and the Department of Veterinary Services, Kenya. Extensive interviews with poultry owners, sellers, and market workers are conducted to understand trade network.

### **Timeline**

The study started in 2008 and will conclude in 2009.

### **Progress and Initial Conclusions**

The analysis is ongoing. A report is expected in late 2009.

## **Live Bird Market Surveillance, Kenya**

The purpose of this project is to understand the prevalence and distribution of circulating avian influenza viruses in markets in Nairobi and Nakuru, Kenya.

### **Approach**

In collaboration with the Department of Veterinary Services, a sampling of market birds is done monthly at the same 5 markets. Testing will be performed at the CDC-Kenya IEIP laboratory, DVS laboratories.

### **Timeline**

The study started March 2009 and is planned for 2 years.

### **Progress and Initial Conclusions**

Awaiting testing at new avian BSL-3 laboratory in Kisumu (expected to be functional November 2009).

## **Nigeria**

### **Survey of Knowledge, Attitudes, and Practices Related to Reporting of Suspect Human Cases of Avian Influenza and Other Notifiable Infectious Diseases in Nigeria**

An outbreak of highly pathogenic avian influenza H5N1 in poultry was detected in Nigeria in January 2006 with continued sporadic reports of outbreaks in birds. In January 2007, the 1st human case of avian influenza H5N1 was identified. A broad range of public health response and control measures were undertaken in response to this threat, including strengthening the detection and reporting of priority diseases, such as avian influenza.

### **Approach**

To understand the barriers to complete and timely reporting of priority diseases by health care workers, a survey of physicians working at urban public hospitals is being conducted in 6 large cities in Nigeria. The knowledge, attitudes, and practices of these physicians related to their reporting of human avian influenza infections and other priority notifiable infectious diseases will be evaluated. The sources of information and types of information technology that physicians routinely use to acquire new medical and public health knowledge will also be assessed to improve efforts to effectively disseminate public health communications intended for physicians.

## **Peru**

### **Occupational Exposure to Zoonotic Influenza in Peru**

In an effort to better understand transmission of zoonotic influenza to humans after intense occupational exposure to swine and avian species (i.e., backyard poultry, backyard swine, formal and formal poultry and swine farmers, slaughter houses, live bird markets, game-bird breeders), we will conduct a prospective, 3-year cohort study of transmission of zoonotic influenza among 1,500 adults exposed to swine and birds.

The objectives of the study are to determine the prevalence of antibodies to avian and swine influenza among humans, particularly against those strains that have been shown to possess the ability to cross the human-avian-swine species barrier; estimate the incidence of zoonotic influenza infection; determine risk factors for zoonotic influenza infection; study the presence of influenza infection among swine; and determine which influenza strains are circulating in these populations.

### **Approach**

The study will be conducted in areas of Peru with large concentrations of potentially exposed humans. Questionnaires and serum collections from participants will be obtained at 0, 12, 24, and 36 months. Active surveillance for influenza virus infections among human participants and related animal populations will be performed. During the active surveillance, if participants develop ILI, they will be asked to seek medical attention within 48 hours of symptom development at specific medical treatment facilities where a medical worker will collect 2 pharyngeal swabs for virus detection and collect epidemiologic information from participants. Serologic assays, RT-PCR, viral isolation, and nucleic acid sequencing will be used to identify circulating influenza strains. With a better understanding of transmission of zoonotic influenza in these specific populations, pandemic planning can be strengthened by including measures that will prevent influenza transmission within this population and to other groups at risk.

### **Monitoring of Avian Influenza in Wild Birds, Peru**

Migratory waterfowl are currently considered to be the primary reservoirs for avian influenza viruses. Although influenza surveillance in wild birds has been occurring in Europe, North America, Asia, and Africa, few activities are present to date in South America.

### **Approach**

To determine genotypes of avian influenza circulating among wild birds in South America, we have been collecting environmental fecal samples from 5 wetlands along the central coast of Peru since June 2006.

### **Progress and Initial Conclusions**

To date, we have collected and tested 6,587 fecal samples and have recovered 21 AI isolates, representing 9 different strains (7 different hemagglutinin and 6 neuraminidases).

### **Surveillance for Avian Influenza in Live Bird Markets of Peru**

AI and other avian diseases in birds in Peruvian wet markets and those seized during government confiscations are currently being tested. This will allow us to assess the potential direct threat of AI and other zoonotic diseases to humans, as well as to livestock, in these settings. This study includes wild-caught birds (for exportation and sale to pet markets), exotic caged birds, and domestic avian species. Previous studies have shown that wild birds in Peru may serve as competent reservoirs for influenza strains. The risk of AI transmission may increase if these wild birds are housed along with domestic poultry or other domestic species, such as swine.

### **Approach**

All samples are collected with the consent of the bird seller. Tracheal and cloacal swabs are collected for viral isolation in egg culture. Positive isolates are further analyzed by RT-PCR, followed by sequencing for confirmation and molecular characterization.

### **Progress and Initial Conclusions**

To date, birds from 16 live bird markets (in 7 Peruvian cities) are being monitored and sampled. More than 1,700 samples (oral, cloacal, and fecal swabs and feces) have been obtained from 630 birds. None have been positive ( $n = 793$ ) for AI; however, 18 have been positive for Newcastle disease (Paramyxovirus type 1).

## **Knowledge, Attitudes, and Practices about Avian Influenza in Wild Birds and Poultry Holders at Peruvian Wet Markets, Peru**

Wet markets, also known as live animal markets, provide optimal conditions for the amplification and transmission of disease agents, such as avian influenza. Such markets are quite common in developing countries of Asia and South America and are characterized by the presence of animals in densely packed cages with poor hygienic conditions. In addition to wild birds, local populations often bring domestically raised poultry to marketplaces for sale or slaughter. Furthermore, illegal trade of wild birds at wet markets introduces new and poorly studied potential risks. The aims of this study are to assess the knowledge, attitudes, and practices of wild bird handlers and poultry workers regarding AI, and to establish baseline data in order to develop educational and preventive intervention methods in this population.

### **Approach**

The population under study includes wild bird handlers and poultry workers working in wet markets in 7 cities in coastal and rainforest regions of Peru (i.e., Pucallpa, Piura, Ica, Tumbes, Lima, Iquitos, Chiclayo). An information sheet explaining all the study procedures is given to all participants before recruitment. All participants are asked about sociodemographic information, general knowledge about avian influenza transmission and prevention, as well as attitudes and practices related to holding, slaughtering, and management of healthy, ill, and dead birds.

## **Influenza Viral Surveillance in Swine Populations of Peru**

Pandemic influenza viruses have been the product of the reassortment of circulating human, avian, and swine influenza strains. Pigs are often blamed as mixing vessels because these animals may serve as hosts for productive infections of avian, swine, and human viruses. The goal of this study is to determine the different strains of influenza (swine, avian, and human) circulating in Peruvian swine populations.

### **Approach and Timeline**

We are performing a serologic and virologic surveillance to monitor and study informal (backyard) and formal (mechanized) swine farms and slaughter houses. Studies are being conducted in multiple locations in Peru (i.e., Tumbes, Cuzco, Lima, Puerto Maldonado). This study uses infrastructure and workforce that have already been established by other NMRCD studies. Nasal and tracheal swabs and blood samples (antibody detection) will be collected from pigs 3 times a year from March 2009 to December 2010. RT-PCR, viral culture, and nucleic acid sequencing will be used to identify circulating strains of influenza.

### **Progress and Initial Conclusions**

To date, no influenza isolates have been recovered from 300 slaughtered pigs from Tumbes. Serologic results are pending.



# Influenza Cooperative Research at the Animal-Human Interface

In 2006, five 3-year cooperative agreements were initiated to establish a set of research projects related to detecting, preventing, and controlling zoonotic influenza. The agreements provide a more integrated public health response to avian and swine influenza outbreaks by human and veterinary health services. Collaborators included Colorado State University, the University of Minnesota, the University of Georgia, the National Institute of Public Health and the Environment (The Netherlands), and Mahidol University (Thailand).

## Colorado State University

The goals of this study are to understand better the transmission of avian influenza in small bird flocks in the United States and Indonesia and to assess the potential risk for infection of people interacting with these birds. A survey of backyard flocks in urban Colorado was performed to understand the size of backyard chicken and duck flocks and the characteristics of flock ownership in urban areas. The results of this research will be combined with demographic information and used to develop a model to predict the spread of avian influenza in these areas.

A nationwide survey of upland game bird facilities is being performed to understand flock characteristics, husbandry practices, disease management, movement, and biosecurity practices. Characteristics of human-to-bird interactions will also be examined, and this information will be used to evaluate the potential role of this bird population during an outbreak of avian influenza in the United States. Additional research is being performed in Indonesia to examine the prevalence of highly pathogenic avian influenza in ducks raised under differing management systems and to evaluate the interactions of these ducks with other poultry, wild birds, and humans.

## University of Minnesota

The goals of this research are to evaluate avian, swine, and human influenza virus transmission at the human-animal interface. In order to accomplish this goal, studies are ongoing in several human and animal populations. Surveillance for avian influenza is being conducted among backyard poultry flocks and their handlers in Minnesota and Wisconsin. Surveillance is also ongoing among an urban wild geese population in Minnesota and the human recreational users of their habitat. Swine influenza virus surveillance is conducted to detect and characterize influenza A viruses from pigs and people who work with them in commercial and noncommercial operations in the Midwest. This surveillance is occurring where influenza A virus has been detected in pigs and where human cases of ILI have been reported.

In Thailand, the prevalence and viral shedding of influenza virus is also being assessed in 4 rural villages where highly pathogenic avian influenza has been previously detected. The information from these studies will be used to identify factors that facilitate virus transmission from animals to humans, to characterize human illness caused by avian and swine influenza viruses, and to assess the use and effectiveness of interventions that interrupt transmission of influenza viruses from animals to humans.

## **University of Georgia**

The risk of human infection with avian influenza virus from an environmental source is not well understood. To understand that risk, studies are underway to estimate avian influenza virus loads associated with environmental sources of potential public health significance and to identify factors that may enhance or limit persistence of type A influenza viruses in these environmental sources (i.e., surface water, environmental surfaces, feces, carcasses). A quantitative risk assessment of the public health risk associated with environmental sources of avian influenza will be performed, and risk for exposure to the human population from environmental sources of avian influenza will be characterized to determine the exposure pathways, likely exposure amounts, and frequency and duration of exposure. Transmission studies will also be performed in ferrets and cats to examine the potential risk of human exposure from these species.

## **National Institute of Public Health and the Environment (The Netherlands)**

An epidemic of highly pathogenic avian influenza virus subtype H7N7 occurred in the Netherlands in 2003 at commercial poultry farms. During this outbreak, 89 confirmed human cases of avian influenza were identified among poultry workers and their families, including 1 death. This study will further evaluate this outbreak of avian influenza virus in humans. Researchers will estimate the level of virus exposure from poultry by studying the dynamics of avian influenza in the flock. Additional methods will be used to evaluate transmission of avian influenza subtype H7N7 to humans, and this information will be used to identify activities associated with increased risk for infection of avian influenza virus infection in humans.

## **Mahidol University (Thailand)**

Since 2004, outbreaks of highly pathogenic avian influenza virus H5N1 have occurred frequently in birds in Thailand, and numerous human cases have been identified. The goals of this research are to understand the incidence and prevalence of avian influenza virus infection in birds, humans, and other animals in Thailand, and to assess the transmission of avian influenza to people exposed to humans, birds, or other animals infected with avian influenza viruses. To determine the role of migratory birds in the transmission of avian influenza virus, the migratory routes of open-billed storks and lesser whistling ducks and gulls in and out of Thailand are being evaluated by the use of satellite telemetry. The prevalence of avian influenza in these birds and in nonmigratory birds, other animals, and humans who share a habitat with tracked migratory birds is being monitored. In addition, the prevalence of avian influenza in poultry in the area where avian influenza has been found in migratory birds is under study. The diversity and phylogeny of avian influenza viruses isolated in Thailand during the study is also being evaluated.

# Molecular Epidemiology

## LaoPDR

### Profiling Temporal and Spatial Phylogenetic Evolution of HPAI

In Laos, the U.S. CDC experts will assist to establish first-time sequencing capabilities in clade molecular characterization when profiling the temporal and spatial phylogenetic evolution of HPAI. This activity has been delayed because of U.S. CDC's focus on pandemic 2009 H1N1 influenza. Nevertheless, this activity will be carried out in FY 2010.

#### **Proposed Timeline**

- Visit by U.S. CDC team to review sequencing information (July 2010).
- Training of staff from National Center for Animal Health (NCAH) and NCLE in Atlanta to carry out sequencing with isolates from Laos (November 2010).
- Installation of new (unused) sequencing machine at NCAH (February 2011).
- Publication (May 2011).





# **U.S. CDC's Threat Reduction Collaboration**

The U.S. CDC's Influenza Division and the Department of State's Office of Cooperative Threat Reduction (CTR) collaborated in 2007. The CTR is an office located in the U.S. Department of State and works to enhance global health security and foster safe, secure, and sustainable bioscience capacity development. The CTR accomplishes this through joint scientific work, prevention, detection, and response to biologic threats and capacity building in nations and regions where terrorism, high infectious disease burden, proliferation of biotechnology, and high containment biology facilities coexist. The ultimate goal of the CTR is to foster long-term U.S. engagement with foreign governments and international organizations to harmonize biologic safety and security best practice guidelines.

Through the collaboration, which was developed in 2007, the CTR has provided funds for the Influenza Division to supplement cooperative agreements in countries located in the EMRO, namely Afghanistan, Morocco, and Pakistan. The CTR has assisted to improve laboratory capacity by providing funds for laboratory equipment and training. The collaboration provided financial assistance to countries with cooperative agreements and technical assistance to countries related to biosecurity and biosafety. The CTR has graciously agreed to assist countries to ensure quality biosafety and biosecurity in laboratories in the Middle East and North Africa.

Through their work with these EMRO countries, the CTR identified a need to have the *Biosafety in Microbiological and Biomedical Laboratories, 5<sup>th</sup> Edition* (BMBL) translated into the predominant languages used in these countries. Through an interagency agreement with U.S. CDC's Influenza Division, the BMBL document was translated into the following languages: Arabic, Bahasa, French, Mandarin, Spanish, Thai, and Urdu. These translations represent the languages spoken in many of the countries with whom the CTR provides financial or technical assistance. The Influenza Division and the CTR are hopeful these translations will provide the basis to improve biosafety practice and policy for laboratory workers.



# Influenza Burden of Disease Workshop and Vaccine Effectiveness Meeting, Bangkok, 2009

During August 26–28, 2009, the Influenza Division sponsored a 3-day workshop in Bangkok, Thailand, with more than 40 participants from 15 countries: Bangladesh, Cambodia, China, India, Indonesia, Laos, Mongolia, Nepal, Philippines, Senegal, South Africa, Sri Lanka, Thailand, United States, and Vietnam. U.S. CDC staff from the Influenza Division and the International Emerging Infections Program were also in attendance.

The goals of the meeting were to review the need for country-level disease burden estimation, to present burden of disease estimates from partners in attendance and to discuss the application of these estimates in informing vaccination, particularly in the context of pandemic 2009 H1N1 influenza.

Major topics addressed included

- Disease burden in the context of pandemic 2009 H1N1 influenza.
- Lessons learned from other global disease programs.
- Technical considerations in estimating influenza disease burden.
- Country-based examples for different methods of disease burden estimation.
- Presentation of surveillance data and national disease burden estimates.
- Current and future vaccine effectiveness studies.

The next burden of disease meeting will be held July 2010 in Atlanta, Georgia.



# Laboratory Training and Research

## Training

The Influenza Division and partners have led the development and use of training modules for improved infection control practices in health care settings and focused on reducing respiratory disease transmission in hospitals. The training program was developed by Thailand IEIP/GDD staff in collaboration with the REDI Center, Singapore, and Jhpiego.

## Immunology and Pathogenesis Branch

International collaboration with Huan Nguyen at the International Vaccine Institute, Seoul, Korea, and scientists at the National Center for Veterinary Diagnostics, Department of Animal Health, Hanoi, Vietnam—to test the prophylactic and therapeutic effectiveness of avian antibodies against pandemic influenza.

Passive immunization (the transfer of antigen-specific antibodies to a previously nonimmune recipient host) offers an alternative strategy to prevent and treat influenza virus infections. Even after targeted vaccines become available, passive immunization could still have a prophylactic effect and provide an additional countermeasure against influenza. Chickens produce a unique immunoglobulin molecule called IgY that is functionally equivalent to mammalian IgG. IgY is found in the sera of chickens and is passed from hens to the embryo via the egg yolk. Egg IgY has been used to prevent bacterial and viral infections of the gastrointestinal tract and recently for protection against *Pseudomonas aeruginosa* infection of the respiratory tract of patients with cystic fibrosis. However, the prophylactic and therapeutic effectiveness of IgY (isolated from eggs of hens immunized with H5N1 virus vaccine) against influenza virus infection has not been tested.

The epidemic of HPAI H5N1 virus has resulted in serious economic losses to the poultry industry, mostly in Southeast Asia. Therefore, many countries, including China, Indonesia, Thailand, and Vietnam have introduced mass vaccination of poultry with H5N1 virus vaccines that control the H5N1 epidemic to some extent. In this collaboration, the effectiveness of chicken IgY antibodies is being examined against H5N1 virus. We found that marketed chicken eggs in Vietnam, where mass poultry vaccination against H5N1 virus is mandatory, contain high levels of virus-specific IgY that provide protection against and therapy of H5N1 virus infections in mammals. Virus-specific IgY offers potentially inexpensive, yet highly safe and effective, alternatives for prevention and treatment against potential H5N1 pandemic strains.

## Libo Dong—International EID Fellow with the Pandemic Preparedness Team in the Immunology and Pathogenesis Branch

Libo Dong, an International EID fellow, began her fellowship on October 16, 2008 with the Pandemic Preparedness Team, Immunology and Pathogenesis Branch of the Influenza Division at U.S. CDC. She comes from the National Influenza Center, Virus Disease Control and Prevention Institute at CDC-China in Beijing where she worked with the avian influenza surveillance group. Libo's mentor at CDC-China is Xiuhua Lu. The purpose of Libo's fellowship is to provide training on serological assays used for influenza serodiagnosis, on ferret and mouse animal models of influenza infection, and on techniques for working with highly pathogenic avian influenza viruses. Through Libo's fellowship, we will be transferring technology to China's National Influenza Center and strengthening the ties between the 2 institutions.

By March, 2009, Libo was an expert in the microneutralization and hemagglutination assays for influenza serodiagnosis. Her part in the Pandemic Preparedness Team's response to the emerging H1N1 pandemic in April, May, and June was crucial. These early studies of cross-reactive neutralizing antibodies resulted in 2 publications; 1 in Morbidity and Mortality Weekly Report and the other in the New England Journal of Medicine. Libo continues to play a key role in our evaluation of the antibody response to the pandemic virus.

Under Lu's guidance, Libo and Feng Liu have developed methods to determine the specificity of the antibody response to the pandemic virus. At the same time, Libo is working alongside U.S. CDC experts in animal models of influenza, learning techniques and procedures. Libo returns to CDC-China in March, 2010.

### **Laboratory Training Table**

<b>Month/ Year</b>	<b>Country</b>	<b>Institute</b>	<b>Location</b>	<b>Influenza Division Laboratory</b>	<b>Training Type</b>
Oct 2008	Nigeria	HHS/CDC Nigeria	Atlanta, GA	Immunology and Pathogenesis Branch	Serology Training: Microneutralization and horse RBC HI assay for the detection of neutralizing antibodies to influenza viruses.
Oct 2008	Ghana	Noguchi Memorial Institute for Medical Research, University of Ghana	Atlanta, GA	Immunology and Pathogenesis Branch	Serology Training: Microneutralization and horse RBC HI assay for the detection of neutralizing antibodies to influenza viruses.
Oct 2008	Uganda	Uganda Virus Research Institute	Atlanta, GA	Immunology and Pathogenesis Branch	Serology Training: Microneutralization and horse RBC HI assay for the detection of neutralizing antibodies to influenza viruses.
Oct 2008	Morocco	National Institute of Health	Atlanta, GA	Immunology and Pathogenesis Branch	Serology Training: Microneutralization and horse RBC HI assay for the detection of neutralizing antibodies to influenza viruses.
Feb–Mar 2009		National Center for Laboratory and Epidemiology, Ministry of Health	Vietienne, Laos	VSDB	Diagnosis of influenza infections
Mar 2009	Cambodia	National Institute of Public Health, Ministry of Health	Phnom Penh, Cambodia	VSDB	Diagnosis of influenza infections
Mar 2009	Thailand	Armed Forces Research Institute of Medical Sciences (AFRIMS)	Bangkok, Thailand	VSDB	Diagnosis of influenza infections
Apr 2009	Egypt	NAMRU-3	Cairo, Egypt	Molecular Virology and Vaccines Branch	Genetic sequencing of influenza viruses
Jun–Jul 2009	Chile	Ministry of Health ISP	Chile	Molecular Virology and Vaccines Branch	Diagnostics
Aug 2009	Kenya	National Influenza Center	Nairobi, Egypt	VSDB	Diagnosis of influenza infections
Aug–Sep 2009	Mexico	Laboratorio de Virus Respiratorios	Mexico City	VSDB	Diagnosis of influenza Infections

Laboratory Capacity Building and Technical Assistance to NAMRU-3, Cairo, Egypt

- Two staff.
- Ongoing collaboration to provide technical assistance (diagnostic/sequencing) to international counterparts performed at CDC-Atlanta.
- No days spent overseas for global laboratory capacity building.

Laboratory Capacity Building and Technical Assistance to the National Center for Veterinary Diagnostics, Department of Animal Health, Hanoi, Vietnam

- Two staff.
- Ongoing collaboration to provide technical assistance (diagnostic/sequencing) to international counterparts performed at CDC-Atlanta.
- No days spent overseas for global laboratory capacity building.

Technical Assistance to CEMIC University Hospital, Buenos Aires, Argentina

- A full-time staff member for 1 week.
- Five days providing technical assistance (diagnostic/sequencing) to international counterparts performed at U.S. CDC.
- No days spent overseas for global laboratory capacity building.

Laboratory Capacity Building and Technical Assistance to the Chilean Ministry of Health for pandemic 2009 H1N1 Influenza Response

- A full-time staff member for 4 weeks.
- A total of 20 days spent training international counterparts in laboratory activities (in-country).
- A total of 28 days spent overseas for global laboratory capacity building.

Laboratory Capacity Building and Technical Assistance to Istituto Zooprofilattico Sperimentale delle Venezie, Padua, Italy

- One staff member.
- A total of 10 weeks of training to prepare prepandemic influenza candidate seed viruses performed at CDC-Atlanta.
- No days spent overseas for global laboratory capacity building.



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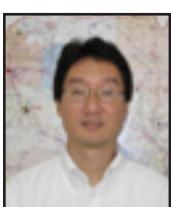
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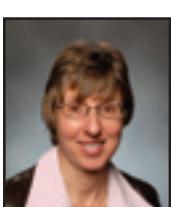
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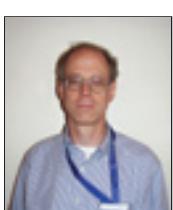
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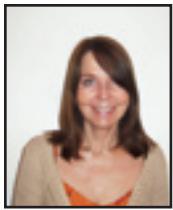
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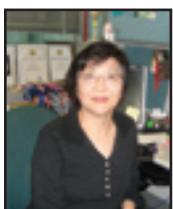
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